 

**Ethiopian Food and Drug Authority/ Ministry of Health**

**Ethiopian Medicines Formulary**

**Third Edition**

**October 2024**

**Addis Ababa, Ethiopia**

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# Foreword message from the EFDA

To promote the safe and effective use of medicines, up to date and evidence based medicines information is crucial. In the absence of such information sources, promotion of rational use of medicines is at risk, which ultimately compromises people's health and has an impact on the healthcare delivery system as a whole.

Recognizing this unmet need on medicines information, the Ethiopian Food and Medicine Authority (EFDA) in collaboration with Ministry of health has been working to develop and make available a variety of medicine information resources, such as Ethiopian medicine formulary, good prescribing and dispensing manuals, bulletins, and more, both in hard copy and through its website, [www.efda.gov.et](http://www.efda.gov.et).

The EMF aims to offer accurate, unbiased, and current medicine information and it targets all health professionals involved in patient care, training, research and others. Therefore, the main objective of the EMF is to assist health professionals in establishing a sound foundation for their practice in order to promote the rational use of medicines.

The third edition of the Ethiopian Medicines Formulary (EMF) is hereby revised based on the latest developments in the fields of health and pharmaceutical sciences. The EMF contains key information on medicines which are essential for good prescribing, dispensing, administration and use of medicine.

This EMF is helpful in providing useful information to promote the rational use of medicines and provision of quality health services for improved health outcomes. It is of particular importance to those healthcare providers working at health facilities who have little access to adequate and up to date information on medicines.

Lastly, I want to say thank you to everyone who took part in the EMF revision. I urge all pertinent health professionals to utilize the EMF to its fullest potential in their day-to-day work and to share their thoughts and recommendations for improvement and future changes.

Heran Gerba

Director General, EFDA

**Foreword Message from the Ministry of Health**

It is with great pleasure that we present the third edition of the Ethiopian Medicines Formulary. This formulary is a testament to our unwavering commitment to enhancing public health and ensuring the well-being of all Ethiopians. Medicines play a crucial role in the prevention and treatment of diseases, and it is our duty to ensure that they are used rationally and effectively.

The Ethiopian Medicines Formulary serves as an essential tool for healthcare providers, policymakers, and stakeholders involved in the procurement, distribution, and utilization of medicines. It provides up-to-date, evidence-based information that is vital for making informed decisions about the selection, dosing, and administration of essential medicines.

This formulary has been developed through a collaborative effort involving the Ministry of Health, the Ethiopian Food and Drug Authority (EFDA), healthcare professionals, and academic institutions. It reflects the latest scientific evidence and international best practices, tailored to meet the specific needs of our healthcare system.

Our aim is to ensure that all healthcare providers have access to accurate and unbiased information, enabling them to deliver the highest standard of care to their patients. The formulary includes a comprehensive list of medicines that are essential for the treatment of common diseases in Ethiopia, promoting the rational use of these medicines to improve health outcomes.

We extend our heartfelt gratitude to all those who have contributed to the development and revision of this formulary. Your expertise and dedication have been instrumental in creating a resource that will benefit healthcare providers and patients alike.

As we move forward, we remain committed to continuous improvement and innovation in healthcare. We encourage feedback from the healthcare community to enhance the relevance and effectiveness of the formulary. Together, we can build a stronger healthcare system and ensure a healthier future for all Ethiopians.

Sincerely,

Firehiwot Abebe Gobena

State Minister, Ministry of Health-Ethiopia

# Acknowledgements

The Ministry of Health and the Ethiopian Food and Drug Authority (EFDA) extend our heartfelt gratitude to all those who contributed to the preparation and refinement of this edition of the Ethiopian Medicines Formulary. The extensive work involved in the revision of this document, from drafting individual medicine monographs to producing a comprehensive compilation, was made possible through the collaborative efforts of various stakeholders.

We are particularly grateful to healthcare professionals - doctors, pharmacists, nurses, and other healthcare providers - who offered valuable feedback and insights during the review process. Their practical experience and expertise have been instrumental in shaping the content of the formulary. In addition, the contributions from academic institutions and service providers from universities, have significantly enriched the scientific basis of this formulary through their knowledge and research findings.

We also acknowledge the active participation and support of professional associations such as the Ethiopian Medical Association and the Ethiopian Pharmaceutical Association. Their involvement has ensured that the formulary meets the needs of healthcare professionals across the country. Special thanks go to the members of the Technical Working Group, who carefully reviewed and refined the formulary. Their dedication and attention to detail have been critical in ensuring the accuracy and relevance of the information provided.

The participants of the national workshop deserve our gratitude for engaging in discussions and sharing their perspectives, which were instrumental in shaping the final version of the formulary. We also thank the team of final editors for their tireless work in ensuring the quality and coherence of the document. Their commitment to excellence has played a crucial role in the completion of this formulary.

We extend our deepest thanks to the supporting organizations, particularly the Clinton Health Access Initiative, for their continued generous sponsorship. Their support covered the printing and workshop costs associated with the formulary, making this valuable resource available to healthcare providers across Ethiopia.

Lastly, we acknowledge the unwavering support of our partners, including the World Health Organization (WHO) and other international health agencies. Their collaboration and support have been invaluable in the development of this formulary.

Once again, we express our profound appreciation to everyone involved in this collaborative endeavour. Your dedication has contributed to the enhancement of healthcare practices in Ethiopia, and your efforts will undoubtedly have a lasting impact on the health and well-being of our citizens.

# Executive Summary

The Ethiopian National Medicines Formulary (ENMF) is an essential resource designed to support healthcare professionals in delivering high-quality, evidence-based care. This formulary serves as a comprehensive guide for the selection, procurement, distribution, and utilization of medicines within Ethiopia’s healthcare system. Developed through a collaborative effort involving the Ministry of Health and the Ethiopian Food and Drug Authority (EFDA), the ENMF reflects the latest scientific evidence and international best practices tailored to the specific needs.

The primary objectives of the ENMF are to ensure the rational use of medicines, enhance patient safety, and improve healthcare outcomes. By providing accurate, unbiased, and up-to-date information, the formulary assists healthcare professionals in making informed decisions about medication therapy. The ENMF aims to promote rational drug use by ensuring the right medicine is used for the right patient at the right dose and for the right duration. It also seeks to enhance patient safety by minimizing the risk of adverse drug reactions through detailed information on drug interactions, contraindications, and side effects. The formulary also supports evidence-based practice by providing recommendations grounded in the latest scientific research, facilitates access to essential medicines, and improves treatment outcomes.

The ENMF is organized into therapeutic categories, with each section containing medicines grouped by their pharmacological class. Each medicine monograph follows a standardized format that includes the name of the drug, pharmacological class, dosage form, indications, dose and administration, contraindications, drug interactions, side effects, cautions, and storage conditions. This structured approach ensures that healthcare professionals can quickly and easily find the information they need, supporting safe and effective medicine use.

Key features of the ENMF include its evidence-based information, comprehensive coverage, user-friendly format, special considerations for specific populations, and continuous updates. The formulary incorporates the latest scientific research and clinical guidelines to provide reliable and current information. It offers detailed monographs for a wide range of medicines. The standardized format of the monographs ensures consistency and ease of use. Specific guidelines for the use of medicines in special populations such as pregnant women, children, and the elderly ensure safe and effective treatment across all patient groups.

# Abbreviations and Acronyms

ADR: Adverse Drug Reaction

AIDS: Acquired Immunodeficiency Syndrome

ALL: Acute Lymphoblastic Leukemia

AML: Acute Myeloid Leukemia

ART: Antiretroviral Therapy

BCG: Bacillus Calmette-Guérin

BPaLM: Bedaquiline, Pretomanid, Linezolid, and Moxifloxacin

CBC: Complete Blood Count

CCB: Calcium Channel Blocker

CD4: Cluster of Differentiation 4

CLL: Chronic Lymphocytic Leukemia

CML: Chronic Myeloid Leukemia

CNS: Central Nervous System

CrCl: Creatinine Clearance

DNA: Deoxyribonucleic Acid

DTP: Diphtheria, Tetanus, Pertussis

DTPa-HepB Hib: Diphtheria, Tetanus, acellular Pertussis, Hepatitis B, Haemophilus influenzae type B

DTwP: Diphtheria, Tetanus, whole-cell Pertussis

EFDA: Ethiopian Food and Drug Authority

GBS: Guillain-Barré Syndrome

GI: Gastrointestinal

G6PD: Glucose-6-Phosphate Dehydrogenase

HAT: Human African Trypanosomiasis

HCV: Hepatitis C Virus

Hib: Haemophilus influenzae type B

HIV: Human Immunodeficiency Virus

HL: Hodgkin Lymphoma

HPV: Human Papilloma Virus

IM: Intramuscular

INR: International Normalized Ratio

IU: International Unit

IV: Intravenous

IVIG: Intravenous Immunoglobulin

J&J: Johnson & Johnson

MDR: Multidrug Resistant

MDR-TB: Multidrug-Resistant Tuberculosis

MDS: Myelodysplastic Syndromes

mg: Milligram

mL: Milliliter

NIP: National Immunization Programme

NSAIDs: Nonsteroidal Anti-Inflammatory Drugs

NSCLC: Non-Small Cell Lung Cancer

OPV: Oral Poliomyelitis Vaccine

PCP: Pneumocystis Pneumonia

PCV: Pneumococcal Conjugated Vaccine

PWID: People Who Inject Drugs

PWIDs: People Who Inject Drugs

RNA: Ribonucleic Acid

SC: Subcutaneous

SCARs: Severe Cutaneous Adverse Reactions

TB: Tuberculosis

T. b. Gambiense: Trypanosoma brucei gambiense

T. b. rhodesiense: Trypanosoma brucei rhodesiense

TIA: Transient Ischemic Attack

tOPV: Trivalent Oral Poliovirus Vaccine

VEGF: Vascular Endothelial Growth Factor

vWD: von Willebrand Disease

WBC: White Blood Cell

XDR-TB: Extensively Drug-Resistant Tuberculosis

# Introduction to the Ethiopian Medicine Formulary

The Ethiopian Medicine Formulary (EMF) is an essential resource designed to support healthcare professionals in the rational use of medicines. The primary goal of the formulary is to ensure that all medicines used in the Ethiopian healthcare system are safe, effective, and of high quality. By providing comprehensive, evidence-based information on a wide range of medicines, the formulary aims to enhance the quality of care delivered to patients and improve overall health outcomes.

This formulary serves as a guide for the selection, procurement, distribution, and utilization of medicines across various healthcare settings in Ethiopia. It includes detailed monographs for each medicine, covering essential aspects such as pharmacological class, dosage form, indications, dose and administration, contraindications, drug interactions, side effects, cautions, and storage conditions. The standardized format of the monographs ensures consistency and ease of use, enabling healthcare professionals to make informed decisions quickly and efficiently.

Key Objectives of the Ethiopian Medicine Formulary

1. **Promote Rational Use of Medicines:** The EMF provides healthcare professionals with the information needed to prescribe and administer medicines appropriately, ensuring the right drug is given to the right patient at the right dose and for the right duration.
2. **Ensure Access to Essential Medicines:** By listing essential medicines required for the treatment of common health conditions in Ethiopia, the formulary helps in ensuring their availability and accessibility throughout the country.
3. **Support Evidence-Based Practice:** The formulary is based on the latest scientific evidence and international best practices, adapted to the local context. This supports healthcare professionals in providing high-quality, evidence-based care to their patients.
4. **Enhance Patient Safety:** Detailed information on contraindications, drug interactions, side effects, and cautions helps in minimizing the risk of adverse drug reactions and improving patient safety.
5. **Facilitate Training and Education:** The EMF serves as an educational tool for healthcare professionals, including students, providing a reliable reference for the safe and effective use of medicines.

**Development and Revision Process**

The Ethiopian Medicine Formulary is the result of a collaborative effort between the Ministry of Health, the EFDA, and various stakeholders, including healthcare professionals, academic institutions, and Clinton Health Access Initiative. The formulary is regularly updated to reflect new developments in medical science and pharmacology, ensuring that it remains a relevant and up-to-date resource for healthcare providers.

The revision process involves reviewing the latest scientific evidence, international guidelines and formularies, and feedback from users of the formulary. This rigorous process ensures that the formulary continues to meet the highest standards of quality and reliability.

**Scope and Organization**

The formulary is organized into therapeutic categories, each containing medicines grouped by their therapeutic class. This structure allows for easy navigation and quick reference, helping healthcare professionals find the information they need efficiently. Each medicine monograph follows a standardized format, providing detailed information on the name of the drug, pharmacological class, dosage form, indications, dose and administration, contraindications, drug interactions, side effects, cautions, and storage conditions.

# Background

**Historical Development of the Formulary**

The Ethiopian Medicines Formulary has undergone significant evolution since its inception, reflecting the dynamic nature of healthcare and the continuous advancements in medical science. The journey began in 2008 with the development of the first edition by the Drug Administration and Control Authority (DACA), which was modelled after the World Health Organization (WHO) Model Drug Formulary. This foundational document set the stage for standardized and rational use of medicines across Ethiopia.

Since then, subsequent editions have progressively built upon this foundation, incorporating new scientific evidence and addressing the changing healthcare needs of the Ethiopian population. Each revision has been driven by the goal of improving the accuracy, relevance, and comprehensiveness of the information provided to healthcare professionals.

The second edition marked a significant step forward by integrating the latest developments in pharmacology and clinical practice. This edition expanded the scope of the formulary, including a wider range of medicines and more detailed monographs. The focus was on providing evidence-based recommendations that could be easily implemented in clinical settings.

In recent years, the formulary has continued to evolve in response to both local and global health challenges. The incorporation of emerging treatments, updated clinical guidelines, and feedback from healthcare providers has ensured that the formulary remains a vital resource. The integration of new technologies and data management systems has also enhanced the accessibility and usability of the formulary.

The collaborative efforts of the Ministry of Health, the EFDA, healthcare professionals, academic institutions, and international partners have been instrumental in this ongoing development. These collaborations have ensured that the formulary not only meets international standards but also addresses the unique healthcare needs of Ethiopia. As we look to the future, the Ethiopian Medicines Formulary will continue to evolve, guided by the principles of evidence-based practice, patient safety, and healthcare excellence. Each edition aims to build on past successes and learn from the evolving landscape of healthcare, ensuring that Ethiopian healthcare providers have access to the most current and relevant information to support their clinical decisions.

**Importance and Objectives of the Formulary**

The Ethiopian Medicines Formulary is an essential tool designed to support the rational use of medicines, which is a cornerstone of effective healthcare delivery. Its importance cannot be overstated, as it directly impacts patient safety, treatment efficacy, and overall healthcare outcomes. By serving as a comprehensive reference, the formulary guides healthcare professionals in the selection, procurement, distribution, and utilization of medicines across various levels of the healthcare system.

The formulary plays a crucial role in enhancing patient safety. It provides detailed information on drug interactions, contraindications, and side effects, which is vital for minimizing the risk of adverse drug reactions. By offering clear guidelines on the safe use of medicines, the formulary helps healthcare providers make informed decisions that safeguard patient health. Furthermore, the formulary is grounded in the latest scientific evidence and international best practices. This ensures that the recommendations are current and reliable, supporting healthcare professionals in delivering evidence-based care that meets the highest standards of quality.

Improving treatment outcomes is another significant benefit of the formulary. By providing comprehensive information on the indications, dosing, and administration of medicines, it helps healthcare providers select the most appropriate treatments for their patients. This leads to more effective management of diseases and better health outcomes. Additionally, the formulary promotes standardized prescribing practices across the country, reducing variability in treatment approaches. This consistency is essential for maintaining a high standard of care and ensuring that all patients receive appropriate and effective treatment.

Facilitating access to essential medicines is a key objective of the formulary. By listing the medicines necessary for addressing the health needs of the Ethiopian population, the formulary helps ensure that these critical medicines are available and accessible in healthcare facilities nationwide. This is crucial for the effective functioning of the healthcare system and for meeting the needs of patients.

The primary objective of the formulary is to promote the rational use of medicines by providing accurate, unbiased, and up-to-date information. This helps healthcare professionals prescribe medicines appropriately, ensuring that patients receive the right medicine at the right dose for the right duration. Additionally, the formulary serves as an educational tool for healthcare providers, including medical students and trainees. It offers a reliable source of information that supports learning and professional development in the field of pharmacotherapy.

The formulary also assists policymakers and healthcare planners in making informed decisions about medicine procurement and distribution. It provides a foundation for developing policies that ensure the availability and affordability of essential medicines. By promoting the use of effective and safe medicines, the formulary contributes to cost-effective healthcare delivery. Rational prescribing reduces the incidence of drug-related complications and unnecessary treatments, leading to more efficient use of healthcare resources.

Continuous improvement is a fundamental aspect of the formulary. It is regularly updated to reflect new scientific evidence, emerging treatments, and feedback from healthcare providers. This ongoing process ensures that the formulary remains a relevant and valuable resource for the Ethiopian healthcare system.

# Presentation of Information

**Structure of the Formulary**

The Ethiopian Medicines Formulary is meticulously organized to ensure ease of use and quick reference for healthcare professionals. The formulary is divided into therapeutic categories, with each section containing medicines grouped by their pharmacological class. This logical arrangement facilitates the efficient location of specific medicines and relevant information. Each entry within these categories provides detailed information to support the safe and effective use of medicines. The main sections of the formulary include:

* **Name of the Drug:** The generic name of the medicine.
* **Pharmacological Class:** The therapeutic category or class to which the medicine belongs.
* **Dosage Form:** The available formulations (e.g., tablet, injection, suspension).
* **Indications:** The medical conditions or diseases for which the medicine is approved.
* **Dose and Administration:** Detailed dosage information, including standard doses, dosing intervals, and special instructions for administration.
* **Contraindications:** Situations or conditions where the medicine should not be used.
* **Drug Interactions:** Important interactions with other medicines that may affect the efficacy or safety of the drug.
* **Side Effects:** Common and significant adverse effects associated with the medicine.
* **Cautions:** Precautions and warnings to consider when using the medicine.
* **Storage Condition:** Proper storage instructions to ensure the medicine's stability and effectiveness.

This structured approach ensures that healthcare professionals can quickly and easily find the information they need.

**How to Use the Formulary**

Healthcare professionals can use the Ethiopian Medicines Formulary as a comprehensive reference guide to support their clinical decision-making. The formulary is designed to assist in the selection of the most appropriate medicine for a given condition, determining the correct dosage, understanding potential drug interactions and side effects, and ensuring proper storage and handling of medicines.

To use the formulary effectively, healthcare providers should:

* **Identify the Therapeutic Category:** Start by locating the therapeutic category relevant to the patient's condition.
* **Find the Specific Medicine:** Within the therapeutic category, find the specific medicine listed alphabetically or by pharmacological class.
* **Review the Monograph:** Carefully read the monograph for detailed information on indications, dosing, administration, contraindications, drug interactions, side effects, cautions, and storage conditions.
* **Cross-Reference Information:** Use the cross-references provided in the formulary to check for potential drug interactions and special considerations, especially for patients with comorbid conditions or special populations such as pregnant women, children, and the elderly.
* **Apply Evidence-Based Guidelines:** Follow the evidence-based recommendations provided in the formulary to ensure safe and effective use of the medicine.

By following these steps, healthcare professionals can ensure that they are making informed decisions that enhance patient safety and treatment efficacy.

**Explanation of Monograph Format**

Each monograph in the Ethiopian Medicines Formulary follows a standardized format to ensure consistency and ease of use. This format includes the following sections:

* **Name of the Drug:** The official generic name used internationally and recognized within the Ethiopian healthcare system.
* **Pharmacological Class:** The class or category of the medicine based on its mechanism of action or therapeutic use.
* **Dosage Form:** The different formulations available for the medicine, such as tablets, capsules, injections, suspensions, etc.
* **Indications:** The approved medical conditions or diseases for which the medicine is indicated. This section provides guidance on clinical situations where the medicine should be used.
* **Dose and Administration:** Detailed instructions on the appropriate dosing regimen, including the recommended dose, frequency, and route of administration. Special dosing instructions for different populations (e.g., children, elderly, patients with renal or hepatic impairment) are also included.
* **Contraindications:** A list of conditions or situations where the medicine should not be used due to potential harm or lack of efficacy. This section helps healthcare professionals avoid prescribing the medicine to patients for whom it is unsafe.
* **Drug Interactions:** Information on significant interactions with other medicines that can affect the efficacy or safety of the drug. This section highlights potential interactions that healthcare providers should be aware of to prevent adverse effects.
* **Side Effects:** A comprehensive list of possible adverse effects associated with the medicine, categorized by frequency and severity. This section helps healthcare professionals monitor for and manage potential side effects in their patients.
* **Cautions:** Precautions and special warnings to consider when using the medicine. This section includes information on specific patient populations, such as pregnant women, lactating mothers, and individuals with certain medical conditions.
* **Storage Condition:** Guidelines on how to store the medicine properly to maintain its stability and effectiveness. This section includes information on temperature, humidity, light exposure, and other relevant storage conditions.

# Sources of Information

**References and Literature Used**

The Ethiopian Medicines Formulary is built upon a solid foundation of reputable sources to ensure the accuracy and reliability of the information provided. The references include clinical guidelines, pharmacology textbooks, peer-reviewed journals, and manufacturer product information. Key sources that have been instrumental in the development of the formulary include the British National Formulary (BNF), the WHO Model List of Essential Medicines, and the Kenya National Medicines Formulary (KNMF). These references offer a wealth of evidence-based information that supports the formulary’s recommendations and ensures they meet global standards.

**Regulatory and Professional Guidelines**

Incorporating guidelines and recommendations from renowned regulatory authorities and professional bodies is crucial to the formulary's integrity and utility. The formulary adheres to standards set by organizations such as the World Health Organization (WHO) and the Ethiopian Food and Drug Administration (EFDA). In addition, it reflects the guidelines and best practices established by the Ministry of Health. This alignment with both international and local guidelines ensures that the formulary is both globally informed and locally relevant.

**Contribution of Experts**

The preparation and revision of the Ethiopian Medicines Formulary involve the collaborative efforts of a diverse group of experts. Clinicians, pharmacists, researchers, and public health specialists contribute their expertise to ensure that the formulary is comprehensive, evidence-based, and tailored to the healthcare needs of Ethiopia. Experts provide insights that address the specific challenges and requirements of the Ethiopian healthcare system based on global best practices and the latest advancements in medical science. This approach enriches the formulary, making it a valuable resource for healthcare providers in Ethiopia.

# General Guidelines for Medicine Use

**Principles of Rational Drug Use**

The Ethiopian Medicines Formulary is guided by the principles of rational drug use, which are essential for effective and safe healthcare delivery. These principles include:

* **Correct Diagnosis:** Ensure an accurate diagnosis is made before prescribing any medication. This involves a thorough patient assessment and appropriate diagnostic tests.
* **Effective Treatment:** Select the most effective and safe medication based on current evidence, considering the efficacy, safety, and cost-effectiveness of available treatment options.
* **Appropriate Dosage:** Administer the correct dose to achieve the desired therapeutic effect, considering the patient’s age, weight, renal and hepatic function, and other relevant factors.
* **Patient Compliance:** Encourage adherence to the prescribed treatment regimen to ensure optimal outcomes, including educating patients about the importance of following their medication instructions.
* **Monitoring and Follow-up:** Regularly monitor the patient’s response to treatment and make necessary adjustments to identify and manage any adverse effects or complications promptly.

**Dose and Administration**

The formulary provides comprehensive guidelines on the correct dosage and administration of each medication to ensure optimal therapeutic outcomes. This includes:

* **Standard Doses:** Recommended doses for various conditions.
* **Dosing Intervals:** Guidelines on the frequency of administration.
* **Special Instructions:** Specific instructions for different routes of administration and any preparatory steps required.

Proper dosing and administration are critical for achieving desired therapeutic effects and preventing medication errors. Healthcare professionals should follow these guidelines to ensure the safe and effective use of medicines.

**Special Considerations (Pregnancy, Pediatrics, Geriatrics)**

The formulary includes specific guidelines for the use of medicines in special populations such as pregnant women, children, and the elderly. These sections address the unique pharmacokinetic and pharmacodynamic considerations in these groups to ensure safe and effective treatment:

* **Pregnancy:** Information on the safety of medications during pregnancy, including potential teratogenic effects and recommended alternatives.
* **Pediatrics:** Guidelines on appropriate dosing for children, considering their developmental stage and metabolic differences.
* **Geriatrics:** Considerations for elderly patients, including dosage adjustments due to altered pharmacokinetics and increased susceptibility to adverse effects.

These tailored recommendations assist healthcare providers in delivering appropriate care to special populations.

**Drug Interactions and Side Effects**

The formulary provides detailed information on potential drug interactions and side effects to help healthcare professionals avoid adverse reactions and manage them effectively if they occur. This section includes:

* **Drug Interactions:** Significant interactions with other medications that can affect the efficacy or safety of the drug, helping healthcare providers anticipate and mitigate potential risks.
* **Side Effects:** A comprehensive list of possible adverse effects associated with the medication, categorized by frequency and severity, enabling healthcare professionals to monitor and manage potential side effects in their patients.

Understanding drug interactions and side effects is essential for ensuring patient safety and optimizing therapeutic outcomes. The detailed and accessible information provided in this section supports healthcare professionals in delivering high-quality, evidence-based care.

# Gastrointestinal System Medicines

## Antacids and anti-flatulent agents

Antacids are weak bases that react with gastric hydrochloric acid to form a salt and water. Their principal effect is reduction of intragastric acidity. Antacids (which usually contain aluminium or magnesium compounds) can often relieve symptoms in ulcer dyspepsia and in non-erosive gastroesophageal reflux. Magnesium-containing antacids have a laxative effect whereas aluminium-containing antacids have constipating effect. Antiflatulents are agents used for the alleviation or prevention of excessive intestinal gas and are commonly used in combination with antacids.

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| **Aluminium hydroxide + Magnesium hydroxide + Sodium alginate + Simethicone** | | |
| Pharmacological class | Antacid with anti-flatulent | |
| Dosage form | Suspension: (125mg + 250mg + 100mg + 50mg)/5ml  Chewable tablet: 200mg + 400mg + 100mg + 50mg | |
| Indications | Duodenal and stomach ulcers, non-ulcer dyspepsia, non-erosive gastroesophageal reflux disease (GERD), flatulence, gastritis, hiatus hernia and esophagitis. | |
| Dose and administration | **Child above 12 years and Adult**:5–10 ml 4 times a day, to be taken between meals and at bedtime or when required. | |
| Contraindications | Hypophosphatemia, undiagnosed gastrointestinal or rectal bleeding, appendicitis, porphyria, severe renal failure, alkalosis or hypermagnesemia. | |
| Drug interactions | Alkylating agents, gabapentin, azole antifungals, chloroquine, proguanil, aspirin, bisphosphonates, corticosteroids, dipyridamole, dolutegravir, HIV-protease inhibitors, iron, phenothiazines, quinolones, raltegravir, rifampicin, statins, tetracyclines, levothyroxine, allupurinol, cyclosporine, isoniazid, and phenytoin. | |
| Side effects | Constipation, diarrhoea, electrolyte imbalance, abdominal pain, hyperaluminaemia. | |
| Cautions | Uraemia, congestive heart failure, renal failure and renal dialysis, oedema, cirrhosis, low sodium diets, gastrointestinal haemorrhage, and elderly. | |
| Storage condition | Store below 30 °C. | |
| **Aluminium hydroxide + Magnesium trisilicate** | | |
| Pharmacological class | | Antacid |
| Dosage form | | Suspension: 310 mg + 620 mg in 5ml.  Tablet (chewable): 120 mg + 250 mg |
| Indications | | Ulcer and non-ulcer dyspepsia, GERD. |
| Dose and administration | | **Dyspepsia, GERD,** oral:  **Adult**: 5–10 ml suspension 4 times daily between meals and at bedtime, or as required.  **Adult**: Chew 1-2 tablets when required.  **Child 6–12 years**: 5 ml up to 3 times daily. |
| Contraindications | | Hypophosphatemia, undiagnosed gastrointestinal or rectal bleeding, appendicitis, porphyria, hepatic coma. |
| Drug interactions | | Estramustine, gabapentin, antifungal agents, chloroquine, proguanil, aspirin, bisphosphonates, corticosteroids, dipyridamole, dolutegravir, HIV-protease inhibitors, iron salts, phenothiazines, quinolones, raltegravir, rifampicin, statins, tetracyclines, levothyroxine, allupurinol, cyclosporine, isoniazid, phenytoin. |
| Side effects | | Constipation, diarrhoea, electrolyte imbalance, renal impairment, abdominal pain, nephrolithiasis (long-term use). |
| Cautions | | Uraemia, congestive heart failure, renal failure and renal dialysis, oedema, cirrhosis, low sodium diets, gastrointestinal haemorrhage, and elderly. |
| Storage condition | | Store below 30 °C. |
| **Simethicone** | | |
| Pharmacological class | | Antifoaming agent, anti-flatulent |
| Dosage form | | Tablet: 80 mg (chewable)  Oral drop: 40 mg/ml, 66.6mg/ml |
| Indications | | Symptomatic relief of flatulence, wind pains, bloating, abdominal distension, and other intestinal gas symptoms. |
| Dose and administration | | **Oral:**  **Child 1 month–1 year**: 2.5 ml, to be taken with or after each feed; may be added to bottle feed (maximum 6 doses per day) |
| Contraindications | | Hypersensitivity to the drug. |
| Drug interactions | | Levothyroxine |
| Side effects | | Allergic reaction/rash, hives, itching, difficulty breathing, tightness in the chest, swelling of mouth, face, lips, or tongue. |
| Cautions | | Infant colic. |
| Storage condition | | Store below 30 °C. |

## Antiulcer medicines

Antiulcer medicines may be broadly divided into anti-secretory agents which suppress the production of gastric acid, and agents with cytoprotective or mucosal protectant properties. Histamine-2 (H2)-receptor antagonists such as cimetidine and famotidine reduce acid secretion by blocking the action of histamine at the H2-receptors in the parietal cells of the stomach. They are used in the management of peptic ulcer disease (PUD), reflux oesophagitis and hyper-secretory states such as Zollinger-Ellison syndrome (ZES). High doses of H2-receptor antagonists have been used in ZES, but a proton-pump inhibitor (PPIs) [e.g., omeprazole, pantoprazole], is now preferred. Maintenance treatment with low doses of H2-receptor antagonists has largely been replaced in *Helicobacter pylori (H.pylori)* positive patients by eradication regimens. H2-receptor antagonist therapy can promote healing of Non-steroidal anti-inflammatory drugs (NSAIDs)-associated ulcers, particularly duodenal ulcer. Their treatment also reduces the risk of acid aspiration in obstetric patients at delivery (Mendelson syndrome).

PPIs are effective short-term treatments for gastric and duodenal ulcers. They are also used in combination with antibacterials for the eradication of *H. pylori*. Following endoscopic treatment of severe peptic ulcer bleeding, an intravenous, high-dose PPIs reduces the risk of re-bleeding and the need for surgery. Proton pump inhibitors can be used for the treatment of dyspepsia and GERD. PPIs are also used for the prevention and treatment of NSAID-associated ulcers. A PPIs can be used to reduce the degradation of pancreatic enzyme supplements in patients with cystic fibrosis. They can also be used to control excessive secretion of gastric acid in ZES; high doses are often required.

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| **Cimetidine** | | |
| Pharmacological class | | H2-receptor antagonist |
| Dosage form | | Injection: 200mg/ml in 2ml ampoule |
| Indications | | Gastric and duodenal ulceration, GERD, ZES, and other conditions where gastric acid reduction is beneficial |
| Dose and administration | | **Short-term treatment of active ulcers:**  **Adult:** IM, IV 200mg 4-6 hourly. For IV, dilute it in 20ml of 0.9% sodium chloride solution and give slowly, over at least 2 minutes. IV infusion is recommended in cardiovascular disease or if a higher dose is required: 400mg, diluted in 100ml of 0.9% sodium chloride and given over 30 minutes-1 hours, may be repeated 4-6 hourly; or continuous infusion at a rate of 50-100mg/hour (maximum 2.4g/24 hours).  **Gastric hyper-secretory conditions:**  **Adult**: IM, IV 300mg–600mg every 6 hours (max. dose 2.4g/day).  **Child:** IM, IV 20-40mg/kg/day in divided doses every 6 hours. |
| Contraindications | | Hypersensitivity to the drug or other H2-receptor antagonists. |
| Drug interactions | | Aminophylline, antiarrhythmics, antiepileptics, azole antifungals, chloroquine, calcium channel blockers, capecitabine, fentanyl, fluorouracil, metformin, quinine praziquantel, selective serotonin re-uptake inhibitors (SSRIs), and tricyclic antidepressants (TCAs). |
| Side effects | | Constipation, diarrhoea, dizziness, fatigue, headache, myalgia, skin reactions, confusion, depression, erectile dysfunction, gynaecomastia, hallucination, hepatic disorders, leukopenia, nausea, and tachycardia. |
| Cautions | | Gastric cancer, severe renal and hepatic impairment. |
| Storage condition | | Store below 30 °C in an air tight container. Protect from light. |
| **Famotidine** | | |
| Pharmacological class | | H2-receptor antagonist |
| Dosage form | | Tablet: 20mg, 40mg |
| Indications | | Duodenal or benign gastric ulcers, GERD, ZES |
| Dose and administration | | **Benign gastric and duodenal ulceration,** oral:  **Adult*:*** 40mg daily at bed time (or 20 mg twice daily) for 4-8 weeks. Maintenance therapy: 20 mg daily at bed time.  **GERD**, oral:  **Adult:** 20mg twice daily for 6-12 weeks or up to 40 mg twice daily if there is oesophageal ulceration. Maintenance dose: 20 mg twice daily may be given to prevent recurrence.  **Child**: 0.5mg/kg once daily if <3 months; 0.5mg/kg twice daily if 3 to 12 months; 1mg/kg/day twice daily (maximum dose: 40mg twice daily) if 1 to 16 years.  **ZES**, oral:  **Adult**: Initially, 20 mg every 6 hour, up to 40 mg daily if necessary.  **Child** **1-16 year**: 0.5-1 mg/kg/day up to 40 mg/ day, given once at bed time or taken twice daily.  **Non-ulcer dyspepsia**, oral:  **Adult:** 10 mg twice daily.  **Heartburn, indigestion, sour stomach**, oral:  **Adult:** 10-20mg every12 hours; dose may be taken 15-60 minutes before eating foods known to cause heartburn. |
| Contraindications | | Hypersensitivity to the medicine and other H2-receptor antagonists |
| Drug interactions | | See under cimetidine; the potential for drug interaction is much less than with cimetidine. |
| Side effects | | Appetite decreased, dry mouth, taste altered, vomiting. |
| Cautions | | Pregnancy, breastfeeding, and renal impairment |
| Storage condition | | Store at a temperature between 15°C and 30 °C in an airtight container. Protect from light. |
| **Esomeprazole** | | |
| Pharmacological class | Proton pump inhibitor. | |
| Dosage form | Capsule: 20mg  Tablet (enteric coated): 20mg, 40mg  Powder for suspension (pediatric): 20mg, 40mg/sachet  Powder for injection: 20mg/5ml, 40mg/5ml vial | |
| Indications | Erosive oesophagitis, GERD, NSAIDs-associated gastric ulcer, ZES, eradication of *H. pylori*,severe peptic ulcer bleeding (following endoscopic treatment) | |
| Dose and administration | **Erosive oesophagitis,**oral:  **Adult and child > 12 years:** 40 mg once daily for 4-8 weeks. Maintenance to prevent relapse, 20mg once daily for additional 4-8 weeks.  **Chlid (1 to 11 years):** 10 mg once a day up to 4-8 weeks.  **GERD** **(without oesophagitis), oral**:  **Adult and child > 12 years:** 20mg once daily for 4 weeks.  **Chlid (1 to 11 years):** 10 mg once a day up to 4 weeks.  **NSAIDs-associated gastric ulcer, oral**: **Adult:** 20 mg once daily for 4–8 weeks.  **ZES, oral**: **Adult**: initially 40 mg twice daily, adjusted according to response; usual range 80–160 mg daily (above 80 mg in 2 divided doses).  **Eradication of *H. pylori,* oral**: **Adult:**esomeprazole 20mg plus amoxicillin 1g and clarithromycin 500mg, all twice daily for 7 -10 days.  **Gastric antisecretory treatment, IV: Adult:** **GERD**, 40 mg once daily (IV over a period of at least 3 minutes or by infusion); **symptomatic reflux disease without oesophagitis, treatment of NSAID-associated gastric ulcer, prevention of NSAID associated gastric or duodenal ulcer**, 20 mg daily (IV over a period of at least 3 minutes or by infusion); continue until oral administration possible.  **Prevention of rebleeding of gastric and doudinal ulcers, IV: Adult: severe peptic ulcer bleeding (following endoscopic treatment):** initial IV infusion of 80 mg over 30 minutes, then by continuous IV infusion 8 mg/hour for 72 hours, then by mouth 40 mg once daily for 4 weeks.  **Note:** Taking the medication at least 1 hour before a meal will have maximum benefit*.* | |
| Contraindications | Hypersensitivity to the drug. | |
| Drug interactions | Diazepam, warfarin, phenytoin, fluoxetin, propranolol, indinavir, ketoconazole, and carbamazepine. | |
| Side effects | Diarrhoea, headache, skin rashes, nausea, vomiting, constipation, flatulence and abdominal pain, pruritus, urticaria, dizziness. | |
| Cautions | Pregnancy**,** lactating women, liver disease, porphyria. | |
| Storage condition | Store below 30°C. Protect from light. | |
| **Omeprazole** | | |
| Pharmacological class | Proton pump inhibitor | |
| Dosage form | Tablet/Capsule: 10 mg, 20 mg  Powder for injection: 40 mg in vial  Powder for oral liquid: 20 mg, 40 mg sachets | |
| Indications | Benign gastric and duodenal ulcers, reflux esophagitis and ZES, gastric acid reduction during gastric surgery, GERD, NSAID-induced ulcer, prophylaxis during NSAIDs treatment in patients with high risk for peptic ulceration, eradication of *H. pylori* in combination with other drugs, as preoperative medication, and in patients not responsive to H2-receptor blockers. | |
| Dose and administration | **Adult:**  **GERD**, oral: 20 mg once daily for 4–8 weeks.  **Severe esophagitis,** oral: 40 mg once daily for at least 8 weeks. Continue as maintenance treatment if appropriate.  ***H. pylori* eradication**, oral: 20 mg or 40 mg twice daily as part of an appropriate combination regimen with antibiotics.  **PUD, uncomplicated ulcer**, oral: 20 to 40mg once daily for 4–8 weeks.  **Complicated ulcer (perforation, penetration, or gastric outlet obstruction)**, oral: 40 mg twice daily for 4 weeks, followed by 40 mg once daily  **Stress ulcer prophylaxis in selected critically ill patients**, oral or via NG tube: 40 mg once daily  **ZES,** oral: 40 mg twice daily up to a maximum of 180 mg/day. Once acid output has been controlled, maintenance dose is 10–180 mg daily.  **NSAID-associated peptic ulcer**, oral: 20 mg once daily for 4 weeks; continue for a further 4 weeks if not fully healed.  **Prophylaxis against NSAID-associated peptic ulcer**, oral:20 mg once daily.  **Major peptic ulcer bleeding following endoscopic treatmen**t, IV: Initially 80 mg, to be given over 40–60 minutes, then (by IV infusion) 8 mg/ hour for 72 hours; subsequent dose then changed to oral therapy.  **Treatment and prevention of benign peptic ulcers, NSAID-associated ulcers, and GERD**, IV: 40 mg once daily until oral administration possible.  **Child**  ***H. pylori* eradication, used in combination with antibacterial agents,** oral:  **Child 5–11 years**: 1–2 mg/kg once daily, max daily dose 40 mg  **Child 12–17 years**: 40 mg once daily.  **Gastric and duodenal ulcers**  **Child:** 1–2 mg/kg (maximum 40 mg) once daily.  **GERD, esophagial stricture, NSAID-associated gastric and duodenal ulcers prophylaxis and treatment, ZES, acid-related dyspepsia, fat malabsorption despite pancreatic enzyme replacement therapy in cystic fibrosis,** oral:  **Child 10-19 kg**:1 mg/kg once or twice daily (max. 40 mg/day).  **Child ≥ 20 kg**:20 mg once daily, increased if necessary to 40 mg once daily.  **GERD, esophagial stricture, ZES, acid-related dyspepsia, fat malabsorption despite pancreatic enzyme replacement therapy in cystic fibrosis**, IV:  **Child 1 month–11 years**: Initially 500 mcg/kg once daily (max. per dose 20 mg), increase if necessary to 2 mg/kg once daily (max. per dose 40mg), injection to be given over 5 minutes.  **Child 12–17 years**: 40 mg once daily, injection to be given over 5 minutes  ***Note:*** *Taking the medication at least 1 hour before a meal will have maximum benefit.* | |
| Contraindications | Hypersensitivity | |
| Drug interactions | Azole antifungals, clopidogrel, dasatinib, erlotinib, HIV-protease inhibitors, oral iron preparations, methotrixate and SSRIs (escitalopram). | |
| Side effects | Abdominal pain, constipation, diarrhoea, dizziness, dry mouth, gastrointestinal disorders, headache, insomnia, nausea, skin reactions, vomiting, arthralgia, bone fractures, confusion, depression, drowsiness, leukopenia, malaise, myalgia, paraesthesia, peripheral oedema, thrombocytopenia, vertigo, and vision disorders. | |
| Cautions | Elderly, gastrointestinal infections (including *Clostridioides difficile* infection), gastric cancer (in adults), long-term use (risk of osteoporosis and reduced absorption of Vit B12). | |
| Storage condition | Store at below 30 °C. Protect from light and moisture. | |
| **Pantoprazole** | | |
| Pharmacological class | Proton pump inhibitor | |
| Dosage form | Tablet: 20mg, 40mg | |
| Indications | Duodenal ulcer, gastric ulcer, GERD, erosive esophagitis, prophylaxis of NSAID-associated gastric or duodenal ulcer and ZES. | |
| Dose and administration | **Benign gastric ulcer**, oral:  **Adult**: 40 mg daily for 4 weeks, continued for further 4 weeks if not fully healed.  **GERD**, oral:  **Adult and child ≥ 12 years**: 20–40 mg daily for 4 weeks, continued for further 4 weeks if not fully healed; maintenance 20mg daily, increased to 40mg daily if symptoms return.  **Child ≥ 5 years**: 20mg once daily for up to 8 weeks if child of 15-40 kg; 40mg once daily for up to 8 weeks if child of 40kg or greater.  **Dyspepsia**, oral:  **Adult**: 20mg once daily for 4 weeks or 40mg once daily for 4 weeks if cause is unknown.  **Uncomplicated gastric ulcer**, oral:  **Adult**: 40 mg daily for 8 weeks; increased if necessary up to 80 mg daily (dose increased in severe cases).  **Duodenal ulcer**, oral:  **Adult**: 40 mg daily for 4 weeks; increased if necessary up to 80 mg daily (dose increased in severe cases).  ***H. pylori* eradication**, oral:  **Adult**: 40 mg twice daily for 7 days as part of an appropriate combination regimen with antibiotics (clarithromycin 250mg twice daily + metronidazole 500mg twice daily OR amoxicillin 1g twice daily + clarithromycin 500mg three times daily if a patient has been treated with metronidazole for other infections)  **Prophylaxis against NSAID-associated gastric or duodenal ulcer**, oral:  **Adult**: 20mg once daily for 8 weeks.  **NSAID**-**associated peptic ulcer disease**, oral:  **Adult:** 40 mg once daily for 8 weeks.  **Severe esophagitis**, oral:  **Adult:** 40 mg once daily for 8 weeks, continue as maintenance treatment if appropriate.  **ZES and other hyper-secretory syndromes**, oral:  **Adult:** 80 mg once daily initially (max. per dose 80 mg), adjusted according to response, up to 240mg/day. | |
| Contraindications | Hypersensitivity to the drug, hepatic impairment, severe renal impairment, pregnancy. | |
| Drug interactions | Protease inhibitors, azole antifungals, methotrexate, warfarin. | |
| Side effects | Sleep disturbances, headache and dizziness, fundic gland polyps, abdominal pain, diarrhoea, nausea and vomiting, increased liver enzymes, rash, pruritus, angioedema, bone fractures. | |
| Cautions | Long term use in elderly, GI infections (including *Clostridioides difficile* infection), gastric cancer (in adults), long-term treatment, patients at risk of osteoporosis. | |
| Storage condition | Store below 30°C. Protect from light. | |

## Medicines for upper gastro-intestinal bleeding

Proton pump inhibitors, prokinetic agents, non-steroidal anti-inflammatory drugs (NSAIDs), histamine H2 antagonists, iron products, antibiotics are among the drugs that used for the managment of upper GI bleeding. Sclerosing agents are the mainstay therapy for upper GI bleeding. These agents are used in the management of varicosities including varicose veins and oesophageal varices when their capacity to damage veins is apparently put to good use. The mechanisms by which injection sclerotherapy works are not completely understood but are thought to involve damage to the intima, intraluminal thrombosis, and intravascular fibrous organisation. Nowadays, hormone analogs (e.g., octreotide) and beta blockers (e.g., propranolol) are also largely used.

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| **Octreotide** | | |
| Pharmacological class | Somatostatin analog | |
| Dosage form | Injection: 50mcg/ml, 100mcg/ml. | |
| Indications | Bleeding from gastroesophageal varices | |
| Dose and administration | **Adult**: 25 mcg/hour for 5 days by continuous intravenous IV infusion. | |
| Contraindications | Hypersensitivity to the drug. | |
| Drug interactions | Beta blockers, calcium channel blockers, indapamide, cyclosporine, quinidine, disopyramide, ciclosporin, cimetidine, bromocriptine, and anti-diabetic drugs. | |
| Side effects | Cholelithiasis, hepatitis, glucose dysregulation, abdominal pain, nausea, flatulence, diarrhoea, headache, pruritus, rash, alopecia, and bradycardia. | |
| Cautions | Hepatic impairment, pregnancy, breastfeeding. | |
| Storage condition | Stored below 30 °C. Protect from light. | |
| **Omeprazole** | | |
| Pharmacological class | Proton pump inhibitor | |
| Dosage form | Powder for injection: 40 mg in vial | |
| Indications | Gastro esophageal reflux diseases (GERD), severe esophagitis, *H.pylori* eradication, peptic ulcer disease, uncomplicated ulcer, NSAID-associated peptic ulcer, Zollinger Ellison syndrome (ZES), Stress ulcer prophylaxis in critically ill patients, Complicated ulcer (perforation, penetration, or gastric outlet obstruction). | |
| Dose and administration | Refer to omeprazole under antiulcer medicines. | |
| Contraindications | Refer to omeprazole under antiulcer medicines. | |
| Drug interactions | Refer to omeprazole under antiulcer medicines. | |
| Side effects | Refer to omeprazole under antiulcer medicines. | |
| Cautions | Refer to omeprazole under antiulcer medicines. | |
| Storage condition | Store at below 30 °C. Protect from light. | |
| **Pantoprazole** | | |
| Pharmacological class | Proton pump inhibitor. | |
| Dosage form | Tablet: 20mg, 40mg | |
| Indications | Duodenal ulcer, gastric ulcer, GERD, erosive esophagitis, prophylaxis of NSAID-associated gastric or duodenal ulcer in patients with an increased risk of gastro-duodenal complications who require continued NSAID treatment and ZES. | |
| Dose and administration | Refer to pantoprazole under antiulcer medicines. | |
| Contraindications | Refer to pantoprazole under antiulcer medicines. | |
| Drug interactions | Refer to pantoprazole under antiulcer medicines. | |
| Side effects | Refer to pantoprazole under antiulcer medicines. | |
| Cautions | Refer to pantoprazole under antiulcer medicines. | |
| Storage condition | Store below 30°C. Protect from light. | |
| **Propranolol** | |
| Pharmacological class | Non-selective beta blocker |
| Dosage form | Tablet: 10mg, 20mg, 40mg |
| Indications | Prophylaxis of variceal bleeding in portal hypertension. |
| Dose and administration | **Prophylaxis of variceal bleeding in portal hypertension**, oral:  **Adult**: Initially 40 mg twice daily, then increased to 80 mg twice daily (max. per dose 160 mg twice daily), dose to be adjusted according to heart rate. |
| Contraindications | Asthma, history of bronchospasm, uncontrolled heart failure, marked bradycardia, hypotension, sick sinus syndrome, second- or third-degree atrioventricular block, cardiogenic shock, metabolic acidosis, severe peripheral arterial disease, phaeochromocytoma. |
| Drug interactions | Bupivacaine, chlorpromazine, oral contraceptives, dexamethasone, diazepam, digoxin, enalapril, epinephrine, furosemide, halothane, hydrochlorothiazide, hydrocortisone, ibuprofen, insulins, ketamine, lidocaine, meloquine, neostigmine, nifedipine, nitrous oxide, prednisolone, procainamide, pyridostigmine, quinidine, rifampicin, sodium nitroprusside, spironolactone, suxamethonium, thiopental, verapamil. |
| Side effects | Nausea, diarrhoea, fatigue, insomnia, nightmares, dyspnoea, bronchospasm, peripheral vasoconstriction, exacerbation of Raynaud’s syndrome, bradycardia, heart failure, hypotension, conduction disorders, rash, exacerbation of psoriasis, muscle cramp, dry eyes, hypersensitivity reaction, thrombocytopenic purpura, liver function abnormality, alopecia, cardiac arrest. |
| Cautions | Avoid abrupt withdrawal, first- degree atrioventricular block, portal hypertension, diabetes mellitus, history of obstructive airways disease, renal impairment, liver disease, myasthenia gravis, history of hypersensitivity, use of adrenaline. |
| Storage condition | Store below 30 °C. |

## Antispasmodics

Antispasmodics are used to treat symptoms such as pain and spasm in irritable bowel syndrome (IBS). Antispasmodics can be divided into two main classiﬁcations: antimuscarinics and smooth muscle relaxants. Antimuscarinics reduce intestinal motility and are used for gastrointestinal smooth muscle spasm.

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| **Hyoscine (Scopolamine) butylbromide** | |
| Pharmacological class | Antispasmodic |
| Dosage form | Injection: 20mg/ml  Tablet: 10mg  Syrup: 5mg/5ml |
| Indications | Symptomatic relief of GI or genitourinary disorders characterised by smooth muscle spasm, IBS, acute spasm, excessive respiratory secretions in palliative care, and bowel colic in palliative care. |
| Dose and administration | **Symptomatic relief of gastro-intestinal or genitourinary disorders characterised by smooth muscle spasm**, oral:  **Child 6–11 years**: 10 mg 3 times a day.  **Child 12–17 years**: 20 mg 4 times a day.  **Adult**: 20 mg 4 times a day.  **Irritable bowel syndrome**, oral:  **Adult**: 10 mg 3 times a day; increased if necessary up to 20 mg 4 times a day.  **Acute spasm, spasm in diagnostic procedures**, IM, IV:  **Adult**: 20 mg (by IM or slow IV injection), then 20 mg after 30 minutes if required, dose may be repeated more frequently in endoscopy (max. 100 mg per day).  **Excessive respiratory secretions in palliative care**, oral:  **Child 1 month–1 year**: 300-500 mcg/kg 3-4 times a day (max. 5 mg/dose)  **Child 2–4 years**: 5 mg 3-4 times a day.  **Child 5–11 years**: 10 mg 3-4 times a day.  **Child 12–17 years**: 10-20 mg 3-4 times a day.  **Excessive respiratory secretions in palliative care**, IM, IV  **Child 1 month–4 years**: 300-500 mcg/kg 3-4 times a day (max. 5mg/dose).  **Child 5–11 years**: 5–10 mg 3–4 times a day.  **Child 12–17 years**: 10–20 mg 3–4 times a day.  **Bowel colic in palliative care**, oral:  **Child 1 month–1 year**: 300–500 mcg/kg 3–4 times a day (max. 5mg/dose).  **Child 2–4 years**: 5 mg 3–4 times a day.  **Child 5–11 years**: 10 mg 3–4 times a day.  **Child 12–17 years**: 10–20 mg 3–4 times a day.  **Bowel colic in palliative care**, IM, IV:  **Child 1 month–4 years**: 300–500 mcg/kg 3–4 times a day (max. 5mg/dose).  **Child 5–11 years**: 5–10 mg 3–4 times a day.  **Child 12–17 years**: 10–20 mg 3–4 times a day. |
| Contraindications | Hypersensitivity to the dug, angle-closure glaucoma, prostate hypertrophy with urinary retention, mechanical stenosis in the GIT, paralytic or obstructive ileus, megacolon, tachycardia, myasthenia gravis. |
| Drug interactions | CNS depressants. |
| Side effects | Feeling hot, hypotension, mydriasis, sweat changes, headache, confusion, dizziness, dyspnoea, hallucination, palpitation, tachycardia, blurred vision, photophobia, cycloplegia, dry mouth, constipation, paralytic ileus. |
| Cautions | Cardiac disease including coronary heart disease. |
| Storage condition | Store below 30 °C. |
| **Scopolamine (hyoscine) Hydrobromide** | |
| Pharmacological class | Antispasmodic |
| Dosage form | Injection: 0.4mg/ml, 0.6mg/ml in 1 ml ampoule  Tablet: 0.6mg |
| Indications | Symptomatic relief of visceral spasms of the gastrointestinal tract, painful spasm of the biliary and genitourinary system, bowel colic and excessive respiratory secretions. |
| Dose and administration | **Adult:** Oral,0.3 mg 30 minutes before a journey to prevent motion sickness then 0.3 mg every 6 hours if required up to a maximum of 3 doses in 24 hours; IM, IV, or SC, 0.3 to 0.6 mg; if necessary, the dose may be repeated 3 or 4 times daily.  **Child 4-10 years**: oral, 75 to 150 mcg.  **Child >10 years**: oral, 150 to 300 mcg; IM, IV, or SC, 0.006mg/kg. |
| Contraindications | Refer to hyoscine (scopolamine) butylbromide above. |
| Drug interactions | CNS depressants |
| Side effects | Refer to hyoscine (scopolamine) butylbromide above. |
| Cautions | Refer to hyoscine (scopolamine) butylbromide above. |
| Storage condition | Store below 30 °C in a light-resistant container. |

## Antiemetics

Antiemetics are a diverse group of medicines used to treat or prevent nausea and vomiting. Antiemetics include dopamine antagonists (metoclopramide and chlorpromazine hydrochloride), antihistamines (dimenhydrinate, meclizine hydrochloride, and promethazine hydrochloride), phenothiazine, neurokinin-1 receptor antagonist (aprepitant), and corticosteroids (dexamethasone).

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| **Aprepitant** | |
| Pharmacological class | Neurokinin-1 receptor antagonist |
| Dosage form | Capsule: 80 mg, 125 mg, 165 mg  Powder for oral suspension: 125 mg in sachet |
| Indications | Prevention of nausea and vomiting associated with emetogenic cancer chemotherapy. |
| Dose and administration | **Child > 12 years and adult**:125 mg, dose to be taken 1 hour before chemotherapy on day 1 and 80 mg on days 2 and 3. If no chemotherapy is given on days 2 and 3, it should be administered in the morning. It is given for 3 days as part of a regimen that includes a corticosteroid and 5-hydroxy-triptamine (5-HT3) antagonist. If a corticosteroid, such as dexamethasone, is co-administered with it, the dose of the corticosteroid should be administered at 50 % of the usual dose.  **Child < 12 years**, **and not less than 6 kg**: 3 mg/kg (max. 125 mg), dose to be taken 1 hour before chemotherapy on day 1, then 2 mg/kg (max. 80 mg) on days 2 and 3, give in the morningif no chemotherapy on days 2 and 3. |
| Contraindications | Acute porphyrias, hypersensitivity to the drug. |
| Drug interactions | Benzodiazepines, corticosteroids, warfarin, hormonal contraceptives, 5-HT3 antagonists. |
| Side effects | Alanine amino transferase (ALT) increase, constipation, decreased appetite, asthenia, constipation, gastrointestinal discomfort, fatigue, headache, hiccups, anemia, anxiety, burping, dizziness, drowsiness, dry mouth, febrile neutropenia, gastrointestinal disorders, hot flush, malaise, nausea, palpitations, skin reactions, urinary disorders, vomiting. |
| Cautions | Moderate to severe hepatic impairment, elderly (≥ 65 years). |
| Storage condition | Store below 30 °C. Protect from moisture. |
| **Chlorpromazine Hydrochloride** | |
| Pharmacological class | Dopamine antagonist |
| Dosage form | Drops: 25mg/ml  Tablet: 25mg  Injection: 25mg/ml |
| Indications | Prophylaxsis and treatment of severe nausea and vomiting. |
| Dose and administration | **Adult:** oral, 12.5-25 mg every 4-6 hours, as necessary; Slow, deep I.M**,** 25 mg as a single dose, the dosage being increased to 25-50 mg every 3-4 hours until vomiting stops; it is then given orally if necessary.  **Child ≥ 6 months:** oral or slow, deep IM, 0.55mg/kg every 6-8 hour as necessary. |
| Contraindications | Severe cardiovascular disease, severe depression, and comatose state. |
| Drug interactions | Alcohol, CNS depressants, TCAs, antithyroid agents, epinephrine, extra pyramidal reaction causing medications, hypotension producing medications, levodopa, lithium, amphetamines, anticonvulsants, barbiturates. |
| Side effects | Akathisia, blurred vision, muscle spasms of the face, neck, and back, tic-like or twitching movements, twisting movements of the body; inability to move eyes; weakness of arms and legs, parkinsonian extrapyramidal effects, hypotension (fainting), pigmentary retinopathy, tardive dyskinesia (lip smacking), putting of cheeks, rapid or worm-like movements of tongue, uncontrolled chewing movements, uncontrolled movements of arms and legs), amenorrhea and galactorrhoea (female), gynecomastia and impotence (in male), hypothermia, dry mouth, tachycardia, urinary retention, increased appetite and weight gain, cholestatic jaundice, corneal opacity. |
| Cautions | Cardiovascular and cerebrovascular disease, respiratory disease, parkinsonism, epilepsy, acute infection, pregnancy, breast-feeding, renal and hepatic impairment, history of jaundice, leucopenia, hypothyroidism, myasthenia gravis, prostatic hypertrophy, closed-angle glaucoma, elderly particularly in very hot or cold weather, avoid abrupt withdrawal. |
| Storage condition | Store below 30°C. Protect from light. |
| **Dexamethasone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection: 4mg/ml |
| Indications | Prophylaxis and treatment of nausea and vomiting induced by cytotoxic chemotherapy and postoperative vomiting. |
| Dose and administration | **Adult**: 8–20 mg IV before starting chemotherapy, then 4–8 mg one to two times daily for 2–3 days as necessary (moderately emetogenic chemotherapy), or up to 3-4 days (highly emetogenic chemotherapy).  **Child ≥12 years**: 6 mg/dose IV once a day for up to 10 days. |
| Contraindications | Hypersensitivity to the drug, systemic fungal infection, administration of live virus vaccines. |
| Drug interactions | Acetylsalicylic acid, albendazole, amphotericin B, carbamazepine, oral contraceptives, digoxin, enalapril, erythromycin, furosemide, hydrochlorothiazide, ibuprofen, insulin, lopinavir, metformin, methotrexate, phenobarbital, phenytoin, praziquantel, propranolol, rifampicin, ritonavir, salbutamol. |
| Side effects | Nausea, increased susceptibility to infection, masking of signs of infection, sodium and water retention, oedema, hypertension, hypokalaemia, hyperglycaemia, increased appetite, dyspepsia, delayed wound healing, bruising, acne, psychiatric effects (euphoria, hypomania, depression, disturbances of mood, cognition, sleep and behaviour), transient itching, burning or tingling in perineal area (after IV bolus). |
| Cautions | Systemic infections such as TB, amoebiasis, strongyloidiasis, severe chickenpox, measles, diabetes mellitus, peptic ulcer, hypertension, corneal perforation, osteoporosis, myasthenia gravis. |
| Storage condition | Store below 30 °C. |
| **Dimenhydrinate** | |
| Pharmacological class | Antihistamine |
| Dosage form | Tablet: 50mg |
| Indications | Prevention and treatment of nausea, vomiting and/or vertigo associated with motion sickness. |
| Dose and administration | **Adult:** oral, 50 to 100 mg every four to six hours.  **Child 6-12 years**: oral,25 to 50 mg every six to eight hours as needed, not to exceed 150 mg per day.  **Child 2-6 years:** Oral, 12.5 to 25 mg every six to eight hours as needed, not to exceed 75 mg per day.  *Note: Oral dosage forms used for motion sickness should be taken 30 minutes before travel.* |
| Contraindications | Hypersensitivity to the drug, patients with stenosing peptic ulcer, and pyloroduodenal obstruction. |
| Drug interactions | Alcohol, CNS depressants (tranquillizers, hypnotics and anxiolytics), medicines with anticholinergic effects (TCAs), ototoxic drugs e.g., aminoglycoside. |
| Side effects | Sedation, drowsiness, disturbance in attention, unsteadiness, dizziness, dry mouth, fatigue. |
| Cautions | Heavy machinery operation/driving, concomitant use with ototoxic drugs (e.g., aminoglycosides), patients with seizures, angle-closure glaucoma, BPH, asthma, emphysema, and acute hepatic insufficiency; elderly, pregnant and nursing mothers. |
| Storage condition | Store below 30 °C. |
| **Meclizine Hydrochloride + Vitamin B6** | |
| Pharmacological class | Antihistamine PLUS Vitamin B6 |
| Dosage form | Tablet: 25mg + 50mg |
| Indications | Prevention and treatment of nausea, vomiting and/or vertigo associated with motion sickness, pregnancy, anesthesia, and radiation therapy. |
| Dose and administration | **Motion sickness (prophylaxis and treatment)**, oral:  **Adult and child >12 years**: 25 to 50 mg one hour before travel. Dose may be repeated every twenty-four hours as needed.  **Vertigo (prophylaxis and treatment)**, oral:  **Adult and child >12 years**: 25 to 100mg a day as needed (in divided doses).  **Treatment of nausea and vomiting associated with pregnancy, anaesthesia and radiation therapy**, oral:  **Adult**: 25 to 50 mg daily, possibly increased, depending upon clinical response, to 100mg daily in divided doses. |
| Contraindications | Hypersensitivity to the drug, children younger than 12 years of age, patients with epilepsy or liver disease, asthma, and BPH or a urinary tract blockage. |
| Drug interactions | Alcohol, CNS depressants (barbiturates, tranquillizers, neuroleptics), medicines with anticholinergic effects including TCAs, cycloserine |
| Side effects | Drowsiness, fatigue, headache, dryness of mouth, nose and throat, palpitations, thickening of bronchial secretions, allergic reaction, increase appetite, weight gain, arthralgia, and pharyngitis. |
| Cautions | Patients with angle-closure glaucoma or prostatic hypertrophy (bladder neck obstruction), coma, jaundice; use with caution in hot weather, and during exercise. |
| Storage condition | Store below 30 °C. |
| **Metoclopramide hydrochloride** | |
| Pharmacological class | Prokinetic agent |
| Dosage form | Drop: 0.2 mg/drop  Injection: 5mg/ml, 5mg/2ml in 2ml ampoule  Syrup: 5mg/5ml  Tablet: 10mg |
| Indications | Symptomatic treatment of nausea and vomiting including that associated with acute migraine, delayed (but not acute) chemotherapy-induced nausea and vomiting, radiotherapy-induced nausea and vomiting, prevention of postoperative nausea and vomiting, hiccup in palliative care, and nausea and vomiting in palliative care. |
| Dose and administration | **Symptomatic treatment of nausea and vomiting, including that associated with acute migraine, delayed chemotherapy-induced nausea and vomiting, radiotherapy-induced nausea and vomiting, prevention of post-operative nausea and vomiting**, oral, IM or slow IV injection:  **Adult < 60 kg**: Up to 500 mcg/kg daily in 3 divided doses.  **Adult ≥ 60 kg**: 10 mg up to 3 times a day (when administered by slow IV injection, to be given over at least 3 minutes).  **Hiccup in palliative care**, oral, IM or SC injection:  **Adult**: 10mg every 6-8 hours.  **Nausea and vomiting in palliative care**, oral:  **Adult**: 10 mg 3 times a day.  **Nausea and vomiting in GI disorders, vomiting associated with radiotherapy and cytotoxic chemotherapy, aid to GI intubation, gastroesophageal reflux, gastroparesis, nausea and vomiting in migraine**, oral, IM or slow IV (over 15 minutes):  **Infant < 10 kg**: 100 mcg/kg (max. 1 mg) twice daily.  **Child 1–3 years** (10–14 kg): 1 mg 2–3 times daily.  **Child 3–5 years** (15–19 kg): 2 mg 2–3 times daily.  **Child 5–9 years** (20–29 kg): 2.5 mg three times daily.  **Child 9–12 years** (≥30 kg): 5 mg three times daily (max. 500 mcg/kg daily).  **Pre- and postoperatively**, oral or IM or slow IV:  **Child all ages**: 0.1–0.2 mg/kg per dose 3–4 times daily as needed. |
| Contraindications | Epilepsy, 3–4 days after GI surgery, GI haemorrhage, obstruction, and perforation, and phaeochromocytoma. |
| Drug interactions | Acetylsalicylic acid, atropine, digoxin, bromocriptine, chlorpromazine, cyclosporine, codeine, haloperidol, methadone, morphine, paracetamol, suxamethonium. |
| Side effects | Asthenia, depression, diarrhea, drowsiness, hypotension, menstrual cycle irregularities, movement disorders, Parkinsonism, arrhythmias, hallucination, hyperprolactinemia, decreased level of consciousness, anxiety, dizziness, dyspnea, edema, skin reactions, visual impairment with injections. |
| Cautions | Asthma, atopic allergy, bradycardia, cardiac conduction disturbances, children, young adults, elderly, Parkinson’s disease, uncorrected electrolyte imbalance, previous extrapyramidal reaction, cerebral irritation, depression, porphyria, and renal impairment. |
| Storage condition | Store below 30 °C. |
| **Ondansetron** | |
| Pharmacological class | 5-HT3 receptor antagonist |
| Dosage form | Injection: 2 mg/ml in 2 ml  Oral liquid: 4 mg base/5 ml  Tablet: 4 mg |
| Indications | Postoperative nausea and vomiting, chemotherapy and/or radiotherapy induced nausea and vomiting. |
| Dose and administration | **Moderate chemotherapy or radiotherapy induced nausea and vomiting:**  **Adult**, oral: Initially 8 mg, dose to be taken 1–2 hours before treatment, then 8 mg every 12 hours for up to 5 days.  **Adult,** IM, slow IV injection: Initially 8 mg, dose to be administered immediately before treatment, then (by mouth) 8 mg every 12 hours for up to 5 days.  **Infants, children, and adolescents**, IV, oral: 0.15 mg/kg/dose (5 mg/m2/dose); max. 8 mg/dose, administer first dose before the start of chemotherapy with subsequent doses every 12 hours used in combination with other antiemetics.  **Severe chemotherapy induced nausea and vomiting**:  **Adult**, oral: 24 mg, dose to be taken 1–2 hours before treatment, then 8 mg every 12 hours for up to 5 days.  **Adult**, IM, slow IV: Initially 8 mg, dose to be administered immediately before treatment, followed by 8 mg every 4 hours if required for 2 doses, alternatively, followed by (by continuous IV infusion) 1 mg/hour for up to 24 hours, then (by mouth) 8 mg every 12 hours for up to 5 days.  **Infants, children, and adolescents**, IV, oral: 0.15 mg/kg/dose (5 mg/m2/dose), administer first dose before the start of chemotherapy and then every 8 hours (max. dose 8 mg/dose) used in combination with other antiemetics.  **Prevention of postoperative nausea and vomiting**:  **Adult**, oral: 16 mg, dose to be taken 1 hour before anesthesia.  **Adult**, IM, slow IV: 4 mg, dose to be administered at induction of anesthesia.  **Infant and child ≤ 40 kg**, IV: 0.1 mg/kg/dose as a single dose (max. 4 mg/dose)  **Child > 40 kg**, IV: 4 mg/dose as a single dose.  **Adolescent**, IM, IV: 4 mg/dose as a single dose.  **Treatment of postoperative nausea and vomiting**:  **Adult**, IM, slow IV: 4 mg for 1 dose.  **Child 1 month –18 years**, IV (over at least 30 seconds): 100 mcg/kg (max. 4 mg). |
| Contraindications | Congenital prolonged QT. |
| Drug interactions | Carbamazepine, phenobarbital, phenytoin, rifampicin, apomorphine. |
| Side effects | Constipation, feeling hot, headache, abnormal sensation, arrhythmias, chest pain, hiccups, hypotension, movement disorders, oculogyric crisis, seizure, dizziness, QT interval prolongation, vision disorders. |
| Cautions | Adenotonsillar surgery, subacute intestinal obstruction, susceptibility to QT-interval prolongation (including electrolyte disturbances), hepatic impairment (reduce dose if moderate or severe impairment). |
| Storage condition | Store between 2 °C and 30 °C. |

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## Laxatives and cathartics

Laxatives and cathartics promote bowel evacuation and are used in the treatment of constipation and before investigational procedures such as endoscopy or radiological examination or before surgery. Laxatives are important in medicine-induced constipation, for the expulsion of parasites after anthelminthic treatment and to clear the alimentary tract before surgery and radiological procedures. Laxatives are usually subdivided into several categories including the bulk forming laxatives such as diphenyl methane derivatives (bisacodyl) and also other miscellaneous agent (castor oil); osmotic laxatives (glycerin, lactulose) and fecal softeners (polyethylene glycol).

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| **Bisacodyl** | | |
| Pharmacological class | Laxative | |
| Dosage form | Suppository: 5mg, 10mg  Tablet: 5mg, 10mg | |
| Indications | Constipation, bowel evacuation. | |
| Dose and administration | **Constipation**, oral:  **Child 4–17 years**: 5–20 mg once daily, adjusted according to response, dose to be taken at night.  **Adult**: 5–10 mg once daily; increased if necessary up to 20 mg once daily, dose to be taken at night.  **Constipation,** rectal**:**  **Child < 3 years**: 5mg daily as a single dose.  **Child 4–9 years**: 5 mg once daily, adjusted according to response.  **Child 10–17 years**: 10 mg once daily, dose to be taken in the morning.  **Adult**: 10 mg once daily, dose to be taken in the morning.  **Bowel evacuation before radiological procedures and surgery*:***  **Adult**: Initially 10 mg twice daily (orally), dose to be taken in the morning and evening on the day before procedure, then 10 mg (by rectum) to be administered 1–2 hours before procedure in the following day. | |
| Contraindications | Acute abdominal conditions, acute inflammatory bowel disease, intestinal obstruction, severe dehydration. | |
| Drug interactions | Antacids, polyethylene glycol, sodium sulphate. | |
| Side effects | Gastrointestinal discomfort, nausea, hematochezia, vomiting, angioedema, colitis, dehydration. | |
| Cautions | Electrolyte imbalance. | |
| Storage condition | Store below 30 °C. Protect from moisture. | |
| **Castor oil** | | |
| Pharmacological class | Laxative | |
| Dosage form | Liquid: 30ml, 60ml | |
| Indications | Constipation, and colonic evacuation. | |
| Dose and administration | **Constipation**:  **Adult**:15ml daily by mouth.  **Child < 2 years**: 1-5 ml daily by mouth.  **Child > 2 years**: 5-15 ml daily by mouth.  **Colonic evacuation before surgery or radiologic sigmoidoscopic procedure:**  **Adult and child ≥12 years**: 15-60 ml, to be administered as a single dose about 16 hours before the procedure.  **Child 2-11 years**: 5-15 ml, to be administered as a single dose about 16 hours before the procedure.  **Child < 2 years**: 1-5 ml, to be administered as a single dose about 16 hours before the procedure.  *Note:**take each dose with a full glass of water or other liquid.* | |
| Contraindications | Pregnancy, acute abdominal pain, nausea, vomiting or other symptoms of appendicitis or undiagnosed abdominal pain, intestinal obstruction. | |
| Drug interactions | Potassium sparing diuretics, potassium supplements. | |
| Side effects | Abdominal discomfort, nausea, mild cramp, gripping or faintness, excessive irritation of the colon, violent purgation. | |
| Cautions | Children below six years of age (prolonged use), elderly. | |
| Storage condition | Store below 30 °C in a tight container and dry place. Protect from freezing. | |
| **Glycerine** | | |
| Pharmacological class | Laxative | |
| Dosage form | Suppository: 1g, 1.36g, 2g, 2.76g. | |
| Indications | Constipation (especially in children). | |
| Dose and administration | **Rectal**  **Child 1–11 months**: 1 g as required.  **Child 1–11 years**: 2 g as required.  **Child 12–17 years**: 4 g as required.  **Adult**: 4 g as required.  *Note: Manufacturer advises moisten suppositories with water before insertion.* | |
| Contraindications | Pregnancy, acute abdominal pain, nausea, vomiting or other symptoms of appendicitis or undiagnosed abdominal pain, intestinal obstruction. | |
| Drug interactions | Potassium sparing diuretics, potassium supplements. | |
| Side effects | Rectal discomfort such as irritation, burning and pain may occur rarely. | |
| Cautions | Avoid habitual use. | |
| Storage condition | Store in a cool place in an airtight container. | |
| **Lactulose** | |
| Pharmacological class | Laxative |
| Dosage form | Enema: 300ml lactulose + 700ml water  Oral solution: 10g/15ml |
| Indications | Constipation, hepatic encephalopathy. |
| Dose and administration | **Constipation**, oral**:**  **Child 1–11 months**: 2.5 ml twice daily, adjusted according to response.  **Child 1–4 years**: 2.5–10 ml twice daily, adjusted according to response.  **Child 5–17 years**: 5–20 ml twice daily, adjusted according to response.  **Adult**: Initially 15 ml twice daily, adjusted according to response.  **Hepatic encephalopathy,** oral**:**  **Adult**: Adjusted according to response to 30–50 ml 3 times a day, subsequently adjusted to produce 2–3 soft stools per day. |
| Contraindications | Galactosaemia, GI obstruction, perforation, and risk of gastrointestinal perforation. |
| Drug interactions | Other laxatives, nifedipine, vitamin K. |
| Side effects | Abdominal pain, diarrhea, flatulence, nausea, vomiting, electrolyte imbalance. |
| Cautions | Lactose/galactose intolerance, patients with diabetes, electrolyte imbalance. |
| Storage condition | Store at a temperature between 2 °C and 30 °C in a tight container. |
| **Polyethylene glycol (PEG)** | |
| Pharmacological class | Laxative |
| Dosage form | Powder: 17g per oral dose. |
| Indications | Bowel cleansing (before any procedure requiring a clean bowel) |
| Dose and administration | **Bowel cleansing (before any procedure requiring a clean Bowel)**, oral:  **Adult**: 500 ml daily for 2 doses; first dose of reconstituted solution taken on the evening before procedure and the second dose on the morning of procedure, alternatively 1 litre daily in 2 divided doses, reconstituted solution to be taken either on the evening before the procedure, or in the morning of the procedure separate doses by at least 1 hour, treatment should be completed at least 1 hour before clinical procedures conducted without general anesthesia, and at least 2 hours before clinical procedures conducted under general anesthesia.  *Note: The contents of the single sachet for dose 1 should be made up to 500ml with water and taken over 30 minutes. The contents of the 2 sachets (A and B) for Dose 2 should be made up to 500ml with water and taken over 30 minutes. Each dose should be followed by 500ml of clear fluid taken over 30 minutes. Other oral drugs should not be taken 1 hour before, or after, administering it because absorption might be impaired.* |
| Contraindications | Disorders of gastric emptying, glucose 6-phosphate dehydrogenase (G6PD) deficiency, GI obstruction, GI perforation, ileus, toxic megacolon. |
| Drug interactions | Angiotensin converting enzyme (ACE) inhibitors, angiotensin-II receptor antagonists, and NSAIDs, diuretics. |
| Side effects | Chills, dehydration, dizziness, fever, GI discomfort, headaches, hunger, malaise, nausea, sleep disorder, thirst, vomiting, arrhythmias, asthenia, drowsiness, dry mouth, dry throat, dysphagia, electrolyte imbalance, hot flush, pain, palpitations, altered temperature sensation. |
| Cautions | Debilitated patients, dehydration, impaired consciousness, impaired gag reflex or possibility of regurgitation or aspiration, moderate-to-severe cardiac impairment, severe acute IBD, creatinine clearance < 30 ml/minute. |
| Storage condition | Store at a temperature between 2°C and 8°C. Do not freeze. |

## Medicines used in diarrhea

Antidiarrheal medicines are essential in the management of diarrhea, a condition characterized by frequent, loose, or watery stools. While often self-limiting, diarrhea can lead to significant dehydration, particularly in vulnerable populations such as young children and the elderly. Antidiarrheal medications are designed to alleviate symptoms and restore normal bowel function. In addition to pharmaceutical treatments, rehydration is crucial to correct fluid and electrolyte depletion and prevent dehydration. Oral rehydration solutions (ORS) are often recommended, especially for children. Antidiarrheal medicines are used as an adjunct in the symptomatic treatment of diarrhoea.

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| **Loperamide** | | |
| Pharmacological class | | Opioid receptor agonist |
| Dosage form | | Tablet/Capsule: 2mg |
| Indications | | Acute and chronic diarrhea, fecal incontinence, pain of bowel colic in palliative care. |
| Dose and administration | | **Symptomatic treatment of acute diarrhoea*,*** oral:  **Child 4–7 years**: 1 mg 3–4 times a day for up to 3 days only.  **Child 8–11 years**: 2 mg 4 times a day for up to 5 days.  **Child 12–17 years**: Initially 4 mg, followed by 2 mg for up to 5 days, dose to be taken after each loose stool; usual dose 6–8 mg daily (max. 16 mg per day).  **Adult**: Initially 4 mg, followed by 2 mg for up to 5 days, dose to be taken after each loose stool; usual dose 6–8 mg daily (max. 16 mg per day)  **Chronic diarrhoea*,*** oral:  **Adult**: Initially 4–8 mg daily in divided doses, adjusted according to response; maintenance up to 16 mg daily in 2 divided doses.  **Child > 2 years**: Initially 1 mg/12.5 kg body mass, followed by 0.5 mg/12.5 kg after each loose stool; alternatively, 0.08–0.24 mg/kg/day in 2–3 divided doses.  **Pain of bowel colic in palliative care*,*** oral:  Adult: 2–4 mg 4 times a day.  *Note: If no improvement has been observed after treatment with 16 mg daily for at least 10 days, further administration is unlikely to be of benefit.* |
| Contraindications | | Active ulcerative colitis, antibiotic-associated colitis, bacterial enterocolitis, conditions where abdominal distension develops, conditions where inhibition of peristalsis should be avoided, |
| Drug interactions | | Fentanyl, opioid analgesics, CNS depressants (e.g., alcohol). |
| Side effects | | GI disorders, headache, nausea, dizziness, drowsiness, dry mouth, GI discomfort, skin reactions, vomiting. |
| Cautions | | Dehydration, impaired hepatic function, children under 12 years. |
| Storage condition | | Store below 30°C. Protect from moisture. |
| **Oral rehydration salt (ORS)** | | |
| Pharmacological class | Electrolyte and mineral | |
| Dosage form | Powder for dilution, each sachet for 1 Liter contains:  Glucose: 75 mEq  Sodium: 75 mEq or mmol/L  Chloride: 65 mEq or mmol/L  Potassium: 20 mEq or mmol/L  Citrate: 10 mmol/L  Osmolarity: 245 mOsm/L  Glucose: 13.5 g/L  Sodium chloride: 2.6 g/L  Potassium chloride: 1.5 g/L  Trisodium citrate dihydrate: 2.9 g/L | |
| Indications | Replacement of fluid and electrolyte loss in diarrhoea. | |
| Dose and administration | **Fluid and electrolyte loss in diarrhoea,** oral:  **Child 1–11 months**: 1–1½ times usual feed volume to be given.  **Child 1–11 years**: 200 ml, to be given after every loose motion  **Child 12–17 years**: 200–400 ml, to be given after every loose motion, dose according to fluid loss.  **Adult**: 200–400 ml, to be given after every loose motion, dose according to fluid loss.  **Note**: Reconstitute 1 sachet with 200ml of water (freshly boiled and cooled for infants; 5 sachets reconstituted with 1 Litre of water provide Na+ 60 mmol, K+ 20 mmol, Cl– 60 mmol, citrate 10 mmol, and glucose 90 mmol. After reconstitution any unused solution should be discarded no later than 1 hour after preparation unless stored in a refrigerator when it may be kept for up to 24 hours. | |
| Contraindications | Shock, severe dehydration, intractable vomiting, coma, acute abdomen, or absent bowel sounds. | |
| Drug interactions | There are no known interactions where it is recommended to avoid concomitant use. | |
| Side effects | Vomiting (with rapid administration), hypernatremia and hyperkalaemia (in overdose, renal impairment or concentrated solution use). | |
| Cautions | Oliguric or anuric renal impairment (dose reduction may be necessary, monitor electrolytes carefully), patients with GI obstruction, inability to drink, when parenteral rehydration therapy is indicated as in severe dehydration or intractable vomiting. | |
| Storage condition | Do not keep the solution for more than 1 hour at room temperature. You may keep it for 24 hours in a refrigerator. | |
| **ReSoMal (Rehydration solution for malnutrition)** | | |

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| Pharmacological class | Electrolyte and mineral |
| Dosage form | For each sachet for 2 litre contains  Glucose: 125 mEq/L  Sodium: 45 mEq/L  Potassium: 40 mEq/L  Chloride: 70 mEq/L  Total osmolality: 294 mEq/L |
| Indications | Prevention and treatment of dehydration, in children suffering from complicated acute malnutrition |
| Dose and administration | **Prevention of dehydration:**  **Child**: 5 ml/kg after each loose stool as long as diarrhoea persists.  **Child < 5 kg**: 25 ml  **Child 5-9 kg**: 50 ml  **Child 10-19 kg**: 100 ml  **Child ≥ 20 kg**: 200 ml  **Treatment of severe acute malnutrition associated dehydration:**  **Child**: 20 ml/kg/hour for 2 hours orally or by nasogastric tube. If improvement (diarrhoea and signs of dehydration regress), reduce to 10 ml/kg/hour until there are no signs of dehydration and/or target weight is reached, then change to prevention of dehydration as above.  **Note**: *ReSoMal can also be administered in adults suffering from complicated acute malnutrition, including pregnant or breastfeeding women.* |
| Contraindications | Cholera or uncomplicated acute malnutrition. |
| Drug interactions | No known interactions where it is recommended to avoid concomitant use. |
| Side effects | Increased respiratory and heart rates and new onset or worsening of oedema (with fluid overload). |
| Cautions | Risk of heart failure when administered too rapidly, renal impairment (dose reduction may be necessary). |
| Storage condition | Store below 30 °C. |

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| **Zinc Sulphate** | |
| Pharmacological class | Electrolyte and mineral |
| Dosage form | Tablet (dispersible): 10mg, 20mg  Liquid: 10mg/unit |
| Indications | Adjunct to oral rehydration therapy in the event of acute and/or persistent diarrhoea |
| Dose and administration | Oral**:**  **Child under 6 months:** 10 mg (elemental Zn) once daily for 10-14 days.  **Child from 6 months to 5 years:** 20 mg (elemental Zn) once daily for 10-14 days. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Calcium salts, quinolone antibiotics (e.g., ciprofloxacin, ofloxacin), ferrous salts, penicillamine. |
| Side effects | Diarrhoea, gastritis, gastrointestinal discomfort, nausea, vomiting. |
| Cautions | Acute renal failure, pregnancy, breastfeeding, copper deficiency. |
| Storage condition | Store below 30 °C. Protect from light and moisture. |

## Medicines used for hemorrhoids

Antihaemorrhoidal medicines are used to temporarily relieve swelling, burning, pain, and itching caused by hemorrhoids. These agents include a coktail of drug combinations such as local anesthetics, corticosteroids, vasoconstrictors, astringents, etc. They come in various forms such as topical ointments, creams, and suppositories. Preparations containing local ansthetetics or corticosteroids are intended only for short-term use after exclusion of infections. Prolonged use can cause atrophy of the anal skin.

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| **Betamethasone valerate+ Phenylephrine HCl + Lidocaine HCl** | |
| Pharmacological class | Corticosteroid + vasoconstrictor + local anaesthetic. |
| Dosage form | Ointment: 0.5mg + 1mg + 25mg |
| Indications | Haemorrhoids, relief from pain and bleeding associated with anal fissures, after haemorroidectomy, mild proctitis. |
| Dose and administration | Apply two or three times a day. Use the applicator for deep anal administration.  *Note: It can be applied before and after defecation.* |
| Contraindications | Hypersensitivity to any of the ingredients, application to infected skin area. |
| Drug interactions | Paraesthesia, skin reactions. |
| Side effects | Mild burning, stinging, itching or redness. |
| Cautions | Pregnancy, breastfeeding. |
| Storage condition | Store below 30 °C. |
| **Hydrocortisone + Framycetin + Cinchocaine + Esculoside** | |
| Pharmacological class | Corticosteroid +aminoglycoside antibiotic +local anaesthetic **+** anti-inflammatory (venotonic agent) |
| Dosage form | Suppository: 5mg + 10mg + 5mg + 10mg  Ointment: 15g/30g |
| Indications | Treatment of pain, itching, swelling, and discomfort caused by haemorrhoids. |
| Dose and administration | **For external treatment (ointment):** apply a small quantity in the morning and evening and after each bowel movement to the painful or pruritic rectal area.  **For internal application (ointment):** attach rectal cannula to tube, insert to full extent and squeeze tube gently from lower end while withdrawing.  **Adult:** one suppository in the morning, at the bedtime and after each bowel movement. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Clopidogrel, prednisone, warfarin. |
| Side effects | Anal pruritus, anorectal discomfort, proctalgia, burning, itching, irritation, redness and pain at the application site, immune system disorders, and hypersensitivity manifested as pruritus, rash and/or urticarial. |
| Cautions | Systemic corticosteroid effects, pregnancy, breastfeeding, infections. |
| Storage condition | Store below 30 °C. |

## Medicines used for inflammatory bowel disease

Several classes of medications are used for the treatment of inflammatory bowel disease (IBD), which can be Crohn's disease or ulcerative colitis. These include aminosalicylates, corticosteroids, immunomodulators and biologics. Aminosalicylates (e.g., mesalamine, sulfasalazine) reduce intestinal inflammation and are typically used for mild to moderate IBD. Corticosteroids (e.g., prednisone, budesonide) effectively control acute flare-ups but are not recommended for long-term use due to potential side effects. Immunomodulators (e.g., azathioprine, mercaptopurine, methotrexate) suppress the immune system to help maintain remission, especially when other treatments fail. Biologics (e.g., infliximab, adalimumab, ustekinumab, vedolizumab) target specific components of the immune response and are effective for moderate to severe cases.

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| **Azathioprine** | |
| Pharmacological class | Antimetabolite, immunosuppressant |
| Dosage form | Tablet: 50mg  Powder for injection: 100mg |
| Indications | Inflammatory bowel disease |
| Dose and administration | Oral:  **Adult**: Initially, 2–2.5 mg/kg daily in 1 or 2 doses, some patients may respond to lower doses. |
| Contraindications | Hypersensitivity to azathioprine and mercaptopurine |
| Drug interactions | Mercaptopurine, allopurinol, sulfasalazine, warfarin, phenytoin, rifampicin, sulfamethoxazole + trimethoprim. |
| Side effects | Bone marrow suppression (dose-related), increased risk of infection, leucopenia, pancreatitis, thrombocytopenia, anaemia, hepatic disorders. |
| Cautions | Elderly, renal impairment, liver disease, breastfeeding, pregnancy, low thiopurine methyl transferase activity. |
| Storage condition | Store below 30 °C in a dry place. Protect from light. |
| **Budesonide** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Tablet/Capsule**:** 6 mg, 9 mg |
| Indications | Induction of remission in patients with mild to moderate active Crohn's disease affecting the ileum and/or the ascending colon. Induction of remission in patients with active microscopic colitis in adults aged ≥ 18 years. |
| Dose and administration | **Mild to moderate Crohn’s disease affecting the ileum and/or ascending colon**, oral:  **Adult**: 9 mg once daily for up to 8 weeks, to be taken in the morning, alternatively 3 mg 3 times a day for up to 8 weeks, reduce the dose gradually over 2 weeks following the treatment course before stopping.  **Microscopic colitis, induction of remission**, oral:  **Adult**: 9 mg once daily for up to 8 weeks, to be taken in the morning half an hour before breakfast, reduce dose gradually over 2 weeks following the treatment course before stopping.  **Microscopic colitis, maintenance**, oral:  **Adult:** 6 mg once daily, to be taken in the morning, alternatively 6 mg once daily, and 3 mg once daily, to be taken on alternate mornings, review treatment regularly and no later than 12 months after initiation of maintenance treatment, treatment may be extended to beyond 12 months if required when stopping treatment, reduce the dose gradually over 2 weeks. |
| Contraindications | Hypersensitivity to the drug, hepatic impairment, severe renal impairment. |
| Drug interactions | Ritonavir. |
| Side effects | Dyspepsia, abdominal pain, dry mouth, muscle complaints, oedema oral disorders, headache, back pain, dizziness, and flatulence. |
| Cautions | Crohn’s disease of the upper GIT; patients with liver function disorders, tuberculosis, hypertension, diabetes mellitus, osteoporosis, peptic ulcer, glaucoma, cataracts, family history of diabetes, family history of glaucoma, visual disturbance. |
| Storage condition | Store below 30 °C. Protect from moisture and light. |
| **Mesalazine** | |
| Pharmacological class | Aminosalicylate, anti-inflammatory agent |
| Dosage form | Tablet: 400 mg  Suppository: 1g |
| Indications | Inflammatory bowel diseases (Ulcerative colitis and Crohn’s disease) |
| Dose and administration | **Treatment of mild to moderate ulcerative colitis, acute attack, o**ral:  **Child 12–17 years**: 800 mg 3 times a day.  **Adult**: 2.4 g daily in divided doses.  **Maintenance of remission of ulcerative colitis and Crohn’s disease,** oral:  **Child 12–17 years**: 400–800 mg 2-3 times a day.  **Adult**: 1.2-2.4 g daily in divided doses.  Suppository:  **Adult**: 1g daily for 2-4 weeks  **Maintenance of remission of ulcerative colitis and Crohn’s disease**, oral:  **Adult**: 1.2-2.4g daily in divided doses.  **Child 12-17 years**: 400-800mg 2-3 times daily.  *Note: preparations that lower stool pH (e.g., lactulose) might prevent the release of mesalazine.* |
| Contraindications | Blood clotting abnormalities. |
| Drug interactions | Antacids, heparins, myelosuppressive agents, NSAIDs, varicella virus-containing vaccines. |
| Side effects | Rash, abdominal pain, diarrhea, nausea and vomiting, arthralgia, headache, cholestasis exacerbated, drug fever, flatulence, nephritis, constipation (with rectal use), Steven Johnson Syndrom (SJS), haematological disorders, renal impairment, photosensitivity, hepatotoxicity. |
| Cautions | Breastfeeding, renal/hepatic impairment, elderly, pulmonary disease. |
| Storage condition | Store below 30 °C. Protect from light. |
| **Methylprednisolone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection (as sodium succinate): 40mg/ml, 80mg/ml |
| Indications | Suppression of inflammatory and allergic disorders, severe IBD. |
| Dose and administration | **Deep IM injection:**  **Adult**: 40-120mg, then 40-120mg after 2-3 weeks if required, to be injected into the gluteal muscle  **Slow IV injection or IV infusion:**  **Adult**: dosage should be varied according to the severity of the condition, initial dosage will vary from 10 to 500 mg.  **Child**: 0.5-1.7 mg/kg daily in 2–4 divided doses. |
| Contraindications | Hypersensitivity to the drug, known or suspected allergy to cow's milk, systemic fungal infection and systemic infection unless specific anti-infective therapy is employed, cerebral oedema associated with malaria, administration of live or live attenuated vaccines. |
| Drug interactions | Antiepileptics, protease inhibitors, macrolides, antifungals, aspirin, NSAIDs, rifampicin. |
| Side effects | Confusion, delusions, depressed mood, diarrhoea, dizziness, dyslipidaemia, hallucination, hiccups, Kaposi’s sarcoma, lipomatosis, oedema, schizophrenia, suicidal thoughts, vomiting, withdrawal syndrome. |
| Cautions | Rapid IV administration, risk of systemic sclerosis. |
| Storage condition | Store below 30 °C. |
| **Sulfasalazine** | |
| Pharmacological class | Aminosalicylate, anti-inflammatory agent |
| Dosage form | Tablet: 500mg |
| Indications | IBD (ulcerative colitis and Crohn’s disease) |
| Dose and administration | **Treatment of acute attack of ulcerative colitis or active Crohn’s disease:**  **Adult**: 1–2 g 4 times a day until remission occurs, corticosteroids may also be given, if necessary.  **Child > 2 years**: 40 to 60 mg/kg daily, reducing to maintenance dose of 20–30 mg/kg daily.  **Maintenance of remission ulcerative colitis:**  **Adult**: 500 mg 4 times a day. |
| Contraindications | Hypersensitivity to salicylates and sulfonamides, severe renal impairment, child under 2 years, porphyria. |
| Drug interactions | Azathioprine, mercaptopurine, vitamin C. |
| Side effects | Arthralgia, cough, diarrhea, dizziness, fever, gastrointestinal discomfort, headache, leucopenia, nausea, skin reactions, vomiting, alopecia, depression, dyspnea, myalgia, photosensitivity reaction, thrombocytopenia, agranulocytosis, bone marrow disorders, cardiac inflammation, hepatitis, neutropenia, pancreatitis, peripheral neuropathy, renal impairment, respiratory disorders, angioedema, eosinophilia, hemolytic anemia, nephritis, yellow discoloration of body fluids. |
| Cautions | Acute porphyrias, G6PD deficiency, history of asthma, maintain adequate fluid intake, hematological disorders, hepatic impairmnet, slow acetylation status. |
| Storage condition | Store between 15 °C and 30 °C. Protect from light. |

# Cardiovascular Medicines

## Medicines for heart failure

Drugs used to treat heart failure due to left ventricular systolic dysfunction include ACE inhibitors, angiotensin receptor blockers (ARBs), beta-blockers, diuretics including aldosterone antagonists, cardiac glycosides, and vasodilators. The primary treatment of heart failure is with ACE inhibitors) such as enalaprilwhich can be used in all stages of chronic heart failure to prevent further deterioration and progression of heart disease. The aldosterone antagonist spironolactone may be considered for patients with severe heart failure who are already receiving an ACE inhibitor and a diuretic to reduce symptoms and mortality rate. The beta-blockers, bisoprolol and carvedilol, can be used in stable heart failure and left ventricular systolic dysfunction. Patients who are already taking a beta-blocker for co-morbidities (e.g. angina or hypertension) and whose condition is stable should be switched to a beta-blocker licensed for heart failure. In addition, digoxin, a cardiac glycoside, increases the strength of cardiac muscle contractions and increases cardiac output. It produces symptomatic improvement, increases exercise tolerance, and reduces the need for hospitalization, but it does not reduce mortality. It is considered for patients with atrial fibrillation and for selected patients who remain symptomatic despite treatment with an ACE inhibitor, a diuretic, and a suitable beta-blocker.

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| **Bisoprolol** | | | | | |
| Pharmacological class | Beta blocker | | | | |
| Dosage form | Tablet: 1.25mg, 2.5mg, 5mg and 10mg | | | | |
| Indications | Stable chronic heart failure, hypertension, angina | | | | |
| Dose and administration | **Adjunct in stable chronic heart failure:**  **Adult:** Initially, 1.25 mg once daily for 1 week, dose to be taken in the morning, then increased if tolerated to 2.5 mg once daily for 1 week, then increased if tolerated to 3.75 mg once daily for 1 week, then increased if tolerated to 5 mg once daily for 4 weeks, then increased if tolerated to 7.5 mg once daily for 4 weeks, then increased, if tolerated to 10 mg once daily. The maximum recommended dose is 10mg once daily.  *Note: refer dosing for other indications at their respective section.* | | | | |
| Contraindications | Hypersensitivity to the drug, acute or decompensated heart failure requiring intravenous inotropes, cardiogenic shock, second- or third-degree AV block (without a pacemaker), sick sinus syndrome, sinoatrial block, symptomatic bradycardia, symptomatic hypotension, severe bronchial asthma or severe chronic obstructive pulmonary disease, late stages of peripheral arterial occlusive disease, Raynaud’s syndrome, untreated phaeochromocytoma and metabolic acidosis. | | | | |
| Drug interactions | Calcium channel blockers, centrally acting antihypertensive drugs (clonidine and methyldopa), class-III antiarrhythmic drugs (e.g., amiodarone), parasympathomimetic drugs, insulin and oral antidiabetic drugs, anaesthetic agents, digitalis glycosides, NSAIDs, sympathomimetics. | | | | |
| Side effects | Constipation, muscle cramps, muscle weakness, postural hypotension, allergic rhinitis, alopecia, auditory disorder, conjunctivitis, flushing, hepatitis, hypersensitivity, pruritus | | | | |
| Cautions | Abrupt withdrawal, hepatic or renal impairment, pregnancy and breastfeeding. | | | | |
| Storage condition | Store below 30ºC. | | | | |
| **Candesartan** | | | | | |
| Pharmacological class | Angiotensin-II receptor antagonist | | | | |
| Dosage form | Tablet: 4 mg, 8 mg and 16 mg | | | | |
| Indications | Heart failure with left ventricular dysfunction when ACE inhibitors are not tolerated, hypertension. | | | | |
| Dose and administration | **Heart failure with impaired left ventricular systolic function when ACE inhibitors are not tolerated:**  **Adult:** Initially 4 mg oral once daily, increased to up to 32 mg once daily, dose to be increased at intervals of at least 2 weeks to ‘target’ dose of 32mg once daily or to maximum tolerated dose  **Heart failure with impaired left ventricular systolic function in conjunction with an ACE inhibitor (under expert supervision):**  **Adult:** Initially 4 mg oral once daily, increased to up to 32 mg once daily, dose to be increased at intervals of at least 2 weeks to ‘target’ dose of 32mg once daily or to maximum tolerated dose  *Note: refer dosing for other indications at their respective section.* | | | | |
| Contraindications | Hypersensitivity to the drug, pregnancy, biliary obstructive disorders, cholestasis, severe hepatic impairment. | | | | |
| Drug interactions | ACE inhibitors, drugs that cause hypotension (e.g., tricyclic antidepressants, antipsychotics), lithium, NSAIDs, medicinal products which cause potassium retention (e.g. spironolactone, amiloride). | | | | |
| Side effects | Abdominal pain, asthenia, back pain, cough, diarrhea, dizziness. headache, hyperkalemia, hypotension, nausea. postural hypotension, renal impairment, vertigo, vomiting, angioedema, myalgia, skin reactions, thrombocytopenia, increased risk of infection, leukopenia, neutropenia and agranulocytosis. | | | | |
| Cautions | Aortic or mitral valve stenosis, breastfeeding, elderly, hypertrophic cardiomyopathy, patients with a history of angioedema, patients with primary aldosteronism, renal artery stenosis, hepatic impairment, cholestasis, renal impairment. | | | | |
| Storage condition | Store below 30ºC. | | | | |
| **Captopril** | | | | | |
| Pharmacological class | | | | ACE inhibitor | |
| Dosage form | | | | Tablet: 12.5 mg | |
| Indications | | | | Treatment of congestive heart failure, hypertension, left ventricular dysfunction after myocardial infarction and diabetic nephropathy | |
| Dose and administration | | | | **Heart failure:**  **Adult,** oral: Initially 6.25–12.5 mg 2–3 times a day, then increased if tolerated to up to 150 mg daily in divided doses, dose to be increased gradually at intervals of at least 2 weeks  **Short-term treatment within 24 hours of onset of myocardial infarction in clinically stable patients,** oral**:**  **Adult**: Initially 6.25 mg, then increased to 12.5 mg after 2 hours, followed by 25 mg after 12 hours; increased if tolerated to 50 mg twice daily for 4 weeks  **Prophylaxis of symptomatic heart failure after myocardial infarction in clinically stable patients with asymptomatic left ventricular dysfunction (starting 3–16 days after infarction) (under close medical supervision),** oral**:**  **Adult:** Initially 6.25 mg daily, then increased to 12.5 mg 3 times a day for 2 days, then increased if tolerated to 25 mg 3 times a day, then increased if tolerated to 75–150 mg daily in 2–3 divided doses, doses exceeding 75mg per day to be increased gradually.  **Diabetic nephropathy in type 1 diabetes mellitus,** oral:  **Adult:** 75–100 mg daily in divided doses  **Dosing: Renal:** Clcr 10-50 ml/minute: Administer at 75% of normal dose every 12-18 hours. Clcr<10 ml/minute: administer at 50% of normal dose every 24 hours.  *Note:**Dose for hypertension is indicated in the section* | |
| Contraindications | | | | Hypersensitivity to ACE inhibitors, idiopathic or hereditary angioedema; known or suspected venovascular disease, aortic or bilateral renal artery stenosis, outflow tract obstruction, pregnancy and lactation. | |
| Drug interactions | | | | Allopurinol, azathioprine, lithium, vasopressin, potassium-sparing diuretics or potassium supplements; aspirin, indomethacin and other NSAIDs, antacids, digoxin and probenecid. | |
| Side effects | | | | Insomnia, peptic ulcer, appetite decreased, anemia, flushing. malaise. Pallor, Raynaud’s phenomenon, aplastic anaemia, autoimmune disorder, cardiac arrest, cardiogenic shock, cerebrovascular insufficiency, depression, gynaecomastia, hepatic disorders, hypoglycaemia, lymphadenopathy, nephrotic syndrome, proteinuria, vision blurred. | |
| Cautions | | | | Concomitant diuretics, diabetes, peripheral vascular disease or generalized atherosclerosis, primary aldosteronism, the risk of agranulocytosis, aortic or mitral valve stenosis, hypertrophic cardiomyopathy, elderly and paediatric, hypotension, impaired renal function, collagen-vascular disease, patients receiving immunosuppressant’s, coronary or cerebrovascular disease, severe salt/volume depletion, pregnancy, breast feeding | |
| Storage condition | | | | Store below 30ºC. Protect from moisture. | |
| **Carvedilol** | | | | | |
| Pharmacological class | Alpha- and beta-adrenoceptor blocker | | | | |
| Dosage form | Tablet: 3.125mg, 6.25mg, 12.5 mg, 25 mg | | | | |
| Indications | Hypertension, angina, adjunct to diuretics, digoxin, or ACE inhibitors in symptomatic chronic heart failure | | | | |
| Dose and administration | **Adjunct to diuretics, digoxin, or ACE inhibitors in symptomatic chronic heart failure:**  **Adult:** Initially 3.125 mg twice daily, dose to be taken with food, then increased to 6.25 mg twice daily, then increased to 12.5 mg twice daily, then increased to 25 mg twice daily, dose should be increased at intervals of at least 2 weeks up to the highest tolerated dose, max. 25 mg twice daily in patients with severe heart failure or body-weight less than 85 kg; max. 50 mg twice daily in patients over 85 kg.  **Left ventricular dysfunction after myocardial infarction:**Initial dose is 6.25 mg twice daily, increased after 3 to 10 days, if tolerated, to 12.5 mg twice daily and then to a target dose of 25 mg twice daily. A lower initial dose may be used in symptomatic patients.  **Heart failure:**  **Child 2–17 years:** Initially 50 mcg/kg twice daily (max. per dose 3.125 mg) for at least 2 weeks, then increased to 100 mcg/kg twice daily for at least 2 weeks, then increased to 200 mcg/kg twice daily, then increased if necessary up to 350 mcg/kg twice daily (max. per dose 25 mg)  *Note:**refer dosing for others under their respective section.* | | | | |
| Contraindications | Hypersensitivity to the drug, class IV of the heart failure, clinically significant hepatic dysfunction, bronchial asthma, AV block (degree II or III), severe bradycardia (<50 bpm), sick sinus syndrome (e.g. sino-atrial block), cardiogenic shock, severe hypotension (SBP< 85 mmHg), Prinzmetal’s angina, untreated pheochromocytoma, metabolic acidosis, severe peripheral arterial circulatory disturbances. | | | | |
| Drug interactions | Chlorpromazine, artemether/lumefantrine, afatinib, diltiazem, verapamil, amiodarone, class I antiarrhythmics, methyldopa, dihydropyridines, nitrates, digoxin, antihypertensives, beta-blockers, α1-receptor antagonists, barbiturates, phenothiazines, tricyclic antidepressants, vasodilating agents. | | | | |
| Side effects | Abdominal discomfort, bradycardia, confusion, depression, diarrhea, dizziness, dry eye, dyspnoea, erectile dysfunction, fatigue, headache, heart failure, nausea, paraesthesia, peripheral coldness, peripheral vascular disease, rash, sleep disorders, syncope, visual impairment, vomiting | | | | |
| Cautions | Diabetes, first-degree AV block, history of obstructive airways disease, myasthenia gravis, portal hypertension, psoriasis, severe liver impairment, renal impairment, hypotension, ischemic heart disease, or diffuse vascular disease, pregnancy and breast feeding | | | | |
| Storage condition | Store at between 15º and 30ºC. Protect from moisture. | | | | |
| **Dapagliflozin** | | | | | |
| Pharmacological class | | | | | Sodium glucose cotransporter 2 inhibitors |
| Dosage form | | | | | Film coated tablet: 10mg |
| Indications | | | | | Symptomatic chronic heart failure (stage C) with reduced ejection fraction, type 2 diabetes mellitus, chronic kidney disease. |
| Dose and administration | | | | | For allIndications, the recommended dose is 10mg orally once daily. |
| Contraindications | | | | | Hypersensitivity to the drug, diabetic ketoacidosis, pregnancy, breast feeding, renal impairment. |
| Drug interactions | | | | | Phenytoin, insulin and insulin secretagogues, diuretics |
| Side effects | | | | | Back pain, balanoposthitis, diabetic ketoacidosis, dizziness, dyslipidemia, hypoglycemia, increased risk of infection, rash, urinary disorders, constipation, dry mouth, genital pruritus, hypovolemia, thirst, vulvovaginal pruritus, weight decreased, rash, haematocrit increased, creatinine renal clearance decreased during initial treatment, dyslipidaemia, necrotizing fasciitis of the perineum (Fournier's gangrene), angioedema. |
| Cautions | | | | | Volume depletion, elderly, renal impairment, severe liver impairment. |
| Storage condition | | | | | Store between 15 and 30ºC. |
| **Digoxin** | | | | | |
| Pharmacological class | | Cardiac glycoside | | | |
| Dosage form | | Tablet: 0.25mg  Injection: 0.25 mg/ml in 2ml ampoule  Elixir: 0.05mg/ml | | | |
| Indications | | Heart failure (for patients in sinus rhythm), atrial fibrillation and flutter. | | | |
| Dose and administration | | **IV infusion**: give intermittently in glucose 5% or sodium chloride 0.9%; dilute to a concentration of not more than 62.5 mcg/ml. To be given over at least 2 hours.  **Oral**:  **Heart failure (for patients in sinus rhythm):**  **Adult:** 0.0625–0.125 mg once daily, reduce dose in the elderly (note: loading dose is not required).  **Chronic heart failure:**  **Child**:  **Neonate <1.5 kg***:* Initially 25 mcg/kg orally or 20mcg/kg IV infusion in 3 divided doses for 24 hours then 4–6 mcg/kg/day oral or IV in 1–2 divided doses.  **Neonate 1.5–2.5 kg***:* Initially 30 mcg/kg orally OR IV infusion in 3 divided doses for 24 hours then 4–6 mcg/kg/day oral or IV in 1–2 divided doses.  **Neonate >2.5 kg or child under 2 years***:* initially 45 mcg/kg orally or 35mcg/kg IV infusion in 3 divided doses for 24 hours then, 10 mcg/kg/day oral or IV in 1–2 divided doses.  **Child 2–5 years***:* Initially 35 mcg/kg orally or IV infusion in 3 divided doses for 24 hours then, 10 mcg/kg/day oral or IV in 1–2 divided doses.  **Child 5–10 years***:* Initially 25 mcg/kg (maximum 0.75 mg) orally or IV infusion in 3 divided doses for 24 hours then, 6 mcg/kg/day (maximum 0.25 mg daily) oral or IV in 1–2 divided doses.  **Child over 10 years:** Initially 0.75–1.5 mg in 3 divided doses for 24 hours then 0.0625–0.25 mg/daily in 1–2 divided doses or initially 0.5–1mg in 3 divided doses for 24 hours then 0.0625–0.250 mcg daily in 1–2 divided doses as IV infusion. | | | |
| Contraindications | | Hypersensitivity to digoxin or digitoxin, constrictive pericarditis, hypertrophic cardiomyopathy, intermittent complete heart block, myocarditis, second degree AV block, supraventricular arrhythmias associated with accessory conducting pathways, ventricular tachycardia or fibrillation. | | | |
| Drug interactions | | Cyclosporine, propafenone, beta-blockers, adenosine, aminoglycosides, antithyroid agents (carbimazole), CCBs ( specially non-dihydropyridine: verapamil and diltiazem), azole antifungals, colchicine, fluoxetine, NSAIDs, ranolazine, spironolactone, amiodarone, phenytoin, bupropion, prazosin, quinidine, macrolide antibiotics, tetracycline, quinine, mefloquine, atorvastatin, ritonavir/ ritonavir containing regimens, St John’s Wort, sucralfate, drugs that reduce serum potassium (e.g., loop diuretics, thiazides, mannitol, acetazolamide, amphotericin B), neuromuscular blocking drugs, sulfasalazine, trimethoprim, vitamin D, rifampicin. | | | |
| Side effects | | GI disturbances including anorexia, nausea, cerebral impairment, vomiting, diarrhea, and abdominal pain, visual disturbances, headache, fatigue, drowsiness, confusion, dizziness, delirium, hallucinations, depression, arrhythmias, heart block, cardiac conduction disorder, PR prolongation, sinus bradycardia, intestinal ischemia, gynecomastia on long-term use, thrombocytopenia, rash. | | | |
| Cautions | | Recent MI, sick sinus syndrome, severe pulmonary disease, thyroid disease, elderly, hypercalcemia, hypokalemia, hypomagnesaemia, hypoxia, renal impairment and pregnancy. | | | |
| Storage condition | | Store between 15°C to 30°C. Avoid exposure to excessive heat. | | | |
| **Empagliflozin** | | | | | |
| Pharmacological class | Sodium glucose co-transporter 2 inhibitor | | | | |
| Dosage form | Film coated tablet: 10 mg | | | | |
| Indications | Symptomatic chronic heart failure, type 2 diabetes mellitus | | | | |
| Dose and administration | **Adult:**  **Symptomatic chronic heart failure**: 10 mg orally once daily.  *Note:**refer the dosing for diabetes mellitus under the section* | | | | |
| Contraindications | Hypersensitivity to the drug, diabetic ketoacidosis, pregnancy, breast feeding, severe hepatic impairment, renal impairment (with eGFR less than 20 ml/minute). | | | | |
| Drug interactions | Phenytoin, rifampicin, statins, insulin and insulin secretagogues (increased risk of hypoglycaemia), diuretics (increased risk of volume depletion) | | | | |
| Side effects | Balanoposthitis, constipation, hypoglycemia, hypovolemia, increased risk of infection, skin reactions, thirst, urinary disorders, urosepsis, angioedema, diabetic ketoacidosis, Fournier’s gangrene | | | | |
| Cautions | Complicated urinary tract infections, elderly, hypotension, risk of volume depletion | | | | |
| Storage condition | Store between 15 and 30ºC. | | | | |
| **Enalapril Maleate** | | | | | |
| Pharmacological class | | | ACE inhibitor | | |
| Dosage form | | | Tablet: 2.5 mg, 5 mg, 10 mg | | |
| Indications | | | Treatment of congestive heart failure, hypertension, left ventricular dysfunction after myocardial infarction, diabetic nephropathy | | |
| Dose and administration | | | **Heart failure, Prevention of symptomatic heart failure in patients with asymptomatic left ventricular dysfunction:**  **Adult**: Initially 2.5 mg oral once daily, increased if tolerated to 10–20 mg twice daily, dose to be increased gradually over 2–4 weeks  **Pediatric**  **Heart failure,** oral**:**  **Neonate:** Initially 10 mcg/kg oral once daily, increased as necessary up to 500 mcg/kg daily in 1–3 divided doses; monitor blood pressure and urine output carefully for at least 2 hours following first dose and during dose escalation until blood pressure is stable.  **Child 1 month–11 years:** Initially 100 mcg/kg once daily, monitor blood pressure carefully for 1–2 hours, then increase if necessary up to 1 mg/kg daily in 1–2 divided doses  **Child 12–17 years, (body weight up to 50 kg):** Initially 2.5 mg once daily, monitor blood pressure carefully for 1–2 hours, maintenance 10–20 mg daily in 1–2 divided doses.  **Child 12–17 years (body weight 50 kg and above):** Initially 2.5 mg once daily, monitor blood pressure carefully for 1–2 hours, maintenance 10–20 mg daily in 1–2 divided doses, maximum 40 mg.  *Note:**refer dosing for hypertension under its section.* | | |
| Contraindications | | | Hypersensitivity to ACEIs, renovascular disease, pregnancy. | | |
| Drug interactions | | | Acetazolamide, acetylsalicylic acid, alcohol, amiloride, amlodipine, antacids, atenolol, chlorpromazine, ciclosporin, oral contraceptives, dexamethasone, diazepam, furosemide, glibenclamide, glyceryl trinitrate, haloperidol, heparin, hydralazine, hydrochlorthiazide, hydrocortisone, lithium, potassium salts, spironolactone, metformin, prednisolone, verapamil, nifedipine, allopurinol, azathioprine, vasopressin, indomethacin, antacids, digoxin, probenecid | | |
| Side effects | | | Dizziness, headache, nausea, hypotension, dry cough, fatigue, asthenia, muscle cramps, rash, and renal impairment, GI disturbance, peptic ulcer, liver damage, chest pain, palpitations, arrhythmias, Raynaud syndrome, angioedema, bronchospasm, dry mouth, sore throat, pulmonary infiltrates, paraesthesia. | | |
| Cautions | | | Refer to captopril | | |
| Storage condition | | | Store at 15°C - 30°C. Protect from heat and light. | | |

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| **Furosemide** | | |
| Pharmacological class | | Loop diuretic |
| Dosage form | | Tablet:40 mg, 80mg  Injection:10 mg/ml in 2 ml ampoule  Oral liquid: 20mg/5ml |
| Indications | | Edema of cardiac, hepatic or renal origin, oliguria due to renal failure, mild to moderate hypertension, as adjunct in the treatment of hypertensive crisis and for the treatment of hypercalcemia. |
| Dose and administration | | **Edema associated with heart failure,** oral*:*  **Adult**: Initially 40 mg daily, preferably in the morning; usual maintenance dose, 20–40 mg daily; may be increased to 80 mg daily or more in resistant edema.  **Neonate:** 0.5–2 mg/kg every 12–24hours (every 24hours if corrected age under 31 weeks).  **Child 1 month – 11 years:** 0.5–2 mg/kg 2–3 times daily, higher doses may be required in resistant edema, maximum 12 mg/kg (80 mg) daily.  **Child 12–17 years:** 20–40 mg daily; increased to 80–120 mg daily, in resistant edema.  **Edema associated with heart failure,** by IM injection or slow IV injection or IV infusion:  **Adult**: Initially 20–50 mg, then increased in steps of 20 mg every 2 hours if required, doses greater than 50 mg given by IV infusion only; maximum 1.5 g per day (for resistant edema dose can be increased to 80–120 mg daily).  **Neonate**: 0.5–1 mg/kg every 12–24 hours (every 24 hours if corrected age under 31 weeks).  **Child 1 month – 11 years:** 0.5–1 mg/kg (maximum 4 mg/kg) repeated every 8 hours as necessary, maximum 6 mg/kg per day  **Child 12–17 years:** 20–40 mg every 8 hours as required, higher doses may be required in resistant cases.  *Note:* *Refer dosing for other indications under respective sections.* |
| Contraindications | | Patients with pre-comatose states associated with liver cirrhosis, renal failure with anuria. |
| Drug interactions | | Aminoglycosides, cyclosporine, cisplatin, carbamazepine, beta-blockers, theophylline, antifungals, digoxin, corticosteroids, phenytoin, immunoglobulins, reboxetine and lithium. |
| Side effects | | Hyponatremia, hypokalemia, hypomagnesaemia, increased calcium excretion, hypotension, hyperuricemia and gout, hyperglycemia, increase in cholesterol and triglyceride concentrations, photosensitivity, agranulocytosis, aplastic anaemia, pancreatitis, tinnitus, deafness, acute kidney injury, hepatic disorders, metabolic acidosis, cholestasis. |
| Cautions | | Hyperproteinemia, children, elderly, pregnancy, breastfeeding, hypotension, hypovolemia, diabetes mellitus, gout, hepatic failure, renal impairment, prostatic enlargement, porphyria, hypokalemia, hyponatremia. |
| Storage condition | | Store below 30 oC. Protect from freezing and light. |
| **Hydrochlorothiazide** | | |
| Pharmacological class | Thiazide diuretic | |
| Dosage form | Oral liquid: 50 mg/5ml  Tablet: 25mg | |
| Indications | Heart failure, hypertension, edema, nephrogenic diabetes insipidus | |
| Dose and method of administration | **Edema,** oral**:**  **Adult:** Initially 25 mg daily on rising, increased to 50 mg daily if necessary.  **Elderly***:* Initially 12.5 mg daily on rising.  **Infant under 6 months:** 2 to 3.3 mg/kg daily in two divided doses; maximum dose 37.5 mg daily.  **Child over 6 months:** 2 mg/kg daily in two divided doses; maximum dose 200 mg daily  **Severe edema in patients unable to tolerate loop diuretics,** oral*:* Up to 100 mg either daily or on alternate days; maximum 100 mg daily  **Nephrogenic diabetes insipidus,** oral*:* Initially up to 100 mg daily  *Note:**refer indication for other under respective sections.* | |
| Contraindications | Hypersensitive to the drug or other sulfonamide-derived drugs, severe renal or severe hepatic impairment, hyponatremia, hypercalcemia, refractory hypokalemia, symptomatic hyperuricemia, Addison disease. | |
| Drug interactions | Allopurinol, NSAIDs, lithium, calcium salts, vitamin D supplements, aspirin. | |
| Side effects | Hypotension, mild gastrointestinal effects, impotence, hypercalcemia, hypokalemia, hypomagnesaemia, hyponatremia, hypochloraemic alkalosis, hyperuricemia, gout, hyperglycemia, and hypercholesterolemia. | |
| Cautions | Renal impairment, hepatic impairment, pregnancy, breastfeeding, elderly, diabetes mellitus, gout, systemic lupus erythermatous, porphyria, paediatrics, dyslipidaemia. | |
| Storage condition | Store between 15 and 30ºC. Protect from heat and light. | |

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| **Lisinopril** | | |
| Pharmacological class | ACE inhibitor | |
| Dosage form | Tablet: 10 mg, 20 mg | |
| Indications | Treatment of congestive heart failure, hypertension, left ventricular dysfunction after myocardial infarction (MI), diabetic nephropathy in hypertensive patients. | |
| Dose and administration | **Heart failure (adjunct) (under close medical supervision):**  **Adult:** Initially 2.5 mg once daily; increased in steps of up to 10 mg at least every 2 weeks; maximum 35 mg per day.  **Short-term treatment following MI in hemodynamically stable patients SBP>120 mmHg:**  **Adult:** Initially 5 mg, taken within 24 hours of MI, followed by 5 mg, to be taken 24 hours after initial dose, then 10 mg, to be taken 24 hours after second dose, then 10 mg once daily for 6 weeks (or continued if heart failure), temporarily reduce maintenance dose to 5 mg and if necessary 2.5 mg daily if SBP≤100 mmHg during treatment; withdraw if prolonged hypotension occurs during treatment (SBP<90 mmHg for more than 1 hour).  **Short-term treatment following MI in hemodynamically stable patients: systolic blood pressure 100–120 mmHg:**  **Adult:** Initially 2.5 mg once daily, maintenance 5 mg once daily, increase to maintenance dose only after at least 3 days of the initial dose, should not be started after MI if systolic blood pressure <100 mmHg, temporarily reduce maintenance dose to 2.5 mg daily if SBP 100 ≤mmHg during treatment; withdraw if prolonged hypotension occurs (SBP <90 mmHg for more than 1 hour).  **Renal complications of diabetes mellitus:**  **Adult:** Initially 2.5–5 mg daily, adjusted according to response; usual dose 10–20 mg once daily. | |
| Contraindications | Hypersensitivity to ACE inhibitors, history of angioedema, known or suspected venovascular disease, aortic or bilateral renal artery stenosis, outflow urinary tract obstruction, pregnancy, breastfeeding. | |
| Drug interactions | Allopurinol, azathioprine, lithium, vasopressin, potassium-sparing diuretics or potassium supplements; aspirin, indomethacin and other NSAIDs, antacids, digoxin, sacubitrin/valsartan combination, probenecid. | |
| Side effects | Postural disorder, hallucination, mood altered, Raynaud’s phenomenon, anemia, autoimmune disorder, azotaemia, bone marrow depression, gynaecomastia, hepatic disorders, hypersensitivity, hypoglycaemia, lymphadenopathy, olfactory nerve disorder, sinusitis, toxic epidermal necrolysis | |
| Cautions | Refer to captopril | |
| Storage condition | Store between 15 and 30ºC. Protect from light. | |
| **Losartan** | | |
| Pharmacological class | Angiotensin-II receptor antagonist | |
| Dosage form | Tablet: 25mg, 50mg, 100mg | |
| Indications | Chronic heart failure when ACE inhibitors are unsuitable or contra-indicated, hypertension, MI with left ventricular dysfunction, diabetic nephropathy in type 2 diabetes mellitus. | |
| Dose and administration | **Chronic heart failure when ACE inhibitors are unsuitable or contra-indicated**  **Adult:** Initially 12.5 mg once daily, increased if tolerated up to 150 mg once daily, doses to be increased at weekly intervals.  *Note:**refer dosing for other indications at their respective section*. | |
| Contraindications | Hypersensitivity to the drug, pregnancy | |
| Drug interactions | ACEI, drugs that cause hypotension (e.g., tricyclic antidepressants, antipsychotics), lithium, NSAIDs, medicinal products which cause potassium retention (e.g. spironolactone, amiloride). | |
| Side effects | Hypoglycemia, dizziness, vertigo, hyperkalemia, hypotension, dyspnea, cough, liver disorder, hypersensitivity, depression, malaise, urinary tract infection, renal impairment. | |
| Cautions | Severe heart failure, aortic or mitral stenosis, or obstructive hypertrophic cardiomyopathy, mild to moderate hepatic impairment, breastfeeding. | |
| Storage condition | Store between 15 to 30°C. | |
| **Metoprolol succinate** | | |
| Pharmacological class | | Selective beta blocker |
| Dosage form | | Tablet: 25mg, 50mg,100mg |
| Indications | | Hypertension, heart failure, angina pectoris, arrhythmia particularly supraventricular tachycardia, prevention of cardiac death and re-infarction after the acute phase of myocardial infarction and prophylaxis of migraine. |
| Dose and administration | | **Heart failure:** Initial daily dose 12.5-25mg once daily; with target dose of 200mg daily.  *Note:**refer dosing for other indications at their respective section.* |
| Contraindications | | Hypersensitivity to the drug, severe bradycardia, greater than first degree heart block, or sick sinus syndrome without a pacemaker, cardiogenic shock or decompensated heart failure. |
| Drug interactions | | Catecholamine-depleting drugs, CYP2D6 inhibitors, clonidine, prazosin, nitroglycerin; verapamil, diltiazem, digitalis glycosides, NSAIDs, lignocaine, alcohol. |
| Side effects | | Tiredness, dizziness, depression, shortness of breath, bradycardia, hypotension, diarrhoea, pruritus, constipation, palpitations, postural disorders, chest pain, drowsiness, dystrophic skin lesion, muscle cramps, edema, skin reactions, weight gain, hyperhidrosis. |
| Cautions | | Hepatic impairment, pregnancy, breastfeeding, bronchospastic disease, pheochromocytoma, diabetic mellitus |
| Storage condition | | Store between 15 °C and 30 °C. Protect from light and moisture |
| **Norepinephrine** | | |
| Pharmacological class | Vasoconstrictor sympathomimetic | |
| Dosage form | Injection: 1mg/1ml | |
| Indications | Cardiogenic shock, septic shock, acute hypotension | |
| Dose and administration | **Acute hypotension (initial and on-going treatment):**  **Adult:** by IV infusion: Initially 0.16–0.33 ml/min, adjusted according to response, dose applies to a solution containing 40 mcg (base)/ml only, dilute the 1 mg/ml concentrate for infusion for this solution. **Neonate:** 20–100 nanograms/kg/min (max. per dose 1 microgram/kg/min), adjusted according to response; dilute the 1 mg/ml concentrate for infusion for this dose.  **Child:** 20–100 nanograms/kg/min (max. per dose 1 microgram/kg/min), adjusted according to response; dilute the 1 mg/ml concentrate for infusion for this dose.  **On-going treatment of acute hypotension (with escalating dose requirements) (body weight 50 kg and above):**  **Adult,** by IV infusion: use the 0.08 mg/ml or 0.16 mg/ ml solution for infusion. | |
| Contraindications | Hypersensitivity to the drug, hypertension. | |
| Drug interactions | Betablockers, ergometrine, volatile halogenated anaesthetic agents, monoamine oxidase inhibitors, linezolid, tricyclic antidepressants, vasopressin, adrenergic-serotoninergic drugs, other cardiac sensitizing agents. | |
| Side effects | Acute glaucoma, anxiety, arrhythmias, asthenia, cardiomyopathy, confusion, dyspnea, extravasation necrosis, gangrene, headache, heart failure, hypovolemia, hypoxia, injection site necrosis, insomnia, ischemia, myocardial contractility increased, nausea, palpitations, peripheral ischemia, psychotic disorder, respiratory failure, tremor, urinary retention, vomiting | |
| Cautions | Coronary or mesenteric or peripheral vascular thrombosis, diabetes mellitus, extravasation at injection site may cause necrosis, following MI, hypercapnia, hyperthyroidism, hypoxia, Prinzmetal’s, variant angina, susceptibility to angle-closure glaucoma, uncorrected hypovolemia, elderly, hepatic impairment, renal impairment, pregnancy and breast feeding. | |
| Storage condition | Store between 15–30°C. Protect from light. Diluted norepinephrine solution may be stored for up to 24 hours at room temperature prior to use. | |
| **Sacubitril + Valsartan** | | |
| Pharmacological class | Angiotensin receptor-neprilysin inhibitor (ARNI) and Angiotensin II receptor antagonist | |
| Dosage form | Tablet: 24mg + 26mg, 49mg+51mg, 97mg+103mg | |
| Indications | Symptomatic chronic heart failure with reduced ejection fraction (HFrEF) (in patients not currently taking an ACE inhibitor or angiotensin II receptor antagonist, or stabilized on low doses of either of these agents). | |
| Dose and administration | **Symptomatic chronic HFrEF (in patients not currently taking an ACE inhibitor or angiotensin II receptor antagonist, or stabilized on low doses of either of these agents):**  **Adult:** Initially, 24/26 mg twice daily for 3–4 weeks, increased if tolerated to 49/51mg twice daily for 3–4 weeks, then increased if tolerated to 97/103mg twice daily.  **Symptomatic chronic HFrEF (in patients currently stabilized on an ACE inhibitor or angiotensin II receptor antagonist):** Initially 49/51 mg twice daily for 2–4 weeks, increased if tolerated to 97/103 mg twice daily, consider a starting dose of 24/26mg if SBP <110mmHg. | |
| Contraindications | Hypersensitivity to the drug, concomitant use with ACEIs and ARBs, SBP less than 100 mmHg, serum potassium level >5.4 mmol/L, hereditary angioedema, severe hepatic impairment, biliary cirrhosis and cholestasis, pregnancy and breastfeeding. | |
| Drug interactions | ACEIs, ARB, statins, phosphodiesterase 5 inhibitors, potassium sparing diuretics, potassium supplements, NSAIDs, selective COX2 inhibitors, lithium, rifampicin, cyclosporine. | |
| Side effects | Anaemia, asthenia, cough, diarrhoea, dizziness, electrolyte imbalance, gastritis, headache, hypoglycaemia, hypotension, nausea, renal impairment, syncope, vertigo, angioedema, skin rash | |
| Cautions | Renal artery stenosis, stage IV CHF, psychiatric events such as hallucinations, paranoia and sleep disorders, hepatic impairment, renal impairment | |
| Storage condition | Store below 30°C. Protect from moisture. | |

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| **Spironolactone** | |
| Pharmacological class | Potassium sparing diuretic, aldosterone antagonist |
| Dosage form | Tablet: 25mg  Oral liquid: 5mg/5ml, 10mg/5ml, 25mg/5ml |
| Indications | Edema and ascites in cirrhosis of the liver, malignant ascites, nephrotic syndrome, moderate to severe heart failure (adjunct), resistant hypertension (adjunct), and primary hyperaldosteronism in patients awaiting surgery. |
| Dose and administration | **Edema in congestive heart failure:**  **Adult:** Initially 100 mg daily, alternatively initially 25–200 mg daily, dose may be taken as a single dose or divided doses, maintenance dose adjusted according to response  **Moderate to severe heart failure (adjunct):**  **Adult:** Initially 25 mg once daily, then adjusted according to response to 50 mg once daily  *Note:**refer dosing for others under respective sections.* |
| Contraindications | Addison’s disease, anuria, hyperkalemia, hyponatremia. |
| Drug interactions | Amiodarone, phenytoin, phenobarbitone, carbamazepine, lithium, ACE inhibitors, ARBs, other potassium sparing diuretics, potassium supplementation. |
| Side effects | Gastro-intestinal disturbances, impotence, gynecomastia, menstrual irregularities, lethargy, headache, confusion; rashes, hyperkalemia, hyponatremia, hepatotoxicity, osteomalacia, and thrombocytopenia, acidosis hyperchloraemic, acute kidney injury, agranulocytosis, alopecia, breast neoplasm benign, breast pain, dizziness, hypertrichosis, leg cramps, leucopenia and libido. |
| Cautions | Elderly, porphyria, diabetes mellitus, renal impairment, hepatic impairment, pregnancy and breastfeeding. |
| Storage condition | Store between 15 and 30ºC. Protect from light. |

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| **Valsartan** | |
| Pharmacological class | Angiotensin-II receptor antagonist |
| Dosage form | Tablet: 40 mg, 80mg and 160 mg |
| Indications | Heart failure, hypertension, MI with left ventricular dysfunction |
| Dose and administration | **Heart failure when ACE inhibitors cannot be used, or in conjunction with an ACE inhibitor when a beta-blocker cannot be used (under expert supervision):**  Adult: Initially 40 mg twice daily, increased to 160 mg oral twice daily and increase dose every 2 weeks.  **MI with left ventricular dysfunction (adjunct):**  **Adult:** Initially 20 mg oral twice daily, increased if necessary up to 160 mg twice daily, doses to be increased over several weeks if tolerated.  *Note:**refer dosing for other indications at their respective section.* |
| Contraindications | Biliary cirrhosis, cholestasis |
| Drug interactions | ACE inhibitors, drugs that cause hypotension (e.g., tricyclic antidepressants, antipsychotics), lithium, NSAIDs, medicinal products which cause potassium retention (e.g. spironolactone, amiloride). |
| Side effects | Syncope, hyponatremia, neutropenia, respiratory disorders, serum sickness. vasculitis |
| Cautions | Aortic or mitral valve stenosis, breastfeeding, elderly, hypertrophic cardiomyopathy, patients with a history of angioedema, patients with primary aldosteronism, renal artery stenosis, hepatic impairment, cholestasis, renal impairment. |
| Storage condition | Store between 15 and 30ºC. Protect from moisture and heat. |

## Antiarrhythmics

**Antiarrhythmics** are a class of medications used to manage and treat **arrhythmias**, which are abnormal heart rhythms. These drugs work by altering the electrical impulses in the heart to restore or maintain a normal rhythm. Arrhythmias can range from benign, mild irregularities to life-threatening conditions, and antiarrhythmic drugs are critical in managing these variations. Antiarrhythmic drugs modulate the electrical activity of the heart by affecting the action potentials that control cardiac muscle contraction. Each class of antiarrhythmic agents works on different phases of the cardiac action potential or affects specific ion channels or receptors. Anti-arrhythmic drugs can be classified clinically into those that act on supraventricular arrhythmias (e.g. verapamil hydrochloride), those that act on both supraventricular (SVT) and ventricular arrhythmias (e.g. amiodarone hydrochloride), and those that act on ventricular arrhythmias (e.g. lidocaine hydrochloride). Based on the electrophysiological activity anti-arrhythmic drugs can also be classified according to their effects on the electrical behaviour of myocardial cells during activity (the Vaughan Williams classification) although this classification is of less clinical significance: *Class I:* membrane stabilizing drugs (e.g. lidocaine, flecainide); *Class II:* beta-blockers; *Class III:* amiodarone; sotalol (also Class II); *Class IV:* non- dihydropyridine calcium-channel blockers. Due to Adenosine’s very short duration of action (half-life about 8 to 10 seconds only), it is a treatment of choice for terminating paroxysmal SVT.

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| **Adenosine** | | | | | |
| Pharmacological class | Other Antiarrhythmic | | | | |
| Dosage form | Injection: 3mg/ml | | | | |
| Indications | For paroxysmal SVT, including Wolff-Parkinson-White (WPW) syndrome, and to aid diagnosis of broad or narrow complex SVT. | | | | |
| Dose and administration | **Rapid reversal to sinus rhythm of paroxysmal SVT, including WPW-syndrome and used to aid diagnosis of broad or narrow, complex SVT**, by rapid IV infusion with cardiac monitoring:  **Adult patients without heart transplant:** Initially 6 mg, administer into central or large peripheral vein and give over 2 seconds followed by rapid saline flush, followed by 12 mg after 1–2 minutes *if required*, then 12 mg after 1–2 minutes *if required*; increments should not be given if high-level AV block develops at any particular dose.  **Adult patients with a heart transplant:** Initially 3 mg, administer into a central or large peripheral vein and give over 2 seconds then give a rapid saline flush, followed by 6 mg after 1–2 minutes *if required*, then 12 mg after 1–2 minutes *if required*; patients with a heart transplant are very sensitive to the effects of adenosine.  **Neonate:** Initially 150 mcg/kg, then increased in steps of 50–100 mcg/kg every 1–2 minutes (max. per dose 300 mcg/kg) if required; dose to be repeated until tachycardia terminated, or maximum single dose given.  **Infants**: Initially 150 mcg/kg, then increased in steps of 50–100 mcg/kg every 1–2 minutes (max. per dose 500 mcg/kg) if required; dose to be repeated until tachycardia terminated, or maximum single dose given.  **Child 1–11 years:** Initially 100 mcg/kg, then increased in steps of 50–100 mcg/kg every 1–2 minutes (max. per dose 12 mg) *if required;* dose to be repeated until tachycardia terminated, or maximum single dose given.  **Child 12–17 years:** Initially 3 mg, followed by 6 mg after 1–2 minutes if required, followed by 12 mg after 1–2 minutes if required; in some children over 12 years, 3 mg dose ineffective (e.g., if a small peripheral vein is used for administration) and higher initial dose sometimes used, however, those with heart transplant are very sensitive to the effects of adenosine and should not receive higher initial doses. | | | | |
| Contraindications | Hypersensitivity to the drug, asthma, chronic obstructive lung disease, decompensated heart failure, QT prolongation, second- or third-degree AV block and sick sinus syndrome (unless pacemaker fitted), severe hypotension. | | | | |
| Drug interactions | Dipyridamole, aminophylline, theophylline and other xanthines, including food and drinks containing xanthines (tea, coffee, chocolate and cola), digoxin, verapamil. | | | | |
| Side effects | Abdominal discomfort, arrhythmias, atrioventricular block, chest discomfort, chest pain (discontinue), dizziness, dry mouth, dyspnea, flushing, headache, hypotension (discontinue if severe), pain, paresthesia, throat discomfort. | | | | |
| Cautions | Atrial fibrillation, atrial fibrillation with accessory pathway (conduction down anomalous pathway may increase), atrial flutter, atrial flutter with accessory pathway, autonomic dysfunction, bundle branch block, first-degree AV block, heart transplant, left main coronary, artery stenosis, left to right shunt, pericardial effusion, pericarditis, QT-interval prolongation, recent myocardial infarction, severe heart failure, stenotic carotid artery, disease with cerebrovascular insufficiency, stenotic valvular heart disease, uncorrected hypovolemia, pregnancy and breastfeeding. | | | | |
| Storage condition | Store between 15 and 30ºC. | | | | |
| **Amiodarone** | | | | | |
| Pharmacological class | Class III antiarrhythmic | | | | |
| Dosage form | Tablet: 100mg, 200mg, 400mg  Injection: 50mg/ml | | | | |
| Indications | For arrhythmia particularly when other drugs are ineffective or contraindicated, for ventricular fibrillation or pulseless ventricular tachycardia refractory to defibrillation | | | | |
| Dose and administration | **Treatment of arrhythmias when other drugs are ineffective or contraindicated (paroxysmal supraventricular, nodal and ventricular tachycardia or fibrillation, atrial fibrillation and flutter, and tachyarrhythmia’s associated with WPW-syndrome):**  **Adult:** 200 mg orally 3 times a day for 1 week, then reduced to 200 mg twice daily for a further week, followed by maintenance dose, usually 200mg orally once daily **OR** Initially 5 mg/kg, to be given over 20–120 minutes as IV infusion with ECG monitoring, subsequent infusions given if necessary according to response; maximum 1.2 g per day.  **Pediatrics,** oral:  **Neonate:** Initially 5–10 mg/kg twice daily for 7–10 days, then reduced to 5–10 mg/kg daily.  **Child 1 month–11 years:** Initially 5–10 mg/kg twice daily (max. per dose 200 mg) for 7–10 days, then reduced to 5–10 mg/kg once daily; maximum 200 mg per day  **Child 12–17 years:** 200 mg 3 times a day for 1 week, then 200 mg twice daily for 1 week, then usually 200 mg daily adjusted according to response  **Pediatrics,** IV infusion**:**  **Neonate**: Initially 5–10 mg/kg IV infusion twice daily for 7–10 days, then reduced to 5–10 mg/kg IV infusion daily.  **Child:** 1 month–11 years: Initially 5–10 mg/kg IV infusion twice daily for 7–10 days, then reduced to 5–10 mg/kg IV infusion once daily; (maximum 200 mg per day).  **Child 12–17 years:** 200 mg 3 times a day for 1 week, then 200 mg twice daily for 1 week, then usually 200 mg daily adjusted according to response.  **Ventricular fibrillation or pulseless ventricular tachycardia refractory to defibrillation** **(for cardiopulmonary resuscitation):** **Adult:** Initially 300mg as IV infusion, dose to be given over at least 3 minutes, dose should be given from a pre-filled syringe or diluted in 20 ml Glucose 5%, then 150 mg if required*.*  **Neonate:** 5 mg/kg to be given over at least 3 minutes  **Child:** 5 mg/kg (max. per dose 300 mg) to be given over at least 3 minutes.  *Note:* *avoid bolus injection in cardiomyopathy, congestive heart failure, circulatory collapse, severe arterial hypotension, and severe respiratory failure.* | | | | |
| Contraindications | Hypersensitivity to the drug or iodine, sino-atrial heart block or sinus bradycardia, thyroid dysfunction, combination of amiodarone with drugs which may induce Torsades de Pointes, pregnancy and breastfeeding. | | | | |
| Drug interactions | Quinidine, procainamide, sotalol, co-trimoxazole, pentamidine injection, some antipsychotics (chlorpromazine, fluphenazine, haloperidol), lithium and TCAs, anti-malarials, erythromycin, clarithromycin, fluoroquinolones, beta blockers, diltiazem, verapamil, stimulant laxatives, diuretics, systemic corticosteroids, amphotericin, general anaesthesia, high dose oxygen therapy, ticagrelor, ciclosporin, simvastatin, lidocaine, tacrolimus, sildenafil, fentanyl, midazolam, ergotamine and colchicine). | | | | |
| Side effects | Arrhythmias, hepatic disorders, hyperthyroidism, nausea, respiratory disorders, skin reactions, bronchospasm in patients with severe respiratory failure constipation, corneal deposits, hypothyroidism, movement disorders, photosensitivity reaction, sleep disorders, taste altered and vomiting whereas hypotension is common with parenteral use, idiopathic intracranial hypertension, nerve disorders. | | | | |
| Cautions | Acute porphyria’s, conduction disturbances, elderly, heart failure, hypokalemia, severe bradycardia, moderate and transient fall in blood pressure, severe hepatocellular toxicity, patients taking amiodarone may develop corneal microdeposits. | | | | |
| Storage condition | Store between 15°C and 30°C. Protect from light and heat. | | | | |
| **Atropine sulfate** | | | | | |
| Pharmacological class | Other antiarrhythmic/antimuscarinic | | | | |
| Dosage form | Injection: 0.1mg/ml, 1mg/ml (as sulphate) in 1-ml ampule | | | | |
| Indications | Symptomatic bradycardia, intra-operative bradycardia, bradycardia following myocardial infarction, symptomatic bradycardia due to acute massive over dosage of beta-blockers | | | | |
| Dose and administration | **Symptomatic bradycardia** due to acute over dosage of beta-blockers, intravenous injection:  **Adult**: 0.5–1.2 mg, repeat doses may be necessary.  **Child**: 0.02 mg/kg (max. per dose 1.2 mg), repeat doses may be necessary.  **Excessive bradycardia** associated with beta-blocker use, IV injection:  **Adult:** 0.6–2.4 mg in divided doses (max. per dose 0.6 mg)  **Neonate:** 10–20 mcg/kg; **Infants:** 1 month – 11 years:10–20 mcg/kg **Child from 12–17 years**: 300–600 mcg, larger doses may be used in emergencies.  **Bradycardia following MI** (particularly if complicated by hypotension), IV injection:  **Adult:** 500 mcg every 3–5 minutes; maximum 3 mg per course.  **Intra operative bradycardia**, IV injection;  **Adult:** 300–600 mcg, larger doses may be used in emergencies.  **Neonate:** 10–20 mcg/kg  **Child:** 1 month–11 years: 10–20 mcg/kg  **Child:** 12–17 years: 300–600 mcg, larger doses may be used in emergencies. | | | | |
| Contraindications | Hypersensitivity to the drug or belladonna alkaloids, closed-angle glaucoma, myasthenia gravis, prostatic enlargement, severe GI inflammatory disease, GI obstruction. | | | | |
| Drug interactions | Concomitant administration of other products with antimuscarinic properties, (amitriptyline, chlorpheniramine, chlorpromazine, haloperidol, metoclopramide, neostigmine, pyridostigmine), clozapine, phenylephrine. | | | | |
| Side effects | Dry mouth, blurred vision, photophobia, flushing and dryness of skin, rash, difficulty in micturition, constipation, tachycardia, palpitations, fever, nausea, vomiting, confusion, seizures, abdominal distension, anhidrosis, anxiety, arrhythmias, bronchial secretion decreased, dysphagia, hallucination, hyperthermia, movement disorders | | | | |
| Cautions | Down syndrome, children, ulcerative colitis, elderly, photosensitivity, pregnancy and breastfeeding. | | | | |
| Storage condition | Store between 15oC to 30 oC. Protect from freezing and heat. | | | | |
| **Bisoprolol** | | | | | |
| Pharmacological class | Beta blocker, class II antiarrythimic | | | | |
| Dosage form | Tablet: 2.5mg, 5mg and 10mg | | | | |
| Indications | Supraventricular arrhythmias, hypertension, angina, heart failure | | | | |
| Dose and administration | **Supraventricular arrhythmias and acute/chronic coronary syndromes,** oral: 5 to 10 mg as a single daily dose; maximum recommended dose is 20 mg daily; dose reduction may be necessary in patients with hepatic or renal impairment | | | | |
| Contraindications | Refer bisoprolol under medicnes used for heart failure. | | | | |
| Drug interactions | Refer bisoprolol under medicnes used for heart failure. | | | | |
| Side effects | Refer bisoprolol under medicnes used for heart failure. | | | | |
| Cautions | Refer bisoprolol under medicnes used for heart failure. | | | | |
| Storage condition | Store between 15 and 30ºC. | | | | |
| **Digoxin** | | | | | |
| Pharmacological class | | | | Cardiac glycoside | |
| Dosage form | | | | Elixir: 0.05mg/ml  Injection: 0.25 mg/ml in 2ml ampoule  Tablet: 0.125mg, 0.25mg | |
| Indications | | | | Atrial fibrillation or flutter, heart failure (for patients in sinus rhythm) | |
| Dose and administration | | | | **IV infusion**: give intermittently in 5% dextrose in water or sodium chloride 0.9%; dilute to a concentration of not more than 62.5 mcg/ml. To be given over at least 2 hours.  **Oral:**  **Rapid digitalization, for atrial fibrillation or flutter:**  Adult: 0.75–1.5 mg in divided doses, dose to be given over 24 hours, reduce dose in the elderly  **Maintenance, for atrial fibrillation or flutter:**  Adult: Maintenance 0.125mg–0.25 mg daily, dose according to renal function and initial loading dose, reduce dose in the elderly  **Emergency loading dose, for atrial fibrillation or flutter, i**nitially by intravenous infusion:  **Adult:** Loading dose 0.75–1 mg, to be given over at least 2 hours, then (by mouth) maintenance, loading dose is rarely necessary, maintenance dose to be started on the day following the loading dose, reduce dose in the elderly  **Supraventricular arrhythmias, Child**:  **Neonate <1.5 kg***:* Initially 25 mcg/kg orally OR 20mcg/kg IV infusion in 3 divided doses for 24 hours then 4–6 mcg/kg/day oral or IV in 1–2 divided doses.  **Neonate 1.5–2.5 kg***:* Initially 30 mcg/kg orally OR IV infusion in 3 divided doses for 24 hours then 4–6 mcg/kg/day oral or IV in 1–2 divided doses.  **Neonate >2.5 kg or child under 2 years***:* initially 45 mcg/kg orally OR 35mcg/kg IV infusion in 3 divided doses for 24 hours then, 10 mcg/kg/day oral or IV in 1–2 divided doses.  **Child 2–5 years***:* Initially 35 mcg/kg orally or IV infusion in 3 divided doses for 24 hours then, 10 mcg/kg/day oral or IV in 1–2 divided doses.  **Child 5–10 years:** Initially 25 mcg/kg (maximum 0.75 mg) orally or IV infusion in 3 divided doses for 24 hours then, 6 mcg/kg/day (maximum 0.25 mg daily) oral or IV in 1–2 divided doses.  **Child over 10 years:** Initially 0.75–1.5 mg in 3 divided doses for 24 hours then 0.0625–0.25 mg/daily in 1–2 divided doses OR Initially 0.5–1mg in 3 divided doses for 24 hours then 0.0625–0.250 mcg daily in 1–2 divided doses as IV infusion. | |
| Contraindications | | | | Refer to Digoxin above | |
| Drug interactions | | | | Refer to Digoxin above | |
| Side effects | | | | Refer to Digoxin above | |
| Cautions | | | | Refer to Digoxin above | |
| Storage condition | | | | Store between 15°C to 30°C. | |
| **Isoprenaline/Isoproterenol hydrochloride** | | | | | |
| Pharmacological class | | Sympathomimetic acting on beta- receptor | | | |
| Dosage form | | Injection: 0.02 mg/ml, 0.2mg/ml | | | |
| Indications | | Cardiac arrythmia, cardiac arrest, severe bradycardia, unresponsive to atropine, shock, bronchospasm | | | |
| Dose and administration | | **Cardiac arrhythmias and cardiac arrest:** **Adult;** IV infusion**:** initial dosage of 5 mcg/minute, adjust subsequent dosage based on patient response (generally ranges from 2–20 mcg/minute).IV injection: IV doses of 0.04–0.06 mg have been used in adults.IM injection: 0.02–1 mg.**Child:** 0.1mcg-1mcg/kg per minute.**Infants:** IV doses of 0.01–0.03 mg.**Shock:****Adult:**IV infusion: 0.5–5 mcg per minute. In advanced stages of shock, rates >30 mcg/minute have been used.IV injection: initial dose of 0.01–0.02 mg dose may be repeated if necessary.**Bronchospasm,** IV:**Adult:** IV doses of 0.01–0.02 mg, repeated as needed. | | | |
| Contraindications | | Tachyarrhythmias, tachycardia of heart-block caused by digitalis intoxication, ventricular arrhythmias which require inotropic therapy and angina pectoris. | | | |
| Drug interactions | | Betablockers, sympathomimetics, halothane, aminophylline, theophylline, MAO inhibitors. | | | |
| Side effects | | Arrhythmias, hypotension, sweating, tremor, headache, palpitations, tachycardia, nervousness, excitability, insomnia, dizziness. | | | |
| Cautions | | Ischemic heart disease, diabetes mellitus, hyperthyroidism; pregnancy, hypertension, cardiovascular disorders (including coronary artery disease and coronary insufficiency). | | | |
| Storage condition | | Store below 30 oC. Protect from light. | | | |
| **Lidocaine (lignocaine) hydrochloride** | | | | | |
| Pharmacological class | | | | | Local anesthetic, Class IB antiarrhythmic |
| Dosage form | | | | | Injection: 5mg/ml (0.5%), 10mg/ml (1%), 20mg/ml (2%) in 20ml vial |
| Indications | | | | | Cardiopulmonary resuscitation (as an alternative if amiodarone is not available), ventricular arrhythmias |
| Dose and administration | | | | | **Cardiopulmonary resuscitation** (as an alternative if amiodarone is not available):  **Adult:** 1 mg/kg IV, do not exceed 3 mg/kg over the first hour.  **Ventricular arrhythmias,** especially after MI in patients without gross circulatory impairment;  **Adult:** 100 mg IV, to be given as a bolus dose over a few minutes, followed immediately by (by IV infusion) 4 mg/minute for 30 minutes, then (by IV infusion) 2 mg/minute for 2 hours, then (by IV infusion) 1 mg/minute, reduce concentration further if infusion continued beyond 24 hours (ECG monitoring and specialist advice for infusion), following IV injection lidocaine has a short duration of action (lasting for 15–20 minutes). If an IV infusion is not immediately available the initial IV injection of 100 mg can be repeated if necessary once or twice at intervals of not <10 minutes.  **Ventricular arrhythmias**, especially after myocardial infarction in lighter patients or those whose circulation is severely impaired;  **Adult:** Initially 50 mg, to be given as a bolus dose over a few minutes, followed immediately by (by IV infusion) 4 mg/minute for 30 minutes, then (by IV infusion) 2 mg/minute for 2 hours, then (by IV infusion) 1 mg/minute, reduce concentration further if infusion continued beyond 24 hours (ECG monitoring and specialist advice for infusion), following IV injection lidocaine has a short duration of action (lasting for 15–20 minutes).  **Ventricular arrhythmias, Pulseless ventricular tachycardia, Ventricular fibrillation in pediatrics:**  **Neonate:** Initially 0.5–1 mg/kg, followed immediately by (by intravenous infusion) 0.6–3 mg/kg/hour, alternatively (by intravenous injection or by intraosseous injection) 0.5–1 mg/kg repeated at intervals of not less than 5 minutes if infusion is not immediately available following initial injection, until infusion can be initiated; maximum 3 mg/kg per course.  **Child 1 month–11 years:** Initially 0.5–1 mg/kg, followed immediately by (by intravenous infusion) 0.6–3 mg/kg/hour, alternatively (by intravenous injection or by intraosseous injection) 0.5–1 mg/kg repeated at intervals of not less than 5 minutes if infusion is not immediately available following initial injection, until infusion can be initiated; maximum 3 mg/kg per course.  **Child 12–17 years:** Initially 50–100 mg, followed by (by intravenous infusion) 120 mg, dose to be given over 30 minutes, then (by intravenous infusion) 240 mg, dose to be given over 2 hours, then (by intravenous infusion) 60 mg/hour, reduce dose further if infusion is continued beyond 24 hours, if infusion not immediately available following initial injection, the initial injection dose may be repeated at intervals of not less than 5 minutes (to a maximum 300mg dose in 1 hour) until infusion can be initiated. |
| Contraindications | | | | | Hypersensitivity to the drug and amide class anesthetics, hypovolemia, all grades of AV block, severe myocardial depression, sino-atrial disorders. |
| Drug interactions | | | | | Propafenone, phenytoin, beta blockers, H2-antagonist (cimetidine), protease inhibitors, macrolides, local anesthetics, antipsychotics (pimozide, olanzapine, quetiapine, zotepine), 5HT3 antagonists (tropisetron, dolasetron), quinupristin/dalfopristin, suxamethonium. |
| Side effects | | | | | Anxiety, arrhythmias, AV-block, cardiac arrest, circulatory collapse, confusion, dizziness, drowsiness, euphoric mood, headache, hypotension, loss of consciousness, methaemoglobinaemia, muscle twitching, myocardial contractility decreased, nausea, neurological effects, nystagmus, pain, psychosis, respiratory disorders, seizure, sensation abnormal, tinnitus, tremor, vision blurred, vomiting. |
| Cautions | | | | | Acute porphyrias, congestive cardiac failure, post cardiac surgery, acid-base balance disorders, hypoxia, hypokalemia, epilepsy, myasthenia gravis, respiratory depression, hepatic impairment, renal impairment, pregnancy, breast feeding. |
| Storage condition | | | | | Store between 15-30ºC. Protect from freezing. |
| **Metoprolol tartrate** | | | | | |
| Pharmacological class | | | Beta blocker, class II antiarrhythmic | | |
| Dosage form | | | Injection: 1mg/ml,5mg/ml  Tablet: 25mg, 50mg | | |
| Indications | | | Arrhythmias, angina, hypertension, MI (early intervention within 12 hours), migraine prophylaxis, hyperthyroidism (adjunct). | | |
| Dose and administration | | | **Arrhythmias:**  **Adult:** Usual dose 50 mg immediate release tablet 2–3 times a day, then increased if necessary up to 300 mg daily in divided doses or up to 5 mg IV infusion, dose to be given at a rate of 1–2 mg/minute, then up to 5 mg after 5 minutes if required, total dose of 10–15mg. | | |
| Contraindications | | | Refer to metoprolol succinate | | |
| Drug interactions | | | Refer to metoprolol succinate | | |
| Side effects | | | Tiredness, dizziness, depression, shortness of breath, bradycardia, hypotension, diarrhoea, pruritus, constipation, palpitations, postural disorders, chest pain, drowsiness, dystrophic skin lesion, muscle cramps, edema, skin reactions, weight gain, hyperhidrosis, alopecia, dry mouth, eye irritation, gangrene, hepatitis, rhinitis, sexual dysfunction, thrombocytopenia, cardiogenic shock, anxiety. | | |
| Cautions | | | Refer to metoprolol succinate | | |
| Storage condition | | | Store between 15 to 30°C. Protect from heat, light and moisture. | | |
| **Procainamide hydrochloride** | | | | | |
| Pharmacological class | Class IA antiarrhythmic | | | | |
| Dosage form | Injection:100 mg/ml, 500mg/ml | | | | |
| Indications | Severe ventricular arrhythmias, especially those resistant to lidocaine or those appearing after MI, atrial tachycardia, atrial fibrillation; maintenance of sinus rhythm after cardioversion of atrial fibrillation. | | | | |
| Dose and administration | **Ventricular arrhythmias**, slow IV injection**:**  **Adult:** 100 mg at a rate not exceeding 50 mg/minute, with ECG monitoring; may be repeated at 5-minute intervals until arrhythmia controlled; maximum 1 g.  **Ventricular arrhythmias,** IV infusion:  **Adult:** 500–600 mg over 25–30 minutes, with ECG monitoring, followed by a maintenance dose of 2–6 mg/minute; if further antiarrhythmic treatment is required, allow an interval of 3–4 hours after infusion before giving further drug therapy by mouth.  **Atrial arrhythmias**, higher doses may be required. | | | | |
| Contraindications | Hypersensitivity to procainamide, procaine, other ester-type local anesthetics, or any component of the formulation, torsades de pointes, systemic lupus erythematosus, heart block, heart failure, hypotension. | | | | |
| Drug interactions | Other antiarrhythmics, anticholinergics, cimetidine, trimethoprim, neuromuscular blockers like succinylcholine. | | | | |
| Side effects | Nausea, vomiting, diarrhea, anorexia, severe hypotension, ventricular fibrillation, pericarditis, rashes, pruritus, urticaria, flushing, fever, and angioedema, depression, dizziness, and psychosis; blood disorders include leukopenia, hemolytic anemia and agranulocytosis after prolonged treatment; lupus erythematosus-like syndrome. | | | | |
| Cautions | Elderly, renal and hepatic impairment, asthma, pregnancy; breastfeeding, blood dyscrasias, myasthenia gravis. | | | | |
| Storage condition | Store below 30 oC. Protect from light. | | | | |
| **Propranolol hydrochloride** | | | | | |
| Pharmacological class | Non-selective beta blocker, class II antiarrythimic | | | | |
| Dosage form | Tablet:10mg, 20mg, 40mg | | | | |
| Indications | Arrhythmias, thyrotoxicosis, prophylaxis of variceal bleeding in portal hypertension, pheochromocytoma, angina, hypertrophic cardiomyopathy and anxiety tachycardia, anxiety with symptoms such as palpitation, sweating and tremor, prophylaxis after myocardial infarction, essential tremor, migraine prophylaxis. | | | | |
| Dose and administration | **Arrhythmias:**  **Adult:** 10–40 mg 3–4 times a day or 1 mg IV to be given over 1 minute, dose may be repeated if necessary at intervals of 2 minutes, maximum 10 mg per course (5 mg in anesthesia). | | | | |
| Contraindications | Refer to propranolol under medicines for upper gastro-intestinal bleeding. | | | | |
| Drug interactions | Refer to propranolol under medicines for upper gastro-intestinal bleeding. | | | | |
| Side effects | Refer to propranolol under medicines for upper gastro-intestinal bleeding. | | | | |
| Cautions | Refer to propranolol under medicines for upper gastro-intestinal bleeding. | | | | |
| Storage condition | Store between 15 and 30ºC. | | | | |
| **Verapamil hydrochloride** | | | | | |
| Pharmacological class | Non- dihydropyridine calcium-channel blocker, class IV antiarrhythmic | | | | |
| Dosage form | Injection: 2.5mg/ml in 2ml ampoule  Tablet: 40mg, 80mg | | | | |
| Indications | Treatment of supraventricular and paroxysmal arrhythmias, angina, hypertension, prophylaxis of cluster headache. | | | | |
| Dose and administration | **Treatment of supraventricular arrhythmias:**  **Adult**, **oral:** 40–120 mg immediate release 3 times a day**.**  **IV:** 5–10 mg to be given over 2 minutes, preferably with ECG monitoring.  **Elderly**: 5–10 mg, to be given over 3 minutes, preferably with ECG monitoring.  **Paroxysmal tachyarrhythmias:**  **Adult:** Initially 5–10 mg slow IV injection, followed by 5 mg after 5–10 minutes if required, to be given over 2 minutes, preferably with ECG monitoring.  **Elderly:** Initially 5–10 mg, followed by 5 mg after 5–10 minutes if required, to be given over 3 minutes, preferably with ECG monitoring. | | | | |
| Contraindications | Acute porphyria’s, atrial flutter or fibrillation associated with accessory conducting pathways, bradycardia, cardiogenic shock, heart failure, history of significantly impaired left ventricular function, hypotension, second- and third-degree AV block, sick sinus syndrome, sino-atrial block | | | | |
| Drug interactions | Aliskiren, doxorubicin, disopyramide, amiodarone, flecainide, propafenone, phenobarbitone, carbamazepine, phenytoin, azole antifungals, antihistamine, second generation antipsychotics, beta blockers, benzodiazepines, bromocriptine, ergotamine, protease inhibitors, cimetidine, ciclosporin, digoxin, erythromycin, halothane, ketamine, lidocaine, nitrous oxide, methyldopa, lithium, ibuprofen, hydrocortisone, glyceryl trinitrate, amitriptyline, amiloride, enalapril, isosorbide dinitrate, furosemide, chlorpromazine, oral contraceptives, dexamethasone, hydralazine, hydrochlorothiazide, acetylsalicylic acid, grapefruit juice, CYP3A4 inhibitors. | | | | |
| Side effects | Hypotension, atrioventricular block, extrapyramidal symptoms, gynecomastia, allergic reactions including pruritus, urticaria, angioedema, and erythema multiforme, SJS, vertigo, bradycardia, cardiac arrest, hepatic impairment hyperhidrosis, myocardial contractility decreased, nervousness, seizure, abdominal discomfort, alopecia, arrhythmias, arthralgia, constipation, erythromelalgia, fatigue, galactorrhea, heart failure, ileus, muscle weakness, tinnitus, tremor, cardiac arrest, hepatic impairment, myocardial contractility reduced, seizure. | | | | |
| Cautions | Acute phase of MI, first degree AV block, neuromuscular disorders, hepatic impairment, renal impairment, pregnancy, breastfeeding. | | | | |
| Storage condition | Store between 15 ºC and 30 ºC. Protect from light. | | | | |

## Antihypertensive medicines

Antihypertensives are a class of [drugs](https://en.wikipedia.org/wiki/Medication) that are used to treat [hypertension](https://en.wikipedia.org/wiki/Hypertension). The fundamental goal of the treatment is for the prevention of the important [endpoints](https://en.wikipedia.org/wiki/Clinical_endpoint) of hypertension, such as heart attack, stroke and heart failure. There are many classes of antihypertensives, which lower blood pressure by different means. Among the most important and most widely used first line medications are [thiazide diuretics](https://en.wikipedia.org/wiki/Thiazide_diuretic), [calcium channel blockers](https://en.wikipedia.org/wiki/Calcium_channel_blocker), angiotensin converting enzyme ([ACE) inhibitors](https://en.wikipedia.org/wiki/ACE_inhibitor), angiotensin II receptor blockers (ARBs), and [beta blockers](https://en.wikipedia.org/wiki/Beta_blocker). A monotherapy condition-specific recommendation should be initiated first, titrated to the optimum or maximum tolerated dose at each step of treatment along with support and discussions around adherence throughout treatment.

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| **Amlodipine** | |
| Pharmacological class | calcium channel blocker |
| Dosage form | Tablet: 2.5mg, 5mg and 10mg |
| Indications | Hypertension, symptomatic chronic stable angina, vasospastic (Prinzmetal's) angina (confirmed or suspected) |
| Dose and administration | **Hypertension:**  **Adult**: oral: Initially 5 mg once daily, increased if necessary; maximum 10 mg once daily;  **Elderly, hepatic or renal impairment:** Initial dose 2.5 mg twice daily (1.25 mg twice daily increased if necessary after 3 - 4 weeks.  **Child** **1month–11 years**: Initially 100–200 mcg/ kg once daily, increased if necessary up to 400 mcg/kg once daily, adjusted at intervals of 1–2 weeks; maximum 10 mg per day.  **Child 12 years and over:** Give adult dose.  **Angina**, oral**:**  **Adult:** Initially, 5 mg once daily, increased if necessary; maximum 10 mg once daily. |
| Contraindications | Hypersensitivity to the drug, severe hypotension, cardiogenic shock, unstable angina, significant aortic stenosis, hemodynamically unstable heart failure after acute MI (during the first 28 days). |
| Drug interactions | Phenobarbitone, carbamazepine, phenytoin, azole antifungals, ritonavir, acetazolamide, alcohol, amiloride, atenolol, chlorpromazine, furosemide, glyceryl trinitrate, ibuprofen, enalapril, hydralazine, spironolactone, ketamine, oestrogens, CYP3A4 inhibitors (e.g., clarithromycin, erythromycin), CYP3A4 inducers (rifampin), IV magnesium, grape fruit juice. |
| Side effects | Asthenia, constipation, diarrhea, dyspepsia, dyspnoea, gastrointestinal disorders, joint disorders, muscle cramps, edema, vision, disorders, alopecia, anxiety, arrhythmias, chest pain, cough, dry mouth, gynecomastia, hyperhidrosis, hypotension, insomnia, malaise, mood altered, numbness, pain, rhinitis, tinnitus, tremor, weight changes. |
| Cautions | Congestive heart failure, elderly, hepatic impairment, pregnancy, breastfeeding*.* |
| Storage condition | Store below 30 oC. Protect from light. |
| **Bisoprolol** | |
| Pharmacological class | Beta blocker |
| Dosage form | Tablet: 2.5mg, 5mg and 10mg |
| Indications | Hypertension, angina, heart failure |
| Dose and administration | **Hypertension:**  **Adult:** Initially 5 mg once daily, usual maintenance 10 mg once daily; increased if necessary up to 20 mg once daily. |
| Contraindications | Refer to bisoprolol under medicines for heart failure. |
| Drug interactions | Refer to bisoprolol under medicines for heart failure. |
| Side effects | Refer to bisoprolol under medicines for heart failure. |
| Cautions | Refer to bisoprolol under medicines for heart failure. |
| Storage condition | Store between 15 and 30ºC. |
| **Candesartan** | |
| Pharmacological class | Angiotensin-II receptor antagonist |
| Dosage form | Tablet: 4 mg, 8 mg and 16 mg |
| Indications | Hypertension, hypertension with intravascular volume depletion, heart failure with left ventricular dysfunction when ACE inhibitors are not tolerated. |
| Dose and administration | **Hypertension:**  **Adult:** Initially 8 mg oral once daily, increased if necessary up to 32 mg once daily, dose to be increased at intervals of 4 weeks; usual dose 8 mg once daily  **Hypertension with intravascular volume depletion:**  **Adult:** Initially 4 mg oral once daily, increased if necessary up to 32 mg once daily, dose to be increased at intervals of 4 weeks; usual dose 8 mg once daily**.** |
| Contraindications | Refer to candesartan under medicines for heart failure. |
| Drug interactions | Refer to candesartan under medicines for heart failure. |
| Side effects | Refer to candesartan under medicines for heart failure. |
| Cautions | Refer to candesartan under medicines for heart failure. |
| Storage condition | Store below 30°C. |
| **Captopril** | |
| Pharmacological class | ACE inhibitor |
| Dosage form | Tablet: 12.5 mg |
| Indications | Hypertension, congestive heart failure, left ventricular dysfunction after MI, diabetic nephropathy. |
| Dose and administration | **Hypertension**  **Adult**: Initially 12.5–25 mg twice daily, then increased if necessary up to 150 mg daily in 2 divided doses, doses to be increased at intervals of at least 2 weeks, once-daily dosing may be appropriate if other concomitant antihypertensive drugs taken  **Elderly**: Initially 6.25 mg twice daily, then increased if necessary up to 150 mg daily in 2 divided doses, doses to be increased at intervals of at least 2 weeks, once daily dosing may be appropriate if other concomitant antihypertensive drugs taken  **Infants:** Initial, 0.15-0.3 mg/kg/dose; titrate dose upward to maximum of 6 mg/kg/day in 1-4 divided doses  **Child***:* Initial, 0.3-0.5 mg/kg/dose; titrate upward to maximum of 6 mg/kg/day in 2-4 divided doses  **Older Child***:* Initial, 6.25-12.5 mg/dose every 12-24 hours; titrate upward to maximum of 6 mg/kg/day.  **Essential hypertension if used in volume depletion, cardiac decompensation, or renovascular hypertension:**  **Adult:** Initially 6.25–12.5 mg for 1 dose (under close medical supervision), then 6.25–12.5 mg twice daily; increased if necessary up to 100 mg daily in 1–2 divided doses, doses to be increased at intervals of at least 2 weeks, once-daily dosing may be appropriate if other concomitant antihypertensive drugs taken. |
| Contraindications | Refer captopril under medicines for heart failure. |
| Drug interactions | Refer captopril under medicines for heart failure. |
| Side effects | Refer captopril under medicines for heart failure. |
| Cautions | Refer captopril under medicines for heart failure. |
| Storage condition | Store below 30ºC. Protect from moisture. |
| **Carvedilol** | |
| Pharmacological class | Alpha- and beta-adrenoceptor blocker |
| Dosage form | Tablet: 3.125mg, 6.25mg, 12.5 mg, 25 mg |
| Indications | Hypertension, angina, symptomatic chronic heart failure (adjunct to diuretics, digoxin, or ACE inhibitors). |
| Dose and administration | **Hypertension**, oral:  **Adult:** Initially 12.5 mg once daily; increased after 2 days to 25 mg once daily; may be increased at intervals of at least 2 weeks up to a maximum of 50mg/day in single or divided doses.  **Elderly:** 12.5mg once daily, titrated at intervals of at least 2 weeks up to 25mg/day. |
| Contraindications | Refer to carvedilol under medicines for heart failure. |
| Drug interactions | Refer to carvedilol under medicines for heart failure. |
| Side effects | Refer to carvedilol under medicines for heart failure. |
| Cautions | Refer to carvedilol under medicines for heart failure. |
| Storage condition | Store at between 15º and 30ºC. Protect from moisture. |
| **Enalapril Maleate** | |
| Pharmacological class | ACE inhibitor |
| Dosage form | Tablet: 2.5 mg, 5 mg, 10 mg  Oral liquid: 1 mg/ml (as hydrogen maleate) |
| Indications | Hypertension, congestive heart failure, left ventricular dysfunction after MI, diabetic nephropathy. |
| Dose and administration | **Hypertension:**  **Adult:** Initially 5 mg oral once daily, lower initial doses maybe required when used in addition to diuretic or in renal impairment; maintenance 20 mg once daily; maximum 40 mg per day.  **Pediatric, oral:**  **Neonate:** Initially 10 mcg/kg once daily, increased as necessary up to 500 mcg/kg daily in 1–3 divided doses; monitor blood pressure and urine output carefully for at least 2 hours following first dose and during dose escalation until blood pressure is stable.  **Child 1 month–11 years (under expert supervision):** Initially 100 mcg/kg once daily, monitor blood pressure carefully for 1–2 hours, then increase if necessary up to 1 mg/kg daily in 1–2 divided doses.  **Child 12–17 years (under expert supervision) (body weight up to 50 kg):** Initially 2.5 mg once daily, monitor blood pressure carefully for 1–2 hours, maintenance 10–20 mg daily in 1–2 divided doses.  **Child 12–17 years (under expert supervision) (body weight 50 kg and above):** Initially 2.5 mg once daily, monitor blood pressure carefully for 1–2 hours, maintenance 10–20 mg daily in 1–2 divided doses, maximum 40 mg. |
| Contraindications | Refer to enalapril under medicines for heart failure. |
| Drug interactions | Refer to enalapril under medicines for heart failure. |
| Side effects | Refer to enalapril under medicines for heart failure. |
| Cautions | Refer to enalapril under medicines for heart failure. |
| Storage condition | Store between 15°C - 30°C. Protect from heat and light. |
| **Hydralazine hydrochloride** | |
| Pharmacological class | Vasodillator |
| Dosage form | Injection: 20mg/ml in 1ml ampoule |
| Indications | Hypertensive emergency, moderate to severe hypertension (adjunct), heart failure (with long acting nitrate). |
| Dose and administration | **Moderate to severe hypertension (adjunct), oral:**  **Adult:** Initially 25 mg twice daily, increased if necessary up to 50 mg twice daily.  **Hypertensive emergencies (including during pregnancy), hypertension with renal complications:**  **Adult:**  **IV infusion:** Initially 200–300 mcg/minute; usual maintenance 50–150 mcg/minute.  **Slow IV injection**: 5–10 mg, to be diluted with 10 ml sodium chloride 0.9%; dose may be repeated after 20–30 minutes. |
| Contraindications | Idiopathic systemic lupus erytherematous, severe tachycardia, high output heart failure, myocardial insufficiency due to mechanical obstruction, cor pulmonale, dissecting aortic aneurysm, porphyria. |
| Drug interactions | Acetazolamide, alcohol, amiloride, amlodipine, atenolol, chlorpromazine, oestrogens, dexamethasone, diazepam, enalapril, fluphenazine, furosemide, glyceryl trinitrate, halothane, hydrochlorothiazide, ibuprofen, isosorbide dinitrate, ketamine, levodopa, methyldopa, nifedipine, nitrous oxide, prednisolone, propranolol, sodium nitroprusside, spironolactone, thiopental, timolol, verapamil. |
| Side effects | Angina pectoris, diarrhea, dizziness, flushing, GI disorders, headache, hypotension, joint disorders, lupus-like syndrome, myalgia, nasal congestion, nausea, palpitations, tachycardia, vomiting, fluid retention, dizziness, flushing. |
| Cautions | Cerebrovascular disease, coronary artery disease, hepatic impairment, renal impairment, pregnancy and breastfeeding. |
| Storage condition | Store between 15 and 30°C. Protect from heat and light. |

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| **Hydrochlorothiazide** | |
| Pharmacological class | Thiazide diuretic |
| Dosage form | Oral liquid: 50 mg/5ml  Tablet: 25mg |
| Indications | Hypertension, edema associated to heart failure, nephrogenic diabetes insipidus. |
| Dose and administration | **Hypertension,** oral:  **Adult:** 12.5, 25 mg daily.  **Elderly:** initially 12.5 mg daily, increased to 25–50 mg daily if necessary.  **Child all ages:** Initially 1 mg/kg once daily; may increase to a maximum 3 mg/kg daily (maximum 50 mg daily). |
| Contraindications | Refer to hydrochlorothiazide under medicines for heart failure. |
| Drug interactions | Refer to hydrochlorothiazide under medicines for heart failure. |
| Side effects | Refer to hydrochlorothiazide under medicines for heart failure. |
| Cautions | Refer to hydrochlorothiazide under medicines for heart failure. |
| Storage condition | Store between 15°C to 30°C. Protect from heat and light. |

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| **Labetalol hydrochloride** | |
| Pharmacological class | Alpha- and beta-adrenoceptor blocker |
| Dosage form | Injection: 5mg/ml, 100mg/20ml |
| Indications | Hypertension, hypertension of pregnancy, hypertension following myocardial infarction, hypertensive emergencies. |
| Dose and administration | **Hypertension,** IV injection***:***  **Adult**: 50 mg, dose to be given over at least 1 minute, then 50 mg after 5 minutes if required; maximum 200 mg per course;  **Hypertension,** IV Infusion:  **Adult:** Initially 2 mg/minute until a satisfactory response is achieved, then discontinue; usual dose 50–200 mg.  **Hypertension of pregnancy:**  **Adult:** Initially 20 mg/hour IV infusion, then increased if necessary to 40 mg/hour after 30 minutes, then increased if necessary to 80 mg/hour after 30 minutes, then increased if necessary to 160 mg/hour after 30 minutes, adjusted according to response; usual maximum 160 mg/hour.  **Hypertension following MI,** IV infusion**:**  **Adult:** 15 mg/hour, then increased to up to 120 mg/hour, dose to be increased gradually.  **Hypertensive emergencies,** IV injection**:**  **Adult:** 50 mg IV, to be given over at least 1 minute, then 50 mg every 5 minutes if required until a satisfactory response occurs; maximum 200 mg per course;  **IV infusion:**  **Adult:** Initially 2 mg/minute until a satisfactory response is achieved, then discontinue; usual dose 50–200 mg.  *Note:* *For IV infusion, give intermittently in 5% dextrose in water or sodium chloride and glucose. Dilute to a concentration of 1 mg/ml; suggested volume 200 ml; adjust rate with inline burette. Avoid upright position during and for 3 hours after IV administration.* |
| Contraindications | Hypersensitivity to the drug, refractory heart failure, sick sinus syndrome (including sino-atrial block), second- or third-degree heart block, Prinzmetal’s angina, history of wheezing or asthma, untreated pheochromocytoma, metabolic acidosis, bradycardia, hypotension, severe peripheral circulatory disturbances, acute MI. |
| Drug interactions | Propafenone, phenobarbitone, diuretics, halothane, class I antiarrhythmic agents, verapamil, tricyclic antidepressants. |
| Side effects | Fever, ejaculation failure, hypersensitivity, urinary disorders, hepatic disorders, systemic lupus erythematosus, myopathy, tremor, cyanosis, hyperkalaemia, interstitial lung, lichenoid keratosis, muscle cramps, nasal congestion, peripheral edema, photosensitivity reaction, postural hypotension, psychosis. |
| Cautions | Peripheral circulatory disorders (Raynaud’s disease or syndrome, intermittent claudication), pulse rate of 50 – 55 bpm, first degree heart block, psoriasis, hepatic impairment, renal impairment. |
| Storage condition | Store between 15°C - 30°C. Protect from light. |
| **Lisinopril** | |
| Pharmacological class | ACE inhibitor |
| Dosage form | Tablet: 10 mg, 20 mg |
| Indications | Hypertension, congestive heart failure, left ventricular dysfunction after MI, diabetic nephropathy. |
| Dose and administration | **Hypertension, oral:**  **Adult**: Initially 10 mg once daily; usual maintenance 20 mg once daily; maximum 80 mg per day.  **Hypertension, when used in addition to diuretic, in cardiac decompensation or in volume depletion, oral**:  **Adult:** Initially 2.5–5 mg once daily; usual maintenance 20 mg per daily; maximum 80 mg per day. |
| Contraindications | Refer to lisinopril under medicines for heart failure. |
| Drug interactions | Refer to lisinopril under medicines for heart failure. |
| Side effects | Refer to lisinopril under medicines for heart failure. |
| Cautions | Refer to lisinopril under medicines for heart failure. |
| Storage condition | Store between 15°C - 30°C. Protect from light. |
| **Lisinopril + Amlodipine** | |
| Pharmacological class | ACE inhibitor + dihydropyridine calcium channel blocker |
| Dosage form | Fixed dose combination tablet: 10 mg + 5 mg, 20 mg + 5 mg, 20 mg + 10 mg. |
| Indications | Hypertension not controlled by monotherapy, and patients stabilized on the individual components in the same proportions. |
| Dose and administration | **Hypertension not controlled by monotherapy,** oral**:**  **Adult:** One tablet of the fixed dose combination daily. |
| Contraindications | Refer to individual monograph. |
| Drug interactions | Refer to individual monograph. |
| Side effects | Refer to individual monograph. |
| Cautions | Symptomatic hypotension, aortic and mitral stenosis, obstructive hypertrophic cardiomyopathy, renal impairmnet, hepatic impairment.  *Note: Refer individual product literature for detail.* |
| Storage condition | Store below 30 oC. |
| **Lisinopril + Hydrochlorothiazide** | |
| Pharmacological class | ACE inhibitor + thiazide diuretic |
| Dosage form | Fixed dose combination tablet: 10 mg + 12.5 mg; 20 mg + 12.5 mg; 20 mg + 25 mg. |
| Indications | Hypertension not controlled by monotherapy, and patients stabilized on the individual components in the same proportions. |
| Dose and administration | **Hypertension:**  **Adult:** 20mg/12.5mg tablet once a day; in general, if the desired therapeutic effect cannot be achieved in 2 to 4 weeks at this dose level, the dose can be increased to 40mg/25mg administered once daily. |
| Contraindications | Hypersensitivity to the drug or any sulphonamide-derived drugs or any other ACEI, concomitant use with sacubitril/ valsartan therapy., history of angioedema, pregnancy, severe renal impairment (CrCl < 30 ml/min), anuria, severe hepatic impairment. |
| Drug interactions | Refer to individual monograph. |
| Side effects | Refer to individual monograph. |
| Cautions | Refer to individual monograph. |
| Storage condition | Store below 30 oC. |
| **Losartan** | |
| Pharmacological class | Angiotensin-II receptor antagonist |
| Dosage form | Tablet: 25 mg, 50mg and 100 mg |
| Indications | Hypertension, heart failure, MI with left ventricular dysfunction |
| Dose and administration | **Hypertension** (including **reduction of stroke risk in hypertension with left ventricular hypertrophy**):  **Adult (18–75** **years)**: Initially 50 mg oral once daily for several weeks, then increased if necessary to 100 mg once daily.  **Elderly (76 years and over)**: Initially 25 mg oral once daily for several weeks, then increased if necessary to 100 mg once daily.  **Hypertension with intravascular volume depletion:**  **Adult**: Initially 25 mg oral once daily for several weeks, then increased if necessary up to 100 mg once daily |
| Contraindications | Refer to losartan under medicines for heart failure. |
| Drug interactions | Refer to losartan under medicines for heart failure. |
| Side effects | Refer to losartan under medicines for heart failure. |
| Cautions | Refer to losartan under medicines for heart failure. |
| Storage condition | Store at between 15 to 30°C. |
| **Methyldopa** | |
| Pharmacological class | Centrally acting antihypertensive agent |
| Dosage form | Tablet: 250 mg |
| Indications | Hypertension during pregnancy |
| Dose and administration | **Adult:** Initially 250 mg 2–3 times daily, gradually increased at intervals of 2 or more days, if necessary; maximum 3 g daily. |
| Contraindications | Depression, active liver disease, pheochromocytoma, porphyria, paraganglioma. |
| Drug interactions | Entacapone, oral iron, vasopressin, irreversible monoamine oxidase (MAO) inhibitors, lithium, other antihypertensive medicines, sympathomimetics, phenothiazines, TCAs. |
| Side effects | Abdominal distension, amenorrhea, angina pectoris, angioedema, arthralgia, asthenia, bone marrow failure, bradycardia, breast enlargement, cardiac inflammation, cognitive impairment, constipation, depression, diarrhea, dizziness, dry mouth, eosinophilia, facial paralysis, fever, gynecomastia, hemolytic anemia, headache, hepatic disorders, hyperprolactinemia, leucopenia, lupus-like syndrome, myalgia, nasal congestion, nausea, nightmare, pancreatitis, paraesthesia, parkinsonism, postural hypotension, psychiatric disorder, psychosis, sedation, sexual dysfunction, tongue discoloration, toxic epidermal necrolysis, vomiting. |
| Cautions | Elderly, history of depression, hepatic impairment, renal impairment, increased sensitivity to hypotensive and sedative effects. |
| Storage condition | Store between 15oC and 30 oC. |
| **Metoprolol succinate** | |
| Pharmacological class | Selective beta blocker |
| Dosage form | Tablet: 25mg, 50mg,100mg |
| Indications | Hypertension, heart failure, angina pectoris, arrhythmia particularly supraventricular tachycardia, prevention of cardiac death and re-infarction after the acute phase of myocardial infarction and prophylaxis of migraine. |
| Dose and administration | **Hypertension:** Initially 100 mg daily, increased if necessary to 200 mg daily in 1–2 divided doses, high doses are rarely required. |
| Contraindications | Refer to metoprolol succinate under medicines for heart failure. |
| Drug interactions | Refer to metoprolol succinate under medicines for heart failure. |
| Side effects | Refer to metoprolol succinate under medicines for heart failure. |
| Cautions | Refer to metoprolol succinate under medicines for heart failure. |
| Storage condition | Store between 15 °C and 30 °C. Protect from light and moisture. |
| **Nifedipine** | |
| Pharmacological class | Dihydropyridine calcium channel blocker |
| Dosage form | Sustain release tablet: 10mg and 20mg. |
| Indications | Hypertension, angina prophylaxis, Raynaud’s phenomenon. |
| Dose and administration | **Hypertension**;  **Adult:** Initially 10 mg twice daily, increased if necessary up to 40 mg twice daily**.** |
| Contraindications | Acute attacks of angina, cardiogenic shock, significant aortic stenosis, unstable angina, within 1 month of MI. |
| Drug interactions | Digoxin, grapefruit juice, magnesium (parenteral), propranolol, rifampicin, phenytoin, phenobarbital, atenolol, alcohol, carbamazepine, ciclosporin, enalapril, haloperidol, hydrocortisone, ibuprofen, insulins, furosemide, glyceryl trinitrate, hydralazine, halothane, ketamine, estrogens, diazepam, chlorpromazine. |
| Side effects | Constipation, malaise, edema, vasodilation, anxiety, chills, diarrhea, dry mouth, epistaxis, gastrointestinal discomfort, hypotension, laryngealedema, migraine, nasal congestion, pain, sleep disorders, tremor, urinary disorders, vertigo, vision disorders. |
| Cautions | Diabetes mellitus, elderly, heart failure, ischemic pain, poor cardiac reserve, severe hypotension, significantly impaired left ventricular function, hepatic impairment, renal impairment, pregnancy, breastfeeding. |
| Storage condition | Store between 15°C and 30°C. Protect from light and moisture. |
| **Valsartan** | |
| Pharmacological class | Angiotensin-II receptor antagonist |
| Dosage form | Tablet: 40 mg, 80mg and 160 mg |
| Indications | Hypertension, heart failure, MI with left ventricular dysfunction |
| Dose and administration | **Hypertension alone or with intravascular volume depletion,** oral: **Adult**: Initially 80 mg once daily, increased if necessary up to 320 mg daily, doses to be increased at intervals of 4 weeks. |
| Contraindications | Refer valsartan under medicines for heart failure. |
| Drug interactions | Refer valsartan under medicines for heart failure. |
| Side effects | Refer valsartan under medicines for heart failure. |
| Cautions | Refer valsartan under medicines for heart failure. |
| Storage condition | Store between 15°C and 30°C. Protect from heat and moisture. |

## Diuretics

Diuretics are class of drugs that increase the rate of urine flow and sodium excretion and are used to adjust the volume and/or composition of body fluids in a variety of clinical situations, including hypertension, heart failure, renal failure, nephrotic syndrome, and cirrhosis. They provide very effective symptomatic control in patients with peripheral or pulmonary edema and rapidly relieve dyspnea in patients with heart failure. Loop diuretics such as furosemide, bumetanide, or torasemide are usually the diuretics of choice. Thiazide diuretics may only be of benefit in patients with mild fluid retention and an eGFR >30 ml/minute/1.73 m2. Combination diuretic therapy may be effective in patients with edema resistant to treatment with one diuretic alone.

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| **Furosemide** | |
| Pharmacological class | Loop diuretic |
| Dosage form | Tablet:40 mg, 80mg  Injection:10 mg/ml in 2 ml ampoule  Oral liquid: 20mg/5ml |
| Indications | Edema of cardiac, hepatic or renal origin, oliguria due to renal failure, mild to moderate hypertension, as adjunct in the treatment of hypertensive crisis and for the treatment of hypercalcemia. |
| Dose and Administration | **Acute pulmonary edema,** slow IV infusion:  **Adult**: 20–50 mg, increased incrementally in 20-mg steps every 2 hours, if necessary; if the effective single dose is more than 50 mg, consider using slow IV infusion at a rate not exceeding 4 mg/min  **Child:** 0.5 to1.5 mg/kg body weight daily (maximum 20 mg daily).  **Oliguria (glomerular filtration rate <20 ml/min),** slow IV (rate not exceeding 4 mg/min)*:*  **Adult:** Initially 250 mg over 1 hour; if urine output is not satisfactory, during the hour after the first dose, infuse 500 mg over 2 hours then, if there is no satisfactory response during the hour after the second dose, infuse 1 g over 4 hours; if there is no response after the third dose, dialysis is probably necessary; effective dose (up to 1 g) can be repeated every 24 hours.  **Resistant hypertension,** oral:  **Adult:** 40–80 mg daily  **Initially by IM injection or slow IV injection or IV infusion, Adult**: Initially 20–50 mg, then increased in steps of 20 mg every 2 hours if required, doses greater than 50 mg given by IVinfusion only; maximum 1.5 g per day.  **Hypertensive crisis in patients with normal renal function**, IV injection:  **Adult:** 40 to 80mg.  **Hypertensive crisis accompanied by pulmonary edema or acute renal failure,** IV injection:  **Adult:** 100-200 mg.  **Antihypercalcemic,** oral:  **Adult:** 120mg a day a single dose or divided into two or three doses; IM or IV:80-100mg in severe cases, the dosage being repeated, if necessary, every one to two hours until the desired response is obtained. In less severe cases smaller doses may be given every two or four hours.  **Child**: IM or IV: 25 to 50mg, the dosage being repeated, if necessary, every four hours until the desired response is obtained.  *Note:* r*efer dosing for other indications under respective section* |
| Contraindications | Refer to furosemide under medicines for heart failure. |
| Drug interactions | Refer to furosemide under medicines for heart failure. |
| Side effects | Refer to furosemide under medicines for heart failure. |
| Cautions | Refer to furosemide under medicines for heart failure. |
| Storage condition | Store below 30C0. Protect from freezing and light. |
| **Hydrochlorothiazide** | |
| Pharmacological class | Thiazide diuretic |
| Dosage form | Oral liquid: 50 mg/5ml  Tablet: 25mg |
| Indications | Hypertension, edema, heart failure, nephrogenic diabetes insipidus |
| Dose and Administration | **Edema, oral:**  **Adult:** Initially 25 mg daily on rising, increased to 50 mg daily if necessary.  **Elderly***:* Initially 12.5 mg daily on rising.  **Infant under 6 months:** 2 to 3.3 mg/kg daily in two divided doses; maximum dose 37.5 mg daily.  **Child over 6 months:** 2 mg/kg daily in two divided doses; maximum dose 200 mg daily.  **Severe edema in patients unable to tolerate loop diuretics,** oral*:* **Adult:** Up to 100 mg either daily or on alternate days; maximum 100 mg daily.  **Nephrogenic diabetes insipidus,** oral*:* Initially up to 100 mg daily  *Note:**dosing for hypertension and heart failure is indicated in the respective sections.* |
| Contraindications | Refer to hydrochlorothiazide under medicines for heart failure. |
| Drug interactions | Refer to Hydrochlorothiazide under medicines for heart failure. |
| Side effects | Refer to Hydrochlorothiazide under medicines for heart failure. |
| Cautions | Refer to Hydrochlorothiazide under medicines for heart failure. |
| Storage condition | Store between15°C to 30°C. Protect from heat and light. |
| **Mannitol** | |
| Pharmacological class | Osmotic diuretic |
| Dosage form | Injection: 10%, 20% |
| Indications | Cerebral edema, raised intraocular pressure, assessment of renal function test. |
| Dose and Administration | **Cerebral oedema,** IV infusion:  **Adult**: 0.25–2 g/kg, repeated if necessary, to be administered over 30-60 minutes, dose may be repeated 1–2 times after 4–8 hours  **Infant or child 1 month to 12 years:** 0.25–1.5 g/kg given over 30 to 60 minutes, repeated if necessary 1 to 2 times after 4 to 8 hours  **Raised intra-ocular pressure,** IV infusion:  **Adult**: 0.25–2 g/kg, repeated if necessary, to be administered over 30–60 minutes, dose may be repeated 1–2 times after 4–8 hours  **Infant or child 1 month to 12 years:** 0.25–1.5 g/kg given  over 30 to 60 minutes, repeated if necessary 1 to 2 times after 4 to 8 hours  **Assessment of renal function, test dose (if patient is oliguric or if renal function is inadequate),** IV infusion:  **Adult**: As a 20% solution infused over 3–5 minutes, 200 mg/ kg; repeat test dose if urine output is <30–50 ml/hour; if response is inadequate after a second test dose, reevaluate the patient  **Child all ages:** 200 mg/kg (maximum dose 12.5 g) given over 3 to 5 minutes to produce urine flow of at least 1 ml/kg/hour for 1–3 hours  *Note:**Solutions containing more than 15% may crystallize during storage, crystals must be redissolved by warming solution before use and solution must not be used if any crystals remain, IV administration sets must have a filter, mannitol should not be administered with whole blood or passed through the same*  *transfusion set as blood.* |
| Contraindications | Anuria, intracranial bleeding, severe cardiac failure. severe dehydration, severe pulmonary oedema. |
| Drug interactions | Lithium |
| Side effects | Fluid and electrolyte imbalance, circulatory overload, acidosis, dry mouth, thirst, nausea, vomiting, oedema, raised intracranial pressure, arrhythmia, hypotension, pulmonary oedema, chest pain, headache, seizures, dizziness, chills, fever. |
| Cautions | Extravasation causes inflammation and thrombophlebitis, hepatic impairment |
| Storage condition | Store between 15°C to 30°C. |

## Medicines used for angina/Ischemic heart disease

Antianginal medicines are used to treat angina pectoris, a symptom of ischaemic heart disease. These drugs help in relieving or preventing conditions associated with coronary insufficiency and related ischemic heart diseases by reducing the heart's need for oxygen or increasing oxygen supply. The main drugs used for myocardial ischema therapy and for relieving pain in angina pectoris are nitrates and nitrites, such as [nitroglycerin](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/glyceryl-trinitrate), [isosorbide](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/isosorbide) dinitrate, and [pentaerythritol](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/pentaerythritol) tetranitrate, which help in lowering systemic venous and arterial pressure. Also substances that suppress adrenergic systems of the heart such as β-adrenoblockers and calcium [channel blockers](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/channel-blocker) are also used for this purpose. Acute attacks of stable angina should be managed with sublingual glyceryl trinitrate. For long-term prevention of chest pain in patients with stable angina, a beta-blocker should be given as first line therapy. A rate-limiting calcium-channel blocker (such as verapamil hydrochloride or diltiazem hydrochloride should be considered as an alternative if betablockers are contra-indicated.

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| **Atenolol** | | | |
| Pharmacological class | | | Selective beta-blocker |
| Dosage form | | | Tablet: 25mg, 50mg, 100mg |
| Indications | | | Angina, hypertension, arrythmia, early intervention within 12 hours of myocardial infarction. |
| Dose and administration | | | **Angina, Adult:** 100 mg daily in 1–2 divided doses. |
| Contraindications | | | Hypersensitivity to the drug, bradycardia, second- and third-degree A-V block, sick sinus syndrome, right ventricular failure secondary to pulmonary hypertension, uncontrolled heart failure, cardiogenic shock, hypotension, severe peripheral arterial disorders, pheochromocytoma in the absence of alpha-blockade, metabolic acidosis. |
| Drug interactions | | | Clonidine, reserpine, guanethidine, class I anti-arrhythmic drugs (disopyramide), calcium channel blockers, NSAIDs, anaesthetics, digoxin. |
| Side effects | | | Gastrointestinal disorder, alopecia, dry mouth, hepatic disorders, mood altered, postural hypotension, psychosis, skin reactions, thrombocytopenia, hypersensitivity, lupus-like syndrome. |
| Cautions | | | Bronchospastic disorders, first degree heart block, peripheral arterial circulatory disorders, diabetes and patients subject to hypoglycemia, impaired renal function, breastfeeding. |
| Storage condition | | | Store between 15oC-30 oC. Protect from light and moisture. |
| **Carvedilol** | | | |
| Pharmacological class | Alpha- and beta-adrenoceptor blocker | | |
| Dosage form | Tablet: 3.125mg, 6.25mg, 12.5 mg, 25 mg | | |
| Indications | Angina, hypertension, symptomatic chronic heart failure (adjunct to diuretics, digoxin, or ACE inhibitors). | | |
| Dose and administration | **Angina:**  **Adult:** Initially 12.5 mg twice daily for 2 days, then increased to 25 mg twice daily. | | |
| Contraindications | Refer to carvedilol under medicines for heart failure. | | |
| Drug interactions | Refer to carvedilol under medicines for heart failure. | | |
| Side effects | Refer to carvedilol under medicines for heart failure. | | |
| Cautions | Refer to carvedilol under medicines for heart failure. | | |
| Storage condition | Refer to carvedilol under medicines for heart failure. | | |
| **Glyceryl Trinitrate (Nitroglycerine)\*** | | | |
| Pharmacological class | Vasodillator | | |
| Dosage form | Tablet (sublingual): 0.3mg, 0.5mg  Tablet (Sustained release): 2.5mg  Spray: 400mcg/spray  Injection: 1mg/ml, 5mg/ml. | | |
| Indications | Unresponsive congestive heart failure, refractory unstable angina pectoris and coronary insufficiency, hypertensive episodes and/or myocardial ischaemia during and after cardiac surgery, induction of controlled hypotension for surgery. | | |
| Dose and administration | **Prophylaxis of angina by sublingual administration using sublingual tablets**:  **Adult**: 1 tablet, to be administered prior to activity likely to cause angina.  **Prophylaxis of angina by sublingual administration using aerosol spray:**  **Adult:** 400–800 mcg, to be administered under the tongue and then close mouth prior to activity likely to cause angina  **Treatment of angina by sublingual administration using sublingual tablets:**  **Adult**: 1 tablet, dose may be repeated at 5minute intervals if required; seek urgent medical attention if symptoms have not resolved 5 minutes after the second dose, or earlier if the pain is intensifying or the person is unwell  **Treatment of angina by sublingual administration using aerosol spray:**  **Adult**: 400–800 mcg, to be administered under the tongue and then close mouth, dose may be repeated at 5-minute intervals if required; seek urgent medical attention if symptoms have not resolved 5 minutes after the second dose, or earlier if the pain is intensifying or the person is unwell. | | |
| Contraindications | Hypersensitivity to nitrates, hypotension, hypovolaemia, hypertrophic obstructive cardiomyopathy, aortic stenosis, cardiac tamponade, constrictive pericarditis, mitral stenosis, marked anaemia, head trauma, increased intracranial pressure, cerebral haemorrhage, angle-closure glaucoma, concomitant use with phosphodiesterase 5 inhibitors. | | |
| Drug interactions | Acetylcysteine, phosphodiesterase type 5 inhibitors (e.g., sildenafil, tadalafil), agents with hypotensive effects (e.g., vasodilators, antihypertensives, beta-blockers, CCBs and neuroleptics), TCAs, alcohol, ergot alkaloids, antimuscarinics, dapsone, prilocaine. | | |
| Side effects | Throbbing headache, vertigo, dizziness, flushing, postural hypotension, tachycardia, paradoxical bradycardia, local burning or tingling sensation under the tongue. | | |
| Cautions | Hypothyroidism, malnutrition, hypothermia, recent history of MI, cerebrovascular disease, patients with lung disease or cor-pulmonale, hepatic impairment, renal impairment, pregnancy and breastfeeding. | | |
| Storage condition | Store between 15-30°C. Protect from light. | | |
| **Isosorbide dinitrate** | | | |
| Pharmacological class | Vasodillator | | |
| Dosage form | Tablet: 20 mg  Tablet (Sublingual): 5mg | | |
| Indications | Prophylaxis and treatment of angina, left ventricular failure/congestive cardiac failure. | | |
| Dose and administration | **Prophylaxis and treatment of angina:**  **Oral tablet (prophylaxsis and treatment)**: 20–120 mg daily in 2-3 divided doses (8-12 hourly).  **Sublingual tablet (prophylaxis)**: 2.5-5 mg 15 minutes before performing activities likely to cause angina.  **Sublingual tablet (treatment)**: 2.5-5 mg; may be repeated every 5-10 minutes; not to exceed 3 doses in 15-30 minutes. | | |
| Contraindications | Refer to glyceryl trinitrate. | | |
| Drug interactions | Refer to glyceryl trinitrate. | | |
| Side effects | Refer to glyceryl trinitrate. | | |
| Cautions | Refer to glyceryl trinitrate. | | |
| Storage condition | Store between 15-30°C. Protect from moisture. | | |
| **Metoprolol succinate** | | | |
| Pharmacological class | Selective beta blocker | | |
| Dosage form | Tablet: 25mg, 50mg,100mg | | |
| Indications | Angina pectoris, hypertension, heart failure, arrhythmia, prevention of cardiac death and re-infarction after the acute phase of MI and prophylaxis of migraine. | | |
| Dose and administration | **Angina:**  **Adult:** 100 mg orally once a day; maintenance dose: 100 to 400 mg per day. | | |
| Contraindications | Refer to metoprolol succinate under medicines for heart failure. | | |
| Drug interactions | Refer to metoprolol succinate under medicines for heart failure. | | |
| Side effects | Refer to metoprolol succinate under medicines for heart failure. | | |
| Cautions | Refer to metoprolol succinate under medicines for heart failure. | | |
| Storage condition | Store between 15 °C and 30 °C. Protect from light and moisture. | | |
| **Metoprolol tartrate** | | | |
| Pharmacological class | | Selective beta blocker | |
| Dosage form | | Injection: 1mg/ml,5mg/ml; Tablet: 25mg, 50mg | |
| Indications | | Angina, arrhythmias, hypertension, early intervention within 12 hours of infarction, migraine prophylaxis, hyperthyroidism (adjunct), early intervention within 12 hours of infarction. | |
| Dose and administration | | **Angina**  **Adult:** 50–100 mg immediate release tablet orally 2–3 times a day OR 200–400 mg modified release daily orally.  *Note*: *it is more preferred than metoprolol succinate to prevent further heart attack or angina.* | |
| Contraindications | | Refer to metoprolol tartrate under antiarrythmics. | |
| Drug interactions | | Refer to metoprolol tartrate under antiarrythmics. | |
| Side effects | | Refer to metoprolol tartrate under antiarrythmics. | |
| Cautions | | Refer to metoprolol tartrate under antiarrythmics. | |
| Storage condition | | Store between 15 °C and 30 °C. Protect from light and moisture. | |
| **Verapamil hydrochloride** | | | |
| Pharmacological class | Non- dihydropyridine calcium-channel blocker | | |
| Dosage form | Injection: 2.5mg/ml in 2ml ampoule  Tablet: 40mg, 80mg | | |
| Indications | Angina, supraventricular and paroxysmal arrhythmias, hypertension, prophylaxis of cluster headache. | | |
| Dose and administration | **Angina:**  **Adult:** 80–120 mg immediate release tablet 3 times a day | | |
| Contraindications | Refer to verapamil under antiarrhythmics. | | |
| Drug interactions | Refer to verapamil under antiarrhythmics. | | |
| Side effects | Refer to verapamil under antiarrhythmics. | | |
| Cautions | Refer to verapamil under antiarrhythmics. | | |
| Storage condition | Store between 15 ºC and 30 ºC. Protect from light. | | |
| **Ranolazine** | | | |
| Pharmacological class | Fatty acid oxidation inhibitor | | |
| Dosage form | Extended release tablet: 500mg, 1000mg | | |
| Indications | Symptomatic treatment of patients with stable angina pectoris who are inadequately controlled or intolerant to first-line antianginal therapies. | | |
| Dose and administration | **Adult:** Initially, 500 mg twice daily; may increase to maximum of 1 g twice daily. | | |
| Contraindications | Hypersensitivity to the drug, hepatic cirrhosis, concomitant use with potent inhibitors or inducers of CYP3A. | | |
| Drug interactions | Azole antifungals, clarithromycin, protease inhibitors, grapefruit juice, diltiazem, verapamil, cyclosporine, rifampin, phenobarbital, phenytoin, carbamazepine, St. John’s wort, metformin, antiarrhythmic medications, TCAs, antipsychotics. | | |
| Side effects | Dizziness, headache, constipation, nausea, bradycardia, palpitations, tinnitus, vertigo, blurred vision, abdominal pain, dry mouth, vomiting, dyspepsia, asthenia, peripheral edema, anorexia, hyponatremia, syncope, anxiety, confusion, hematuria, dyspnea, hyperhidrosis, pruritus, urticaria, orthostatic hypotension. | | |
| Cautions | QT prolongation, hepatic impairment, pregnancy, breastfeeding. | | |
| Storage condition | Store between 15 oC to 30 oC. | | |
| **Trimetazidine** | | | |
| Pharmacological class | Fatty acid oxidation inhibitor | | |
| Dosage form | Tablet: 35mg | | |
| Indications | Long-term treatment of angina pectoris in combination with other medicines | | |
| Dose and administration | **Angina**, **oral:** 35 mg twice daily, in the morning and evening with meals. | | |
| Contraindications | Hypersensitivity to the drug, Parkinson disease or parkinsonian symptoms, tremors, restless leg syndrome, severe renal impairment (CrCl< 30 ml/min). | | |
| Drug interactions | No drug interactions have been identified. | | |
| Side effects | Dizziness, headache, GI disturbance, rash, asthenia, pruritus, urticarial, agranulocytosis, thrombocytopenia, thrombocytopenic purpura, hepatitis. | | |
| Cautions | Close-angle glaucoma, hepatic impairment, renal impairment, athletes (positive reaction in doping tests), pregnancy, breastfeeding. | | |
| Storage condition | Store below 30 oC. | | |

## Medicine used for vascular shock

Shock which is failure of the circulatory system to maintain celluar perfusion and function, should be treated based on the cause. The underlying causes of shock could be haemorrhage, sepsis, or myocardial insufficiency. The profound hypotension of shock must be treated promptly to prevent tissue hypoxia and organ failure. Volume replacement is essential to correct the hypovolaemia associated with haemorrhage and sepsis but may be detrimental in cardiogenic shock. Depending on haemodynamic status, cardiac output may be improved using of sympathomimetic inotropes such as adrenaline/epinephrine dobutamine or dopamine hydrochloride. In septic shock, when fluid replacement and inotropic support fail to maintain blood pressure, the vasoconstrictor noradrenaline/norepinephrine may be considered. The use of sympathomimetic inotropes and vasoconstrictors should preferably be confined to the intensive care setting and undertaken with invasive hemodynamic monitoring.

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| **Dobutamine** | | |
| Pharmacological class | Beta-1 receptor agonist. | |
| Dosage form | Injection: 5mg/ml, 12.5 mg/ml | |
| Indications | Cardiogenic shock, septic shock, acute hypotension. | |
| Dose and administration | **Inotropic support in infarction, cardiac surgery, cardiomyopathies, septic shock, cardiogenic shock, and during positive end expiratory pressure ventilation,** IV infusion:  **Adult:** Usual dose 2.5–10 mcg/kg/minute, adjusted according to response, alternatively 0.5–40 mcg/kg/minute.  **Neonate:** Initially 5 mcg/kg/min, then adjusted according to response to 2–20 mcg/ kg/min; doses as low as 0.5–1 mcg/kg/min have been used.  **Child:** Initially 5 mcg/kg/min, then adjusted according to response to 2–20 mcg/kg/min; doses as low as 0.5–1 mcg/kg/min have been used. | |
| Contraindications | Hypersensitivity to the drug, pheochromocytoma. | |
| Drug interactions | Beta-blockers, linezolid, chlorpromazine, ergometrine, fluphenazine, haloperidol, cyclopropane, halogenated hydrocarbon anesthetics. | |
| Side effects | Arrhythmias, bronchospasm, chest pain, dyspnea, eosinophilia, fever. headache, localized inflammation, ischemic heart disease, nausea, palpitations, platelet aggregation inhibition, skin reactions, urinary urgency, vasoconstriction, MI. | |
| Cautions | Acute heart failure, acute MI, arrhythmias, hypovolemia, hypoxia, metabolic acidosis, diabetes mellitus, elderly, marked obstruction of cardiac ejection, hyperthyroidism, ischemic heart disease, occlusive, vascular disease, severe hypotension, susceptibility to angle-closure glaucoma, tachycardia. | |
| Storage condition | Store between 15 and 30 °C. Protect from light. | |
| **Dopamine hydrochloride** | | |
| Pharmacological class | Sympathomimetic inotrope | |
| Dosage form | Injection: 40mg/ml | |
| Indications | Cardiogenic shock including in MI and cardiac surgery | |
| Dose and administration | **Cardiogenic shock,** IV infusion:  **Adult:** Initially 2–5 mcg/kg/min, gradually increased by 5–10 mcg/kg/min according to blood pressure, cardiac output, and urine output (seriously ill patients, up to 20–50 mcg/kg/min).  **Correct hemodynamic imbalance due to acute hypotension, shock, cardiac failure**, **adjunct following cardiac surgery**, IV infusion:  **Neonate:** Initially 3 mcg/kg/min (max. per dose 20 mcg/kg/min), adjusted according to response.  **Child:** Initially 5 mcg/kg/min (max. per dose 20 mcg/kg/min), adjusted according to response. | |
| Contraindications | Tachyarrhythmia, ventricular fibrillation, ischemic heart disease, pheochromocytoma, hyperthyroidism, cyclopropane and halogenated hydrocarbon anaesthetics. | |
| Drug interactions | Chlorpromazine, beta-blockers, ergometrine, entacapone, linezolid, MAO inhibitors, fluphenazine, haloperidol, cyclopropane and halogenated hydrocarbon anaesthetics. | |
| Side effects | Angina pectoris, anxiety, arrhythmias, azotemia, cardiac conduction disorder, dyspnea, gangrene, headache, hypertension, mydriasis, nausea, palpitations, piloerection, polyuria, tremor, vasoconstriction, vomiting. | |
| Cautions | Hypovolemia, hypoxia, hypercapnia, metabolic acidosis, hypertension, hyperthyroidism, history of peripheral vascular disease, elderly, hepatic and renal impairment, pregnancy, breastfeeding. | |
| Storage condition | Store between 15-30 °C. Protect from heat, light and freezing. | |
| **Epinephrine/adrenaline** | | |
| Pharmacological class | Sympathomimetic | |
| Dosage form | Injection: 1 mg (as hydrochloride or hydrogen tartrate) in 1- ml ampoule.  Injection: 100 mcg/ ml (as acid tartrate or hydrochloride) in 10- ml ampoule | |
| Indications | Acute anaphylaxis, refractory anaphylaxis, cardiogenic shock, septic shock, acute hypotension, control of bradycardia in patients with arrhythmias after MI. | |
| Dose and administration | **Cardiopulmonary resuscitation (specialist use only)**, by slow IV injection:  **Adult:** 1 mg every 3–5 minutes as required, 1 in 10 000 (100 mcg/ml) solution is recommended.  **Child:** 10 mcg/kg every 3–5 minutes (max. per dose 1 mg) as required, 1 in 10,000 (100 mcg/ml) solution is recommended,  **Acute hypotension,** by continuous intravenous infusion.  **Neonate:** Initially 100 nanograms/kg/minute, adjusted according to response, higher doses up to 1.5 mcg/kg/minute have been used in acute hypotension.  **Child:** Initially 100 nanograms/kg/minute, adjusted according to response, higher doses up to 1.5 mcg/kg/minute have been used in acute hypotension.  **Emergency treatment of acute anaphylaxis (under expert supervision),** by intramuscular injection:  **Child up to 6 months:** 100–150 mcg, using adrenaline 1 in 1000 (1 mg/ml) injection.  **Child 6 months–5 years:** 150 mcg, using adrenaline 1 in 1000 (1 mg/ml) injection.  **Child 6–11 years**: 300 mcg, using adrenaline 1 in 1000 (1 mg/ml) injection.  **Child 12–17 years:** 500 mcg, using adrenaline 1 in 1000 (1 mg/ml) injection, 300 mcg to be administered if child is small or prepubertal.  **Adult:** 500 mcg, using adrenaline 1 in 1000 (1 mg/ml) injection.  **Refractory anaphylaxis [persistent symptoms despite at least 2 appropriate doses of intramuscular adrenaline/epinephrine] (specialist use only)**, by intravenous infusion:  **Adult:** Consult emergency treatment of anaphylaxis guideline or local protocols  **Control of bradycardia in patients with arrhythmias after MI, if there is a risk of asystole, or if the patient is unstable and has failed to respond to atropin**e, by intravenous infusion:  **Adult:** 2–10 mcg/minute, adjusted according to response. | |
| Contraindications | Hypertension, cardiac arrhythmias, closed-angle glaucoma, psychoneurosis, use during halothane or cyclopropane anaesthesia. | |
| Drug interactions | Propranolol, entacapone, linezolid, vasopressin, procainamide, quinidine, selegiline transdermal, sotalol, amiodarone, amitriptyline, artemether-lumefantrine, halothane, cyclosporine, chlorpromazine, clarithromycin, erythromycin, fluconazole, fluphenazine, formoterol, haloperidol, imipramine, isoflurane, sevoflurane, ketamine, ketoconazole. | |
| Side effects | Nausea, vomiting, anxiety, headache, fear, palpitations, tachycardia, restlessness, tremor, dizziness, dyspnea, weakness, sweating, pallor, hyperglycemia, hypertension, ventricular arrhythmias, pulmonary oedema, angina, cold extremities, peripheral ischemia and necrosis (at infusion site). | |
| Cautions | Hyperthyroidism, diabetes mellitus, ischemic heart disease, cerebrovascular disease, pheochromocytoma, susceptibility to closed-angle glaucoma, second stage of labour, elderly, pregnancy, breast feeding. | |
| Storage condition | Store below 30 oC. Do not refrigerate or freeze, protect from light. | |
| **Norepinephrine/noradrenaline** | | |
| Pharmacological class | | Sympathomimetic |
| Dosage form | | Injection: 1mg/1ml (4ml ampoule) |
| Indications | | Cardiogenic shock, septic shock, acute hypotension |
| Dose and administration | | **Acute hypotension (initial and on-going treatment):**  **Adult:** by IV infusion: Initially 0.16–0.33 ml/min, adjusted according to response, dose applies to a solution containing 40 mcg (base)/ml only, dilute the 1 mg/ml concentrate for infusion for this solution.  **Neonate:** 20–100 nanograms/kg/min (max. per dose 1 mcg/kg/min), adjusted according to response; dilute the 1 mg/ml concentrate for infusion for this dose.  **Child:** 20–100 nanograms/kg/min (max. per dose 1 mcg/kg/min), adjusted according to response; dilute the 1 mg/ml concentrate for infusion for this dose.  **On-going treatment of acute hypotension (with escalating dose requirements) (body weight 50 kg and above),** IV infusion:  **Adult:** use the 0.08 mg/ml or 0.16 mg/ ml solution for infusion. |
| Contraindications | | Refer to norepinephrine under medicines for heart failure. |
| Drug interactions | | Refer to norepinephrine under medicines for heart failure. |
| Side effects | | Refer to norepinephrine under medicines for heart failure. |
| Cautions | | Refer to norepinephrine under medicines for heart failure. |
| Storage condition | | Store between 15-30 oC. Protect from light. |

## Medicines used for pulmonary hypertension

Pulmonary hypertension is a rare disorder that progresses to increase in right ventricular after load and decrease in the ability to increase cardiac output resulting in heart failure. It is categorized in to five (group 1-5) based on the cause. The treatment of pulmonary hypertension is decided based on the type. Phosphodiesterase type 5 (PDE5) inhibitors, endothelin (ET) receptor antagonists, prostacyclin agonists, calcium channel blockers, anticoagulants, and inhaled nitric oxide (iNO) are widely studied and recommended mainly for group 1 pulmonary hypertension which is [Pulmonary arterial hypertension (PAH)](https://www.lung.org/lung-health-diseases/lung-disease-lookup/pulmonary-arterial-hypertension). Prior to initiation of targeted pulmonary hypertension therapy, the patient should be assessed for acute vasodilator responsiveness via cardiac catheterization; left-sided heart disease or pulmonary venous disease resulting in an anatomic obstruction should be excluded.

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| **Bosentan** | |
| Pharmacological class | Endothelin receptor antagonists |
| Dosage form | Film coated tablet: 62.5mg, 125mg |
| Indications | Pulmonary arterial hypertension, systemic sclerosis. |
| Dose and administration | **Pulmonary arterial hypertension (initiated under specialist supervision**):  **Adult > 40kg:** Initially 62.5 mg twice daily for 4 weeks, then increased to 125 mg twice daily (max. per dose 250 mg); maximum 500 mg per day. Adult <40kg: Maintenance dose at 62.5 mg twice daily.  **Child > 12 years and weighs < 40Kg:** 62.5mg two times a day.  **Child < 12 years:** Dose is based on body weight and must be determined by a specialist.  **Systemic sclerosis with ongoing digital ulcer disease (to reduce number of new digital ulcers):**  **Adult:** Initially 62.5 mg twice daily for 4 weeks, then increased to 125 mg twice daily.  *Note: discontinuation of treatment: consider a reduction in dosage to 62.5 mg twice daily for 3-7 days.* |
| Contraindications | Hypersensitivity to the drug, acute porphyria’s, pregnancy, concomitant cyclosporine or glyburide use. |
| Drug interactions | Phenobarbitone, phenytoin, carbamazepine, amiodarone, azole antifungals, second generation antipsychotics, midazolam, nifedipine, amlodipine, verapamil, cyclosporin, hormonal contraceptives, protease inhibitors, macrolides, dolutegravir, NNRTIs, methadone, rifampicin, St. John’s wort, statins, glibenclimide, tacrolimus, taxanes. |
| Side effects | Anemia, diarrhea, flushing, gastroesophageal reflux diseases, headache, nasal congestion, palpitations, skin reactions, syncope. |
| Cautions | Hypotension, pulmonary veno-occlusive disease, anemia, hepatic impairment, renal impairment, breast feeding. |
| Storage condition | Store between 15ºC and 30ºC. |
| **Sildenafil citrate** | |
| Pharmacological class | Phosphodiesterase-5 inhibitor |
| Dosage form | Tablet: 25mg, 50mg, 100mg  Suspension: 10mg/ml |
| Indications | Pulmonary arterial hypertension (PAH), erectile dysfunction |
| Dose and administration | **PAH (initiated under specialist supervision):**  **Adult:** 20 mg orally 3 times a day.  **Neonate:** 0.25 mg/kg/dose every 6hours or 0.5mg/kg/dose every 8 hours, titrate as needed, maximum reported dose range: 1 to 2 mg/kg/dose every 6 to 8 hours.  **Child <1 year:** the recommended dose of sildenafil is 0.5-0.1 mg/kg 3 times daily orally.  **Child <20 kg**: 10 mg 3 times daily orally.  **Child>20 kg:** 20 mg 3 times daily orally. IV sildenafil is used only in an acute-care setting.  *Note: refer dosing for erectile dysfunction under the respective section.* |
| Contraindications | Hereditary degenerative retinal disorders, history of non- arteritic anterior ischemic optic neuropathy, recent history of MI, recent history of stroke. |
| Drug interactions | Nitrates, alpha blockers (prazocin), carbamazepine, phenobarbitone, phenytoin, azole antifungals, verapamil, diltiazem, grape fruit juice, protease inhibitors, macrolides, NNRTIs, rifampicin, St. John’s wort. |
| Side effects | Alopecia, anemia, anxiety, cough, diarrhea, dizziness, fluid retention, gastrointestinal discomfort, gastrointestinal disorders, headaches, increased risk of infection, insomnia, nasal complaints, nausea, night sweats, pain, skin reactions, tremor, vasodilation, vision disorders. |
| Cautions | Active peptic ulceration, anatomical deformation of the penis (e.g. angulation, cavernosal fibrosis, Peyronie’s disease), autonomic dysfunction, bleeding disorders, cardiovascular disease, left ventricular outflow obstruction, predisposition to priapism (e.g. in sickle-cell disease, multiple myeloma, or leukemia), SBP below 90 mmHg, intravascular volume depletion, pulmonary veno-occlusive disease, elderly, hepatic impairment, renal impairment, pregnancy, breastfeeding. |
| Storage condition | Store between 15 ºC to 30 ºC. |
| **Tadalafil** | |
| Pharmacological class | Phosphodiesterase-5 inhibitor |
| Dosage form | Tablet: 25mg, 50mg, 100mg  Suspension: 10mg/ml |
| Indications | Pulmonary arterial hypertension (initiated under specialist supervision), erectile dysfunction, benign prostatic hyperplasia |
| Dose and administration | **PAH** (initiated under specialist supervision):  **Adult:** 40 mg once daily.  *Note: refer dosing for erectile dysfunction under the respective section.* |
| Contraindications | Mild to severe heart failure, patients in whom vasodilation or sexual activity are inadvisable, uncontrolled hypertension, unstable angina, stroke, arrhythmias, aortic and mitral valve disease, left ventricular dysfunction, life-threatening arrhythmias, pericardial congestive cardiomyopathy, coronary artery disease |
| Drug interactions | Refer sildenafil above |
| Side effects | Alopecia, anemia, anxiety, cough, diarrhea, dizziness, fluid retention, gastrointestinal discomfort, gastrointestinal disorders, headaches, increased risk of infection, insomnia, nasal complaints, nausea, night sweats, pain, skin reactions, tremor, vasodilation, vision disorders. |
| Cautions | Patients with preexisting hypotension, with autonomic dysfunction, with left ventricular outflow obstruction, acute myocardial infarction in past 90 days, history of non-arteritic anterior ischemic optic neuropathy, elderly, hepatic impairment, renal impairment, breastfeeding. |
| Storage condition | Store between 15 ºC to 30 ºC. |

## Lipid lowering agents

Lipid lowering agents are used to modify blood lipid concentrations in the management of hyperlipidemias and for the reduction of cardiovascular risk. The principal groups of lipids regulating medicines are the statins, fibrates, bile-acid binding resins, nicotinates, and omega-3-faty acids. Statins which include agents like simvastatin, rosuvastatin, atrovastatin, fluvastatin and lovastatin act by inhibiting 3-hydroxy-3-methyl glutaryl co enzyme A (HMG-CoA) reductase, the rate determining enzyme for cholesterol synthesis. They are potent reducers of plasma low density lipoprotein (LDL) cholesterol and triglyceride (TG). Fibrates inhibits the synthesis of cholesterol and bile acids, and enhance the secretion of cholesterol in bile. The main effect is to reduce triglycerides by reducing the concentration of very low-density lipoprotein (VLDL); they also increase high density lipoprotein (HDL) cholesterol and have variable effects on LDL-cholesterol. Bile-acid binding agents such as cholestyramine are basic anion-exchange resins that bind bile acids in the gut, preventing their enterohepatic recycling and causing the hepatocyte to upregulate LDL receptors to obtain cholesterol for compensatory increases in bile acid synthesis.

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| **Atorvastatin** | | |
| Pharmacological class | | HMG-CoA reductase inhibitor. |
| Dosage form | | Tablet: 20mg, 40mg, 80mg |
| Indications | | Primary hypercholesterolemia, heterozygous or homozygous hypercholesterolemia, combined hyperlipidemia, primary and secondary prevention of cardiovascular events. |
| Dose and administration | | **Primary hypercholesterolemia or combined (mixed) hyperlipidemia in patients who have not responded adequately to diet and other appropriate measures:**  **Adult:** Usual dose 10 mg once daily; increased if necessary up to 80 mg once daily, dose to be increased at intervals of at least 4 weeks. **Child 10–17 years:** Initially 10 mg once daily, then increase if necessary up to 20 mg once daily; dose tobe adjusted at least 4 weeks interval.  **Heterozygous or homozygous familial hypercholesterolemia in patients who have not responded adequately to diet and other appropriate measures**:  **Adult:** Initially 10 mg once daily, then increased to 40 mg once daily, increase dose to be increased at intervals of at least 4 weeks, then increased if necessary up to 80 mg once daily.  **Primary prevention of cardiovascular events in patients at high risk of a first cardiovascular event:**  **Adult:** 20 mg once daily; increased if necessary up to 80 mg once daily, dose to be increased at intervals of at least 4 weeks.  **Child 10–17 years:** Initially 10 mg once daily, then increase if necessary up to 80 mg once a day; dose to be adjusted at least 4 weeks interval.  **Secondary prevention of cardiovascular events**:  **Adult:** 80 mg once daily. |
| Contraindications | | Hypersensitivity to the drug, active liver disease or unexplained persistently raised serum-aminotransferase concentrations > 3times upper limit of normal (ULN), creatinine Kinase level >5 times ULN. |
| Drug interactions | | Aliskren, amiodarone, carbamazepine, phenytoin, diltiazem, verapamil, fibrates, grape fruit juice, protease inhibitors, NNRTIs, ranolazine, CYP3A4 inhibitors (e.g., ciclosporin, clarithromycin, ketoconazole, voriconazole, itraconazole, fluconazole, ritonavir, erythromycin), CYP3A4 inducers (e.g., efavirenz, rifampicin, St. John’s wort) antacids, bile acid sequestrants, warfarin, oral contraceptives, digoxin, alcohol, cholestyramine, propranolol, imatinib, colchicine. |
| Side effects | | GI disturbance, rhabdomylosis, muscle rupture, myalgia associated with muscle stiffness or weakness, elevations of creatine kinase and serum transaminase, hepatitis, headache, skin rash, peripheral neuropathy, hypersensitivity, urinary tract infections, myopathy, sinusitis, epistaxis, hyperglycaemia, joint disorders, pharyngolaryngeal pain, nasopharyngitis, pain, decreased appetite, chest pain, hypoglycaemia, vision disorders, hearing loss. |
| Cautions | | Pre-disposing factors for rhabdomyolysis, hemmorhagic stroke, renal impairment, hypothyroidism, familial history of muscular toxicity, history of liver disease or alcoholism, elderly, hemorrhagic stroke, pregnancy, breast feeding. |
| Storage condition | | Store between 15 to 30°C. |
| **Omega-3-fatty acids** | | |
| Pharmacological class | Lipid lowering agent | |
| Dosage form | Capsule: 1gm  Liquid: 250 mg to 500 mg/100ml (100 to 200 ml) | |
| Indications | Hypertriglyceridemia, Omega-3 deficiency in cardiovascular patients, secondary prevention in MI. | |
| Dose and administration | **Adjunct to diet and statin in type IIb or III hypertriglyceridemia**, **adjunct to diet in type IV hypertriglyceridemia**, **Omega-3 deficiency in cardiovascular patients:**  **Adult:** Initially 2 capsules daily, dose to be taken with food, increased if necessary to 4 capsules daily  **Adjunct in secondary prevention in those who have had a myocardial infarction in the preceding 3 months:**  **Adult:** 1 capsule daily, dose to be taken with food  *Note:**Evaluate triglyceride levels carefully prior to initiating treatment.* | |
| Contraindications | Hypersensitivity to the drug. | |
| Drug interactions | Antiplatelets, anti-coagulants | |
| Side effects | Burping, constipation, diarrhea, gastrointestinal discomfort, nausea, vomiting, dizziness, gout, hemorrhage, headache, hyperglycaemia, hypotension, skin reactions, taste altered, liver disorder, taste sense altered. | |
| Cautions | Hypersensitivity to fish or shellfish, anticoagulant treatment, haemorrhagic disorders, symptomatic atrial fibrillation or flutter, hepatic impairment, pregnancy, breastfeeding. | |
| Storage condition | Store between 15°C and 30°C. | |
| **Rosuvastatin** | | |
| Pharmacological class | HMG CoA reductase inhibitor | |
| Dosage form | Tablet: 5mg, 10mg, 20mg, and 40mg | |
| Indications | Primary hypercholesterolemia, heterozygous or homozygous hypercholesterolemia, combined hyperlipidemia, primary and secondary prevention of cardiovascular events | |
| Dose and administration | **1O hypercholesterolemia (type IIa including heterozygous familial hypercholesterolemia), mixed dyslipidemia (type IIb), or homozygous familial hypercholesterolemia in patients not responded adequately to diet and other measures:**  **Patients who doesn’t have risk factors for myopathy or rhabdomyolysis:**  **Adult 18–69 years:** Initially 5–10 mg once daily, then increased if necessary up to 20 mg once daily.  **Adult 70 years and over:** Initially 5 mg once daily, then increased if necessary up to 20 mg once daily.  **Patients who have risk factors for myopathy or rhabdomyolysis**: **Adult:** Initially 5 mg once daily, then increased if necessary up to 20 mg once daily.  **Patients with high cardio vascular risk (specialist use only):**  **Adult 18–69 years:** Initially 5–10 mg once daily, then increased if necessary up to 40 mg once daily.  **Adult ≥70 years:** Initially 5 mg once daily, then increased if necessary up to 40 mg once daily.  **Patients with high cardiovascular risk and risk factors for myopathy or rhabdomyolysis** (specialist use only):  **Adult:** Initially 5 mg once daily, then increased if necessary up to 20 mg once daily.  **Prevention of cardiovascular events in patients at high risk of a first cardiovascular event:**  **Adult 18–69 years:** 20 mg once daily.  **Adult 70 years and over:** Initially 5 mg once daily, then increased if tolerated to 20 mg once daily.  **Prevention of cardiovascular events in patients at high risk of a first cardiovascular event and with risk factors for myopathy or rhabdomyolysis:**  **Adult:** Initially 5 mg once daily, then increased if tolerated to 20 mg once daily. | |
| Contraindications | Hypersensitivity to the drug, active liver disease or with unexplained persistent elevations of serum transaminases. | |
| Drug interactions | Refer to atorvastatin above. | |
| Side effects | Headache, dizziness, depression, rash, abdomainal pain, constipation, nausea, vomiting, diarrhea, anemia, pain in the muscles, weakness strength, gynecomastia, hematuria, polyneuropathy, cough, dyspnea, edema, proteinuria, severe cutaneous reactions. | |
| Cautions | Risk factors for myopathy or rhabdomyolysis, hepatic impairment, renal impairment, pregnancy, breast feeding. | |
| Storage condition | Store between 15°C and 30°C. Protect from moisture. | |
| **Simvastatin** | | |
| Pharmacological class | HMG CoA reductase inhibitor | |
| Dosage form | Tablet: 10mg, 20mg and 40mg | |
| Indications | Primary hypercholesterolemia, combined hyperlipidemia, prevention of cardiovascular events. | |
| Dose and administration | **1o hypercholesterolemia or combined hyperlipidemia in patients not responded adequately to diet and other measures:**  **Adult:** 10–20 mg once daily, dose to be taken at night, then increased if necessary up to 80 mg once daily, adjusted at intervals of at least 4 weeks; 80 mg dose only for those with severe hypercholesterolemia and at high risk of cardiovascular complications.  **Homozygous familial hypercholesterolemia in patients not responded adequately to diet & other measures:**  **Adult:** Initially 40 mg once daily, dose to be taken at night, then increased if necessary up to 80 mg once daily, adjusted at intervals of at least 4 weeks; 80 mg dose only for those with severe hypercholesterolemia and at high risk of cardiovascular complications.  **Prevention of cardiovascular events in patients with atherosclerotic cardiovascular disease or diabetes mellitus:**  **Adult:** Initially 20–40 mg once daily, dose to be taken at night, then increased if necessary up to 80 mg once daily, adjusted at intervals of at least 4 weeks. | |
| Contraindications | Active liver disease (or persistently abnormal liver function tests), porphyria, pregnancy, breastfeeding. | |
| Drug interactions | Refer to atorvastatin above. | |
| Side effects | Muscle effects including myalgia, myopathy, myositis, and rhabdomyolysis, abdominal pain, flatulence, constipation, dyspepsia, diarrhoea, nausea, vomiting, pancreatitis, raised serum transaminases, hepatitis, jaundice, headache, dizziness, asthenia, peripheral neuropathy, paresthesia, anaemia, pruritus, alopecia, rash, hypersensitivity reactions (including angioedema and anaphylaxis). | |
| Cautions | History of liver disease or a high alcohol intake, increased risk of myopathy or rhabdomyolysis, renal impairment. | |
| Storage condition | Store between 15°C to 30°C. Protect from light. | |

## Antiplatelet

Antiplatelet drugs are medications that help prevent blood clots by inhibiting the aggregation of platelets. They are commonly used in various cardiovascular conditions to reduce the risk of heart attacks, strokes, and other thrombotic events. Some well-known antiplatelet agents include aspirin and clopidogrel. **Aspirin** inhibits the enzyme cyclooxygenase, leading to decreased production of thromboxane A2, which promotes platelet aggregation. Long-term use of low dose aspirin is recommended in patients with established cardiovascular disease (secondary prevention) but not recommended for primary prevention. The other antiplatelet agent clopidogrel is used for the prevention of atherothrombotic events in patients with a history of symptomatic ischemic disease (e.g. ischemic stroke). Clopidogrel is also used, in combination with low-dose aspirin, for the prevention of atherothrombotic and thromboembolic events in patients with atrial fibrillation (and at least one risk factor for a vascular event), and for whom warfarin sodium is unsuitable.

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| **Acetylsalicylic acid (Aspirin)** | | |
| Pharmacological class | Antiplatelet- NSAID | |
| Dosage form | Tablet, enteric coated: 75mg, 81 mg, 100 mg, 300mg | |
| Indications | Secondary prevention of cardiovascular disease, unstable angina and MI, suspected and confirmed transient ischemic attack, ischemic stroke, ischemic stroke in patients receiving anticoagulation for a prosthetic heart valve, post coronary by-pass surgery, pyrexia, pain, inflammation, migraine, juvenile joint disease, Kawasaki disease, pre-enclamsia. | |
| Dose and administration | **Cardiovascular disease (secondary prevention):**  **Adult:** 75 mg daily.  **Secondary prevention of deep-vein thrombosis (in patients who decline continued anticoagulation treatment), or secondary prevention of pulmonary embolism (in patients who decline continued anticoagulation treatment):**  **Adult**: 75 mg daily, alternatively 150 mg daily.  **Management of unstable angina and non-ST-segment elevation myocardial infarction (NSTEMI) or Management of ST-segment elevation myocardial infarction (STEMI):**  **Adult**: 300 mg, chewed or dispersed in water.  **Suspected transient ischemic attack:**  **Adult:** 300 mg once daily until diagnosis established.  **Transient ischemic attack (long-term treatment in combination with dipyridamole) or Ischaemic stroke not associated with AF (in combination with dipyridamole if clopidogrel contra-indicated or not tolerated) or Ischaemic stroke not associated with AF (used alone if clopidogrel and dipyridamole contra-indicated or not tolerated):**  **Adult:** 75 mg once daily  **Acute ischemic stroke:**  **Adult**: 300 mg once daily for 14 days, to be initiated 24 hours after thrombolysis or as soon as possible within 48 hours of symptom onset in patients not receiving thrombolysis  **Atrial fibrillation following a disabling ischemic stroke (before being considered for anticoagulant treatment):**  **Adult**: 300 mg once daily for 14 days.  **Following disabling ischemic stroke in patients receiving anticoagulation for a prosthetic heart valve and who are at significant risk of hemorrhagic transformation:**  **Adult:** 300 mg once daily, anticoagulant treatment stopped for 7 days and to be substituted with aspirin  **Following coronary by-pass surgery:**  **Adult:** 75–300 mg daily.  **Neonate:** 1–5 mg/kg orally once daily.  **Child 1 month–11 years:** 1–5 mg/kg once daily (max. per dose 75 mg).  **Child 12–17 years:** 75 mg once daily  **Kawasaki disease,** oral:  **Neonate:** Initially 8 mg/kg 4 times a day for 2 weeks or until afebrile, followed by 5 mg/kg once daily for 6–8 weeks; if no evidence of coronary lesions after 8 weeks, discontinue treatment or seek expert advice.  **Child 1 month–11 years:** Initially 7.5–12.5 mg/kg 4 times a day for 2 weeks or until afebrile, then 2–5 mg/kg once daily for 6–8 weeks, if no evidence of coronary lesions after 8 weeks, discontinue treatment or seek expert advice.  **Mild to moderate pain or Pyrexia:**  **Adult:** 300–900 mg orally every 4–6 hours as required; maximum 4 g per day; or 450–900 mg rectally every 4 hours; maximum 3.6 g per day.  **Acute migraine:**  **Adult:** 900 mg for 1 dose, to be taken as soon as migraine symptoms develop.  **Prevention of pre-eclampsia in women at moderate or high risk: Adult**: 75–150 mg once daily from 12 weeks gestation until the birth of the baby. | |
| Contraindications | Hypersensitivity to the drug, children and adolescents under 16 years (risk of Reye syndrome), active peptic ulceration, hemophilia and other bleeding disorders, gout, severe renal and hepatic disease. | |
| Drug interactions | Methotrexate, warfarin, fluoxetine, heparin, acetazolamide, antacids, dexamethasone, ACEIs, thiazide diuretics, rifampicin, bisphosphonate, hydrocortisone, metoclopramide, mifepristone, phenytoin, prednisolone, spironolactone, valproic acid, omega-3 fatty acid. | |
| Side effects | Nausea, dyspepsia, GI ulceration or bleeding, tinnitus, vertigo, confusion, increased bleeding time, hypersensitivity reactions including angioedema, bronchospasm and rash (including SJS), iron deficiency anemia, renal impairment, esophageal ulceration, major hemorrhage, blood dyscrasias, edema, myocarditis, Reye syndrome with subsequent encephalopathy, severe hepatic injury. | |
| Cautions | Uncontrolled hypertension, allergic disease, anemia, asthma, dehydration, elderly, G6PD deficiency, previous peptic ulceration, thyrotoxicosis, hepatic impairment, renal impairment, dehydration, pregnancy, breastfeeding. | |
| Storage condition | Store between 15°C and 30°C. | |
| **Clopidogrel** | | |
| Pharmacological class | | Antiplatelet |
| Dosage form | | Tablet: 75 mg, 300 mg |
| Indications | | Prevention of atherothrombotic events |
| Dose and administration | | **Prevention of atherothrombotic events in percutaneous coronary intervention (adjunct with aspirin) in patients not already on clopidogrel:**  **Adult**: Loading dose 300 mg, to be taken prior to the procedure, alternatively loading dose 600 mg, higher dose may produce a greater and more rapid inhibition of platelet aggregation.  **Transient ischaemic attack for patients with aspirin hypersensitivity, or those intolerant of aspirin despite the addition of a proton pump inhibitor or acute ischaemic stroke for patients with aspirin hypersensitivity, or those intolerant of aspirin despite the addition of a proton pump inhibitor**:  **Adult:** 75 mg once daily.  **Prevention of atherothrombotic events in peripheral arterial disease or within 35 days of MI, or within 6 months of ischaemic stroke**:  **Adult:** 75 mg once daily.  **Prevention of atherothrombotic events in acute coronary syndrome without ST-segment elevation (given with aspirin):**  **Adult:** Initially 300 mg, then 75 mg daily for up to 12 months.  **Prevention of atherothrombotic events in acute myocardial infarction with ST-segment elevation (given with aspirin): Adult 18–75 years:** Initially 300 mg, then 75 mg for at least 4 weeks  **Adult 76 years and over:** 75 mg daily for at least 4 weeks **Prevention of atherothrombotic and thromboembolic events in patients with atrial fibrillation and at least one risk factor for a vascular event (with aspirin) and for whom warfarin is unsuitable:**  **Adult:** 75 mg once daily |
| Contraindications | | Active bleeding |
| Drug interactions | | Fluconazole, moclobemide, protease inhibitors, heparin, NSAIDs, fluoxetine, grapefruit juice, pioglitazone, proton pump inhibitors, rosuvastatin, rifampicin, anticoagulants, taxanes. |
| Side effects | | GI disturbance (nausea, diarrhea), headache, GI and duodenal ulceration, haemorrhage, skin reactions, severe cutaneous adverse reactions (SCARs), thrombocytopenia, acquired haemophilia, agranulocytosis, anaemia, arthralgia, arthritis, glomerulonephritis, hallucination, hepatic disorders, hypersensitivity, hypotension, neutropenia, pancreatitis, respiratory disorders, vasculitis, Kounis syndrome. |
| Cautions | | Patients at risk of increased bleeding from trauma, surgery, or other pathological conditions, elderly, hepatic and renal impairment, pregnancy, breast feeding. |
| Storage condition | | Store between 15°C and 30°C. |
| **Ticagrelor** | | |
| Pharmacological class | | Antiplatelet |
| Dosage form | | Tablet: 60 mg, 90 mg |
| Indications | | Prevention of atherothrombotic events. |
| Dose and administration | | **Prevention of atherothrombotic events in patients with acute coronary syndrome (in combination with aspirin): Adult**: Initially 180 mg once, then 90 mg twice daily usually for up to 12 months.  **Prevention of atherothrombotic events in patients with a history of MI and a high risk of an atherothrombotic event (in combination with aspirin):**  **Adult:** 60 mg twice daily, extended treatment may be started without interruption after the initial 12-month therapy for acute coronary syndrome. Treatment may also be initiated up to 2 years from the MI, or within 1 year after stopping previous ADP receptor inhibitor treatment. |
| Contraindications | | Active bleeding, history of intracranial hemorrhage. |
| Drug interactions | | Fluconazole, moclobemide, protease inhibitors, heparin, NSAIDs, fluoxetine, grapefruit juice, pioglitazone, proton pump inhibitors, rosuvastatin, rifampicin, anticoagulants, taxanes. |
| Side effects | | Constipation, diarrhea, dizziness, dyspepsia, dyspnea, gout, gouty arthritis, hemorrhage, headache, hyperuricemia, hypotension, nausea, skin reactions, syncope, vertigo, angioedema, confusion, intracranial hemorrhage. |
| Cautions | | Asthma, bradycardia, chronic obstructive pulmonary disease, history of hyperuricemia, patients at increased risk of bleeding (e.g. from recent trauma, surgery, gastrointestinal bleeding, or coagulation disorders), second- or third-degree AV block, sick sinus syndrome, hepatic impairment, pregnancy, breastfeeding. |
| Storage condition | | Store between 15°C and 30°C. |

## Thrombolytic agents

Thrombolytic agents are medications used to dissolve blood clots that can cause serious medical conditions such as heart attacks, strokes, or pulmonary embolisms. They work by breaking down fibrin, a protein that helps form blood clots. These agents can generally be used in the treatment of selected cases of acute myocardial infarction, acute severe pulmonary thromboembolism, acute arterial thrombosis and thromboembolism, severe deep-vein thrombosis and clearance of arteriovenous catheters and cannula. Trials have shown that the benefit of thromobolytic agents is greatest in those with ECG changes that include ST segment elevation and in patients with bundle branch block. Alteplase and streptokinase are commonly used thromobolytic agents for thromboembolic disorders such as deep-vein thrombosis and pulmonary embolism. Alteplase is also used for acute ischaemic stroke.

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| **Alteplase** | |
| Pharmacological class | Fibrinolytic agent, (rt-PA; Tissue-type plasminogen activator) |
| Dosage form | Powder for injection: 10 mg; 20 mg; 50 mg in vial. |
| Indications | Acute MI, pulmonary embolism and ischemic stroke. |
| Dose and administration | **Acute MI, accelerated regimen:**  **Adult (body-weight up to 65 kg):** Initially 15 mg IV to be initiated within 6 hours of symptom onset, followed by (by IV infusion) 0.75 mg/kg, to be given over 30 minutes, then (by IV infusion) 0.5 mg/kg to be given over 60 minutes, maximum total dose of 100 mg administered over 90 minutes.  **Adult (body-weight 65 kg and above):** Initially 15 mg IV, to be initiated within 6 hours of symptom onset, followed by (by IV infusion) 50 mg, to be given over 30 minutes, then (by IV infusion) 35 mg, to be given over 60 minutes, maximum total dose of 100 mg administered over 90 minutes  **Acute MI:**  **Adult:** Initially 10 mg IV, to be initiated within 6–12 hours of symptom onset, followed by (by IV infusion) 50 mg, to be given over 60 minutes, then (by IV infusion) 10 mg for 4 infusions, each 10 mg infusion dose to be given over 30 minutes, total dose of 100 mg over 3 hours; maximum 1.5 mg/kg in patients less than 65 kg.  **Pulmonary embolism:**  **Adult:** Initially 10 mg IV, to be given over 1–2 minutes, followed by (by IV infusion) 90 mg, to be given over 2 hours, maximum 1.5 mg/kg in patients less than 65 kg.  **Acute ischemic stroke (under specialist neurology physician only):**  **Adult 18–79 years:** Initially 900 mcg/kg IV infusion (max. per dose 90 mg), treatment must begin within 4.5 hours of symptom onset, to be given over 60 minutes, the initial 10% of dose is to be administered by IV injection and the remainder by IV infusion.  **Thrombolytic treatment of occluded central venous access devices (including those used for hemodialysis):**  **Adult:** (consult product literature) |
| Contraindications | History of hypersensitivity to gentamicin, recent delivery, active internal bleeding, history of recent stroke, ischemic stroke within 3 months except when within 4.5 hr, bleeding diathesis, aortic dissection, current severe uncontrolled hypertension, recent (within 3 months) brain injury or facial trauma intracranial or intraspinal surgery or serious head trauma, presence of aneurysms, prior intracranial haemorrhage. |
| Drug interactions | Anticoagulants, acetylsalicylic acid. |
| Side effects | Anemia, cholesterol embolization, gastrointestinal bleeding, cardiogenic, shock, pain, intracranial hemorrhage, cardiac reinfarction, hhypotension, intracranial hemorrhage, pulmonary embolism, pulmonary edema, bruising. |
| Cautions | Recent major surgery, severe hepatic or renal dysfunction, acute pericarditis, hemostatic defects, severe thrombophlebitis, cerebrovascular disease, hypertension, pregnancy and breastfeeding. |
| Storage condition | Store under refrigeration (between 2°C and 8°C). Protect from light. |
| **Streptokinase** | |
| Pharmacological class | Fibrinolytic agent, plasminogen activator |
| Dosage form | Powder for injection: 1.5 million IU in vial |
| Indications | Acute MI, DVT, central retinal venous or arterial thrombosis, pulmonary embolism |
| Dose and administration | **Acute myocardial infarction:**  **Adult:** 1,500,000 units as IV infusion, to be initiated within 12 hours of symptom onset, dose to be given over 60 minutes  **Deep-vein thrombosis or Central retinal venous or arterial thrombosis:**  **Adult:** 250,000 units IV infusion, dose to be given over 30 minutes, then 100 000 units every 1 hour for 12 hours for central retinal venous or arterial thrombosis, or for 72 hours for deep-vein thrombosis.  **Pulmonary embolism:**  **Adult:** 250,000 units IV infusion, dose to be given over 30 minutes, then 100,000 units every 1 hour for 24 hours, alternatively 1,500,000 units, dose to be given over 1–2 hours.  **Occlusive peripheral arterial disease:**  **Adult:** 250,000 units IV infusion, dose to be given over 30 minutes, then 100,000 units every 1 hour for up to 5 days. |
| Contraindications | Hypersensetivity to the drug and in conditions stated in the alteplase contraindication section above. |
| Drug interactions | Anticoagulants, NSAIDs, or aspirin. Drugs that can reverse effects of streptokinase include aminocaproic acid, aprotinin, and tranexamic acid. |
| Side effects | Arrhythmias, asthenia, diarrhoea, epigastric pain, headache, malaise, pain |
| Cautions | Cavernous pulmonary disease, recent streptococcal infections. |
| Storage condition | Store between 2°C and 30°C. |

# Respiratory Medicines

Respiratory medicines treat conditions like cough, asthma, and Chronic Obstructive Pulmonary Disease (COPD). Non-productive coughs are relieved with suppressants like dextromethorphan, while productive coughs benefit from expectorants like guaifenesin. Asthma management includes beta-2 agonists and inhaled corticosteroids (ICs) for inflammation control and acute attacks. COPD treatment focuses on symptom relief, using bronchodilators like salbutamol, ipratropium, and tiotropium. Oral corticosteroids may be used for severe cases, while mucolytic use remains controversial. Emergency treatments include epinephrine for asthma attacks and magnesium sulfate for severe exacerbations. Aminophylline is essential in neonatal care for managing apnea of prematurity.

## Antitussive/expectorant

Antitussive and expectorants help manage cough and clear mucus from the respiratory tract. Cough may result from underlying conditions like asthma, gastroesophageal reflux disease (GERD), or rhinitis, which should be addressed first. It can also be triggered by drugs (e.g., Angiotensin Converting Enzyme (ACE) inhibitors), smoking, or pollutants, and may have a habitual component. When no cause is found, antitussives and expectorants may be used. Dextromethorphan and codeine are common antitussives, with dextromethorphan for mild cough and codeine for more severe cases. Guaifenesin, an expectorant, thins mucus, aiding its expulsion and improving breathing. These medicines provide comprehensive options for managing both productive and non-productive coughs.

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| **Codeine** | |
| Pharmacological class | Opioid analgesic |
| Dosage form | Tablet: 30mg (phosphate) |
| Indications | Antitussive in lower doses and treat mild to moderate pain |
| Dose and administration | **Antitussive, Oral:**  **Adults:** 15–30 mg 3–4 times a day Maximum, 120mg in 24 hours. |
| Contraindications | Hypersensitivity reactions to the drug and other phenanthrene derivative opioid agonists, child under 12 years old, productive cough, respiratory depression, head injury, acute alcoholism |
| Drug interactions | Monoamine oxidase inhibitors (MAOIs), CNS depressants (e.g., benzodiazepines, alcohol), anticholinergics, CYP2D6 inhibitors (e.g., fluoxetine, paroxetine) |
| Side effects | Constipation, nausea, vomiting, dizziness, sedation, difficulty with micturition, ureteric or biliary spasm, dry oral, headaches, sweating, facial flushing, respiratory depression, circulatory collapse, anaphylactoid reactions, dependence, euphoria |
| Cautions | Asthma, hepatic and renal impairment, history of drug abuse, elderly, pre-existing respiratory conditions |
| Storage condition | Store below 30°C. |
| **Dextromethorphan Hydrobromide** | |
| Pharmacological class | Antitussive |
| Dosage form | Syrup: 15mg/5ml |
| Indications | Symptomatic relief of non-productive cough |
| Dose and administration | **Oral:**  **Adult:** 10 to 20 mg every 4 hours, or 30 mg every 6 to 8 hours, to a usual maximum of 120 mg in 24 hours.  **Child (6-12 years):** 5 to 10 mg every 4 hours or 15 mg every 6 to 8 hours to a maximum of 60mg in 24 hours  **Child (2 to 6 years):** 2.5 to 5 mg every 4 hours, or 7.5 every 6 to 8 hours, to a maximum of 30 mg in 24 hours. |
| Contraindications | Respiratory failure, acute asthma, child under two years of age |
| Drug interactions | MAOIs, quinidine, CNS depressants (e.g., alcohol, benzodiazepines, opioids), amiodarone, fluoxetine, haloperidol, thioridazine |
| Side effects | Dizziness, drowsiness, nausea or vomiting, stomach pain, allergic reactions, hallucinations |
| Cautions | History of respiratory conditions or compromised respiratory function, substance abuse |
| Storage condition | Store below 30°C. |
| **Guaifenesin** | |
| Pharmacological class | Expectorant |
| Dosage form | Syrup: 100mg/5ml |
| Indications | Symptomatic relief of productive cough |
| Dose and administration | **Oral:**  **Adult:** 200 to 400 mg (10 to 20 ml) every 4 hours as needed Maximum dose: 2.4g (120 ml) in 24 hours.  **Child (6 to 12 years):** 100 to 200 mg (5 to 10 ml) every 4 hours as needed (maximum: 1.g (60 ml) in 24 hours)  **Child (2 to 6 years):** 50 to 100 mg (2.5 to 5 ml) every 4 hours as needed (maximum: 600 mg (30 ml) in 24 hours) |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Heparin |
| Side effects | Diarrhea, nausea or vomiting, drowsiness, stomach pain, allergic reactions |
| Cautions | Persistent or chronic cough such as those occurring with smoking, asthma, chronic bronchitis, or emphysema |
| Storage condition | Store below 30°C. |

## Anti-asthmatic and chronic obstructive pulmonary disease (COPD) medicines

These medicines manage chronic respiratory conditions by improving lung function, reducing inflammation, and preventing exacerbations. Bronchodilators like salbutamol and ipratropium relax airway muscles, offering rapid relief from bronchospasm. Inhaled corticosteroids like beclomethasone and budesonide reduce airway inflammation and prevent asthma attacks. Combination inhalers (e.g., budesonide with formoterol) provide both bronchodilation and anti-inflammatory effects. Systemic corticosteroids like prednisolone treat acute exacerbations, while long-acting bronchodilators like tiotropium are key for COPD maintenance. Emergency treatments include epinephrine and magnesium sulfate, with oxygen therapy for hypoxemic patients.

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| **Aminophylline** | |
| Pharmacological class | Bronchodilator (xanthine derivative) |
| Dosage form | Injection: 250mg/10ml in 10ml |
| Indications | Reversible airways obstruction, acute severe and chronic asthma, severe acute exacerbation of COPD |
| Dose and administration | **Adult:**  Slow IV, 250-500 mg (5 mg/kg) for over 20 minutes or diluted with 10 ml of water for injection.  Maintenance, if required, 0.5 mg/kg per hour by slow IV infusion for a period of 24 hours only.  **Elderly:** 0.3mg/kg per hour by slow IV infusion.  **Child:**  Slow IV, 5 mg/kg  Maintenance, if required,  **6 months-9 years:** 1 mg/kg per hour by slow IV infusion.  **For 10 to 16 years:** 0.8 mg/kg per hour by slow IV infusion. |
| Contraindications | Hypersensitivity to the drug and other xanthine derivatives (ethylenediamine, theophylline, caffeine, or theobromine), acute porphyria, use in child under 6 months of age |
| Drug interactions | Zafirlukast, methotrexate, lithium |
| Side effects | Nausea, vomiting, headache, insomnia, nervousness, diarrhea, gastrointestinal (GI) discomfort, increased urination, seizures, cardiac arrhythmias, severe hypotension, allergic reactions |
| Cautions | Cardiac arrhythmias, hypertension, hyperthyroidism, peptic ulcers, severe hypoxemia |
| Storage condition | Store below 30°C. |
| **Beclomethasone dipropionate** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Oral Inhalation (aerosol): 50mcg/dose, 100mcg/dose, 200mcg/dose |
| Indications | Maintenance treatment in the prophylaxis of asthma attacks |
| Dose and administration | **Inhalational:**  **Adult:** 200–400 mcg twice daily; increased, if necessary, up to 800 mcg twice daily, dose to be adjusted as necessary.  **Child (5–11 years):** 100–200 mcg twice daily, dose to be adjusted as necessary. |
| Contraindications | Hypersensitivity to the drug or any of the excipients |
| Drug interactions | Ritonavir, metronidazole |
| Side effects | Throat irritation, candidiasis in oral and throat, taste disturbances, hoarseness, dry mouth, systemic side effects including Cushing’s syndrome, cushingoid features, adrenal suppression, decrease in bone mineral density, cataract, glaucoma, blurred vision. |
| Cautions | High doses prescribed for prolonged periods, use in child and adolescents receiving prolonged treatment, active pulmonary tuberculosis and untreated fungal, bacterial, or viral infections. |
| Storage condition | Store below 30°C. Protect from moisture. |
| **Budesonide** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Inhaler (Metered Dose Inhaler - MDI): 100 mcg/dose, 200 mcg/dose or 400 mcg/dose  Dry Powder Inhaler (DPI): 90 mcg/dose, or 180 mcg/dose  Nebulizer Solution: 0.25 mg/2 ml, 0.5 mg/2 ml, or 1 mg/2 ml  Nasal Spray: 32 mcg per spray  Capsule: 3 mg |
| Indications | Prophylaxis and treatment of asthma, chronic rhinosinusitis |
| Dose and administration | **Asthma (Inhalation):**  **Adult:** 100–800 mcg twice daily, dose to be adjusted as necessary.  **Child (6–11 years):** 100–400 mcg twice daily, dose to be adjusted as necessary.  **Inhalation of Nebulized Suspension:**  **Adult:** Initially 0.25–1 mg twice daily, adjusted according to response.  **Chronic Rhinosinusitis (Nasal Spray)**  **Adult and Child 6 years and older:** 64 mcg (1 spray per nostril) once daily, up to 256 mcg daily.  *Note:* *Doses higher than recommended may be used in severe disease.* |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Ketoconazole, itraconazole, voriconazole, posaconazole, clarithromycin, telithromycin, nefazodone, HIV-protease inhibitors, quinidine, disopyramide, procainamide, phenothiazines, antihistamines (e.g., terfenadine), tricyclic antidepressants, xanthine derivatives, steroids, and diuretics |
| Side effects | Refer notes under Beclomethasone dipropionate side effects |
| Cautions | Refer notes under Beclomethasone dipropionate cautions |
| Storage condition | Store below 30°C. Protect from moisture. |
| **Budesonide + formoterol** | |
| Pharmacological class | Corticosteroid + Long-acting Beta2-agonist (LABA) |
| Dosage form | **MDI:**  80 mcg Budesonide + 4.5 mcg Formoterol per actuation  160 mcg Budesonide + 4.5 mcg Formoterol per actuation  320 mcg Budesonide + 9 mcg Formoterol per actuation  **DPI:**  160 mcg Budesonide + 4.5 mcg Formoterol per actuation  320 mcg Budesonide + 9 mcg Formoterol per actuation |
| Indications | Asthma, COPD |
| Dose and administration | **Asthma:**  **Adult:** 1-2 inhalations twice daily. Some patients may require up to a maximum of 4 inhalations twice daily.  **Child (6 years and older):** A lower strength (80 mcg/4.5 mcg per inhalation) is available.  **COPD:**  **Adult:** 2 inhalations twice daily. |
| Contraindications | Hypersensitivity to the drugs or to any of the excipients. |
| Drug interactions | Ketoconazole, itraconazole, voriconazole, posaconazole, clarithromycin, telithromycin, nefazodone, HIV-protease inhibitors, quinidine, disopyramide, procainamide, phenothiazines, antihistamines (e.g., terfenadine), tricyclic antidepressants, xanthine derivatives, steroids, and diuretics |
| Side effects | Tremor, palpitations, candida infections in the oropharynx, headache, mild irritation in the throat, coughing, hoarseness, nausea, muscle cramps, hypokalemia, hyperglycemia, paradoxical bronchospasm |
| Cautions | Abrupt discontinuation, thyrotoxicosis, phaeochromocytoma, diabetes mellitus, untreated hypokalemia, hypertrophic obstructive cardiomyopathy, idiopathic subvalvular aortic stenosis, severe hypertension, aneurysm, severe cardiovascular disorders such as ischemic heart disease, QT prolongation, tachyarrhythmias |
| Storage condition | Store below 30°C. |
| **Epinephrine (adrenaline)** | |
| Pharmacological class | Sympathomimetic |
| Dosage form | Ampoules for Injection:  1 mg/ml (1:1000) for IM or SC injection   * 1. mg/ml (1:10,000) for IV use |
| Indications | Anaphylactic shock, cardiac arrest, bronchospasms, open-angle glaucoma, added to local anesthetics, severe angioedema |
| Dose and administration | **Severe asthma exacerbation (acute care management):**  **Adult:** 0.3 to 0.5 mg (0.3 to 0.5 ml of 1 mg/ml solution) IM or SC every 20 minutes for 3 doses.  **Child (1 to 12 years):** 0.01 mg/kg (0.01 ml/kg of 1 mg/ml solution) IM or SC, up to a maximum of 0.5 mg/dose every 20 minutes for 3 doses.  **Note:** Rapid IV infusion may cause death from cerebrovascular hemorrhage or cardiac arrhythmias. |
| Contraindications | Asymmetric septal hypertrophy, phaeochromocytoma, tachyarrhythmias, narrow-angle glaucoma, organic brain damage, cardiac dilation, coronary insufficiency, uncontrolled hypertension |
| Drug interactions | Other sympathomimetic agents, alpha-adrenergic blocking agents, beta-blockers, MAOIs, anesthetics, digoxin, theophylline, tricyclic antidepressants |
| Side effects | Tachycardia, arrhythmia, hypertension, tremor, anxiety, sweating, nausea, vomiting, weakness, dizziness, hypotension, pulmonary edema, headache, peripheral vasoconstriction, paradoxical bronchospasm |
| Cautions | Hyperthyroidism, hypertension, diabetes mellitus, ischemic heart disease, arrhythmias, cerebrovascular disease, elderly patients, cerebral arteriosclerosis, Parkinson’s disease, hypercalcemia, hyperreflexia, hypokalemia, prostate disorders, psychoneurosis, severe angina, susceptibility to angle-closure glaucoma, pregnancy, renal impairment. |
| Storage condition | Store below 30°C. Protect from light and freezing. |
| **Fluticasone + Salmeterol** | |
| Pharmacological class | Corticosteroid + Long-acting Beta2-agonist (LABA) |
| Dosage form | **MDI:**  50 mcg Salmeterol + 125 mcg Fluticasone per actuation  50 mcg Salmeterol + 250 mcg Fluticasone per actuation  **DPI:**  50 mcg Salmeterol + 100 mcg Fluticasone per dose  50 mcg Salmeterol + 250 mcg Fluticasone per dose  50 mcg Salmeterol + 500 mcg Fluticasone per dose |
| Indications | Asthma, COPD |
| Dose and administration | **Asthma**  **Adult and Child 12 years and older:**  MDI: 2 inhalations twice daily.  DPI: 1 inhalation twice daily.  **Child 4 to 12 years**  MDI: 2 inhalations of the lower strength (50 mcg Salmeterol + 100 mcg Fluticasone) twice daily.  DPI: 1 inhalation of the lower strength (50 mcg Salmeterol + 100 mcg Fluticasone) twice daily.  **COPD:**  DPI: 1 inhalation of the 50 mcg Salmeterol + 500 mcg Fluticasone twice daily. |
| Contraindications | Known hypersensitivity to the drugs or any component of the formulation, primary treatment of status asthmaticus or other acute episodes of asthma or COPD |
| Drug interactions | Beta-blockers, CYP3A4 inhibitors, diuretics, MAO inhibitors, tricyclic antidepressants |
| Side effects | Throat irritation, hoarseness, and candidiasis (oral thrush), headache, musculoskeletal pain, and increased risk of upper respiratory infections, cardiovascular effects such as palpitations and tachycardia, hyperglycemia, growth retardation in child, and adrenal suppression with prolonged use |
| Cautions | Long term use; infections including tuberculosis, fungal, bacterial, viral, or parasitic infections; cardiovascular disorders especially coronary insufficiency, cardiac arrhythmias, and hypertension; thyrotoxicosis, diabetes mellitus, and ketoacidosis. |
| Storage condition | Store below 30°C. Protect from moisture. |
| **Hydrocortisone Succinate** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection: 40mg/ml, 80mg/2ml, 100 mg/vial |
| Indications | Adrenocortical insufficiency, hypersensitivity reactions including anaphylactic shock, acute asthma exacerbation, COPD exacerbation |
| Dose and administration | **Acute Asthma Exacerbation:**  **Adult:** 100-200 mg IV initially, then 100 mg every 6-8 hours as needed.  **Child:** 1-2 mg/kg/dose IV every 6 hours as needed.  **Severe COPD Exacerbation:**  **Adult:** 100-200 mg IV initially, then 100 mg every 6-8 hours as needed. |
| Contraindications | Systemic infection, live virus vaccines |
| Drug interactions | Acetylsalicylic acid, amiloride, amphotericin B, digoxin, ibuprofen, insulin, methotrexate, phenobarbital, phenytoin, rifampicin, ritonavir, warfarin, atenolol, calcium salts, carbamazepine, contraceptives, enalapril, erythromycin, glibenclamide, hydralazine, metformin, nifedipine, propranolol, salbutamol, spironolactone, influenza vaccine, live vaccines |
| Side effects | Refer notes under budesonide side effects |
| Cautions | Refer notes under budesonide cautions |
| Storage condition | Store below 30°C. Protect from freezing. |
| **Ipratropium bromide** | |
| Pharmacological class | Anticholinergic |
| Dosage form | MDI: 20mcg/metered dose, 40mcg/metered dose inhalation |
| Indications | Chronic asthma, COPD |
| Dose and administration | **Adult:**  **Chronic asthma and COPD, by aerosol inhalation**: 20–40 mcg 3–4 times daily.  **COPD, by inhalation of nebulized solution:** 250–500 mcg 3–4 times daily.  **Pediatric:**  **Chronic asthma, COPD by aerosol inhalation**  **Child up to 6 years:** 20 mcg 3 times daily.  **Child 6–12 years:** 20–40 mcg 3 times daily. |
| Contraindications | Closed angle glaucoma, blockage of the urinary bladder, enlarged prostate, inability to completely empty the bladder |
| Drug interactions | Pramlintide, dimenhydrinate, donepezil, galantamine, tacrine, levodopa, other anticholinergics |
| Side effects | Dry mouth, urinary retention, constipation, tachycardia, atrial fibrillation, paradoxical bronchospasm |
| Cautions | Prostatic hypertrophy, glaucoma |
| Storage condition | Store below 30°C. |
| **Magnesium sulphate** | |
| Pharmacological class | Laxative, Mineral and electrolyte |
| Dosage form | Injectable solution: 1 g/10 ml (10%), 2 g/20 ml (10%) |
| Indications | Rapid bowel evacuation in preparation for rectal and bowel examination, preparation for selective colon surgery, to hasten excretion of poisonous substances (except acids or alkalis) from the GIT, status asthmaticus |
| Dose and administration | **Status asthmaticus**  **Adult:** 1.2 to 2 g IV infusion over 20 minutes. Repeat depending on the patient's response and clinical judgment.  **Child:** 25 to 50 mg/kg IV infusion over 20 minutes, with a maximum single dose of 2 g. |
| Contraindications | Acute GI conditions, colostomy, ileostomy, dehydration, renal impairment |
| Drug interactions | Anticoagulants, digitalis glycoside, chlorpromazine, sodium polystyrene sulfonate, tetracycline |
| Side effects | Colic, cramping, diarrhea, gas formation, increased thirst, electrolyte imbalance |
| Cautions | Renal impairment, hepatic impairment, elderly |
| Storage condition | Store below 30°C. |
| **Prednisolone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Tablet: 5mg |
| Indications | Suppression of inflammatory and allergic disorders, asthma, COPD, immune suppression |
| Dose and administration | **Acute exacerbations of asthma, Oral:**  **Adult:** Initially 40-60 mg daily for 1-2 weeks during exacerbations, followed by a gradual tapering based on clinical response. Maintenance doses typically range from 5-15 mg daily.  **Child:** 1-2 mg/kg/day (maximum 60 mg/day) for 3-5 days.  **Acute exacerbations of COPD:**  **Adult:** 30-40 mg per day for 5-7 days |
| Contraindications | Hypersensitivity to the drug or any component, systemic fungal infections. |
| Drug interactions | NSAIDs, anticoagulants (e.g., warfarin), antidiabetic drugs, antifungal drugs (e.g., ketoconazole), CYP3A4 inducers (e.g., rifampcin, phenytoin, carbamazepine), CYP3A4 inhibitors (e.g., clarithromycin, ritonavir), diuretics, live vaccines, anticholinesterases, estrogens (e.g., oral contraceptives) |
| Side effects | Weight gain, fluid retention, increased blood sugar, mood changes, insomnia, anxiety, peptic ulcers, gastrointestinal bleeding, osteoporosis, high blood pressure, increased infection risk, muscle weakness, thin skin, slow wound healing, cataracts, glaucoma. |
| Cautions | Infection risk, history of gastrointestinal ulcers or bleeding, diabetes, osteoporosis, hypertension, heart failure, psychiatric disorders, glaucoma or cataracts, concurrent NSAID use, adrenal suppression risk. |
| Storage condition | Store below 30°C. Protect from freezing and light. |
| **Salbutamol (Albuterol)** | |
| Pharmacological class | Short acting beta2 agonist (SABA) |
| Dosage form | Inhalation (aerosol): 0.1 mg (as sulfate) per dose  Respirator solution for use in nebulizers: 5 mg/ml (as sulfate)  Injection: 50 mcg/ml (as sulfate) in 5 ml ampoule  Tablets: 2 mg, 4 mg  Syrup: 2 mg/5 ml |
| Indications | Asthma, bronchospasm associated with other conditions such as acute bronchitis, emphysema, chronic bronchitis |
| Dose and administration | **Inhalation:**  **MDI:**  **Adult and Child 12 years and older:** 1-2 inhalations (100-200 mcg) every 4-6 hours as needed.  **Child 4 to 12 years:** 1-2 inhalations (100-200 mcg) every 4-6 hours as needed.  **Child under 4 years:** Consult a healthcare provider for appropriate dosing.  **DPI:**  **Adult and Child 12 years and older:** 1 inhalation (200 mcg) every 4-6 hours as needed.  **Child 4 to 12 years:** 1 inhalation (200 mcg) every 4-6 hours as needed.  **Child under 4 years:** Consult a healthcare provider for appropriate dosing.  **Nebulized Solution**  **Adult and Child 12 years and older:** 2.5 mg to 5 mg via nebulizer every 4-6 hours as needed.  **Child 2 to 12 years:** 2.5 mg via nebulizer every 4-6 hours as needed.  **Child under 2 years:** Consult a healthcare provider for appropriate dosing.  **Child 1 month–4 years:** 2.5 mg, repeat every 20–30 minutes or when required; give via oxygen-driven nebulizer if available  **Child 5–11 years:** 2.5–5 mg, repeat every 20–30 minutes or when required; give via oxygen-driven nebulizer if available  **Child 12–17 years:** 5 mg, repeat every 20–30 minutes or when required; give via oxygen-driven nebulizer if available  **Oral tablet:**  **Adults and Child 12 years and older:** 2-4 mg orally three to four times a day.  **Child 6 to 12 years:** 2 mg orally three to four times a day.  **Child under 6 years:** Use of tablets is not typically recommended; consult a healthcare provider for appropriate dosing.  **Syrup:**  **Adult and Child 12 years and older:** 2-4 mg (5-10 ml) three to four times a day.  **Child 6 to 12 years:** 2 mg (5 ml) three to four times a day.  **Child 2 to 6 years:** 1-2 mg (2.5-5 ml) three to four times a day.  **Child under 2 years:** Consult a healthcare provider for appropriate dosing. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Nonselective beta-blockers, cardiac digoxin, diuretics, corticosteroids, other beta-agonists, acetazolamide, methyldopa |
| Side effects | Muscle cramps, oral irritation, throat irritation, palpitations, tremor, nervousness, headache, paradoxical bronchospasm, hypokalemia |
| Cautions | Hyperthyroidism, myocardial insufficiency, arrhythmias, susceptibility to QT-interval prolongation, hypertension, diabetes mellitus, pregnancy |
| Storage condition | Store below 30°C. |
| **Tiotropium** | |
| Pharmacological class | Anticholinergic |
| Dosage form | DPI: 18 mcg per capsule for inhalation.  MDI: 1.25 mcg, 2.5 mcg |
| Indications | Maintenance treatment of COPD, severe asthma (as an add-on to inhaled corticosteroid and at least one controller) |
| Dose and administration | **COPD**  **Adult**  Inhale the contents of one capsule (18 mcg) once daily using a device.  Two inhalations (2.5 mcg per actuation, total 5 mcg) once daily.  **Asthma**  **Adult and Child 12 years and older:** Two inhalations (2.5 mcg per actuation, total 5 mcg) once daily.  **Child 6 to 12 years:** Two inhalations (1.25 mcg per actuation, total 2.5 mcg) once daily. |
| Contraindications | Hypersensitivity to the drug or any of the excipients, Hypersensitivity to atropine or its derivatives (e.g., ipratropium or oxitropium), narrow-angle glaucoma, in patients with allergies to milk (powder tiotropium capsules). |
| Drug interactions | Pramlintide, dimenhydrinate, donepezil, galantamine, tacrine, clozapine |
| Side effects | Dry mouth, constipation, tachycardia, urinary retention, glaucoma, paradoxical bronchospasm, hypersensitivity reactions including rash, angioedema |
| Cautions | Prostatic hyperplasia, bladder neck obstruction, narrow-angle glaucoma, moderate to severe renal impairment, contact with eyes, first dose of nebulized solution due to the risk of paradoxical bronchospasm. |
| Storage condition | Store below 30°C. |

## Medicines used for sarcoidosis and interstitial lung disease

Medicines for sarcoidosis and interstitial lung disease (ILD) are used to manage inflammation and immune responses that affect lung tissue. Prednisolone is commonly used to reduce inflammation and manage symptoms in both sarcoidosis and ILD. For patients requiring long-term immunosuppression, drugs like methotrexate and azathioprine are employed to control the disease while minimizing steroid use. These are essential in slowing disease progression, managing symptoms, and improving the overall lung function and quality of life for patients with sarcoidosis and ILD.

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| **Azathioprine** | |
| Pharmacological class | Immunosuppressant |
| Dosage form | Tablet: 50 mg |
| Indications | Sarcoidosis, ILD, rheumatoid arthritis that has not responded to other disease-modifying drugs, Severe systemic lupus erythematosus and other connective tissue disorders, dermatomyositis, polymyositis in cases of corticosteroid resistance, organ transplantation (in combination with steroids and/or other immunosuppressants), autoimmune hemolytic anemia, auto-immune chronic active hepatitis, pemphigus vulgaris, polyarteritis nodosa, chronic refractory idiopathic thrombocytopenic purpura, pyoderma gangrenosa |
| Dose and Administration | **For Sarcoidosis and ILD,** oral**:**  **Adult,** Start with 1-2 mg/kg daily. The dose can be given once or twice daily. The dose can be adjusted according to clinical response, ranging from 50-150 mg daily. Maintenance doses usually range from 1-3 mg/kg daily. |
| Contraindications | Hypersensitivity to the drug or mercaptopurine, pregnancy |
| Drug interactions | Allopurinol, sulfasalazine, warfarin, sulfamethoxazole + trimethoprim, phenytoin, live vaccines |
| Side effects | Bone marrow suppression (dose-related), increased risk of infection, leukopenia, pancreatitis, thrombocytopenia, malaise, dizziness, vomiting, diarrhea, fever, rigors, myalgia, arthralgia, rash, hypotension, interstitial nephritis, liver impairment, cholestatic jaundice, hair loss, increased susceptibility to infections, colitis |
| Cautions | Elderly, hepatic or renal impairment, bone marrow suppression, concomitant use with other anti-folate drugs, signs of gastrointestinal toxicity, pneumonitis, pregnancy, breastfeeding |
| Storage condition | Store below 30°C. Protect from light. |
| **Methotrexate** | |
| Pharmacological class | Immunosuppressant |
| Dosage form | Tablet: 2.5 mg, 5 mg, 7.5 mg, 10 mg, 15 mg,  Powder for Injection: 2.5 mg/ml, 50mg in vial |
| Indications | Rheumatoid arthritis, psoriatic arthritis, other systemic rheumatic diseases, sarcoidosis, ILD |
| Dose and administration | **For Sarcoidosis and ILD, o**ral/IV/IM**:**  **Adult:** Start with 7.5 mg once weekly, either as a single dose or divided into three doses given every 12 hours. The dose can be adjusted according to clinical response, up to a maximum of 25 mg weekly. |
| Contraindications | Pregnancy, breastfeeding, immunodeficiency syndromes |
| Drug interactions | Influenza virus vaccine quadrivalent (intranasal), measles, mumps, and rubella vaccine (live), measles, mumps, rubella, and varicella vaccine (live), rotavirus oral vaccine, acetylsalicylic acid, amoxicillin, ampicillin, benzyl penicillin, dexamethasone, doxycycline, hydrocortisone, ibuprofen, nitrous oxide |
| Side effects | With oral use: anemia, decreased appetite, diarrhea, drowsiness, fatigue, gastrointestinal discomfort, headache, increased risk of infection, leukopenia, nausea, oral disorders, respiratory disorders, skin reactions, throat ulcer, thrombocytopenia, vomiting  With parenteral use: anemia, decreased appetite, chest pain, cough, diarrhea, drowsiness, dyspnea, fatigue, fever, gastrointestinal discomfort, headache, leukopenia, malaise, nausea, oral disorders, respiratory disorders, skin reactions, throat complaints, thrombocytopenia, vomiting |
| Cautions | Refer under notes on Azathioprine |
| Storage condition | Store below 30°C. Protect from light. |
| **Mycophenolate Mofetil** | |
| Pharmacological class | Immunosuppressant |
| Dosage form | Tablet: 250 mg, 500 mg  Oral Suspension: 200 mg/ml |
| Indications | Sarcoidosis, ILD |
| Dose and administration | **Sarcoidosis and ILD:**  **Adult:** Start with 500 mg twice daily. The dose can be increased to 1 g twice daily based on clinical response and tolerability. |
| Contraindications | Hypersensitivity to the drug, pregnancy |
| Drug interactions | Antacids containing aluminium and magnesium, cholestyramine, acyclovir, ganciclovir, live vaccines |
| Side effects | Diarrhea, nausea, vomiting, abdominal pain, leukopenia, anemia, thrombocytopenia increased risk of infections, renal impairment, hyperglycemia, hypertension, neoplasms (skin cancers and lymphoproliferative disorders) |
| Cautions | Infections, malignancies, lactation, renal impairment, active GI disease, such as peptic ulcer disease, severe chronic infections, hepatic impairment |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Prednisolone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Tablet: 5mg  Injection (Sodium Phosphate): 10mg/ml, 25mg/ml in 2ml ampoule |
| Indications | Sarcoidosis, ILD, Suppression of inflammatory and allergic disorders, inflammatory bowel disease, asthma, rheumatic disorder, with antineoplastic drugs for acute leukaemia and lymphomas, treatment of adrenocortical insufficiency, immune suppression |
| Dose and administration | **For Sarcoidosis and ILD, Oral:**  **Adult:** Start with an initial dose of 20-40 mg daily, taken preferably in the morning after breakfast. The dose can be tapered based on clinical response and tolerability, to a maintenance dose of 5-15 mg daily.  **Injection (Sodium Phosphate):** Used in severe cases or when oral administration is not feasible. Initial dose of 10-25 mg, adjusted based on clinical response. |
| Contraindications | Refer under notes on prednisolone contraindication |
| Drug interactions | Refer under notes on prednisolone drug interactions |
| Side effects | Refer under notes on prednisolone side effects |
| Cautions | Refer under notes on prednisolone caution |
| Storage condition | Store below 30°C. Protect from freezing and light. |

## Medicines used for apnea of prematurity

Medicines for apnea of prematurity are vital for managing a common condition in premature infants, characterized by episodes of paused breathing. Caffeine citrate is the primary treatment, stimulating the central nervous system and respiratory drive, thereby reducing the frequency and severity of apnea episodes. Aminophylline can be used as an alternative or adjunct therapy. These medications help stabilize breathing patterns, reduce the need for mechanical ventilation, and promote better growth and development in premature infants.

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| **Aminophylline** | |
| Pharmacological class | Bronchodilator (xanthine derivative) |
| Dosage form | Injection: 250mg/10ml in 10ml |
| Indications | Apnea of prematurity, reversible airways obstruction, acute severe and chronic asthma, severe acute exacerbation of COPD |
| Dose and administration | **Child:**  Slow IV 5 mg/kg  Maintenance if required,  **6 months - 9 years:** 1 mg/kg per hour by slow IV infusion.  **10 to 16 years:** 0.8 mg/kg per hour by slow IV infusion. |
| Contraindications | Refer to aminophylline under anti-asthmatic and COPD medicines |
| Drug interactions | Refer to aminophylline under anti-asthmatic and COPD medicines |
| Side effects | Refer to aminophylline under anti-asthmatic and COPD medicines |
| Cautions | Refer to aminophylline under anti-asthmatic and COPD medicines |
| Storage condition | Store below 30°C. |
| **Caffeine citrate** | |
| Pharmacological class | Central Nervous System stimulant (methylxanthine) |
| Dosage form | Injection: 20 mg/ ml  Oral liquid: 20 mg/ ml |
| Indications | Treatment of apnea of prematurity, neonatal apnea in preterm infants |
| Dose and Administration | **Neonate:**  20 mg/kg as a loading dose, then 5 mg/kg once daily, starting 24 hours after the loading dose.  The maintenance dose may be increased by 5 mg/kg every 24 hours to a maximum of 20 mg/kg/day, unless adverse effects develop.  Continue treatment for 4–5 days after cessation of apnea. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Ciprofloxacin, theophylline |
| Side effects | Irritability, restlessness, tachycardia, feeding intolerance, gastrointestinal disturbances, diuresis, jitteriness, tremors, hyperglycemia, hypokalemia. |
| Cautions | Other CNS stimulants, seizure disorders, renal impairment, hepatic impairment. |
| Storage condition | Store below 30°C. |

# Anti-infectives

Anti-infectives are large group of medicines with diverse mechanisms that work to prevent or treat infections. They include antibacterial, antifungal, antiviral, antiprotozoal and anthelminthic medications. Many infectious diseases once considered incurable and lethal are now amenable to treatment with a few anti-infective pills. The remarkable and specific activity of anti-infective drugs is due to their selectivity for targets that are either unique to microorganisms or much more important in these organisms than in humans.

## Antibacterials

**Penicillins**

Penicillins are β-lactam compounds, which constitute one of the most important group of antibiotics. The penicillins are bactericidal and act by interfering with bacterial cell wall synthesis. They are grouped into three major classes: naturally occurring penicillins (penicillin G and V), antistaphylococcal penicillins (cloxacillin and dicloxacillin) and extended/broad spectrum penicillins (aminopenicillins and antipseudomonal penicillins).

Natural penicillins have superior activity against gram-positive organisms, gram-negative cocci, and non-β-lactamase producing anaerobes while they exhibit poor activity against gram-negative rods. Anti-staphylococcal penicillins are found to be resistant to staphylococcal β-lactamases. The third class, broad/extended-spectrum penicillins, retain the antibacterial spectrum of natural penicillin and have improved activity against gram-negative organisms.

Benzylpenicillin, the parent compound of penicillins, is administered parenterally due to gastric acid instability. Moreover, it is inactivated by penicillinase-producing bacteria. Long-acting preparations like procaine and benzathine penicillins slowly release benzylpenicillin after injection. Ampicillin is a broad-spectrum antibiotic with a broader spectrum than benzylpenicillin. It is less effective against gram-positive bacteria but more effective for gram-negative organisms. Ampicillin is acid stable and can be administered orally. Amoxicillin, with a hydroxyl group, is better absorbed from the gastrointestinal tract. Blood levels of all penicillins can be raised by simultaneous administration of probenecid, which increases therapeutic efficacy of penicillins in systemic infections except in cases of gonorrhea and other sexually transmitted infections.

Penicillins can cause hypersensitivity reactions, leading to rashes and anaphylaxis, which can be fatal. These reactions may have crossover sensitivity with other penicillin derivatives, cephalosporins or carbapenems. Moreover, high doses or intrathecal injections of penicillin can cause fatal encephalopathy. Oral penicillin therapy can cause antibiotic-associated diarrhea, mostly with broad-spectrum penicillins.

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| **Amoxicillin (Access)** | |
| Pharmacological class | Penicillin |
| Dosage form | Capsule: 250 mg, 500 mg  Tablet: 125mg, 250mg, 500 mg  Oral powder for reconstitution: 125mg/5ml, 250 mg/5ml |
| Indications | Upper respiratory tract infections, bronchitis, pneumonia, infections of the ear, nose and throat (otitis media, peritonsillar infections), urinary tract infections, dental abscess, osteomyelitis, Lyme disease, endocarditis prophylaxis, post-splenectomy prophylaxis, gynecological infections, gonorrhea, shigellosis, and *Helicobacter pylori* eradication (in combination with other drugs). |
| Dose and administration | **Infections due to sensitive organisms; Oral:**  **Child <3 months**: 30 mg/kg daily in 2 divided doses  **Child >3 months and < 40 kg**: 25 mg/kg daily in 2 divided doses or 20 mg/kg daily in 3 divided doses; in severe infections increase up to 45 mg/kg daily in 2 divided doses or 40 mg/kg daily in 3 divided doses; in acute otitis media: 80-90mg/kg/day in 2 divided doses  **Child >3 months and 40 kg:** 500 mg twice daily or 250 mg 3 times daily for 10-14 days; in severe infections increase dose up to 875 mg 2 times a day or 500 mg 3 times a day  **Adult:** 500 mg every 8 hours, increased if necessary to 1 g every 8 hours, increased dose used in severe infections  **Prophylaxis (Infective Endocarditis):**  **Adult:** 2g 30-60 minute before procedure  ***Helicobacter pylori* eradication; Oral:**  **Adult:** 1 g twice daily for 10-14 days  *Note:* *Reconstitution and administration according to manufacturer’s directions* |
| Contraindications | Hypersensitivity to the drug or any penicillins or other β-lactams. |
| Drug interactions | Probenecid, allopurinol, oral contraceptives, methotrexate, warfarin, live cholera vaccine, mycophenolate mofetil, tetracyclines, chloramphenicol, aminoglycosides, macrolides, sulfonamides. |
| Side effects | Allergic reaction (anaphylaxis, skin rash, joint pain, fever), GIT reaction (mild diarrhea, nausea, vomiting), mucocutaneous candidiasis, pseudomembranous colitis. |
| Cautions | History of allergy, renal impairment, erythematous rashes (common in glandular fever, acute lymphatic leukemia, chronic lymphatic leukemia, cytomegalovirus infection) |
| Storage condition | Store below 30° C. Oral suspension remains stable for 14 days below 30° C. |
| **Amoxicillin + clavulanic acid (Access)** | |
| Pharmacological class | Penicillin and β-lactamase inhibitor combination |
| Dosage form | Tablet (dispersible): amoxicillin 200 mg (as trihydrate) + clavulanic acid 28.5 mg (as potassium salt); amoxicillin 250 mg (as trihydrate) + clavulanic acid 62.5 mg (as potassium salt)  Tablet: amoxicillin 500mg (as trihydrate) + 125mg clavulanic acid, amoxicillin 875mg (as trihydrate) +125 mg clavulanic acid, amoxicillin 250 mg (as trihydrate) + 125 mg clavulanic acid  Powder to reconstitute: 125mg amoxicillin (as trihydrate) + 31.25mg clavulanic acid (as potassium salt)/5ml, amoxicillin 200mg (as trihydrate) + 28.5mg clavulanic acid (as potassium salt) /5ml, 250mg amoxicillin (as trihydrate) + 62.5mg clavulanic acid (as potassium salt)/5ml, 400mg amoxicillin (as trihydrate) + clavulanic acid 57mg (as potassium salt)/5ml  Injection**:** amoxicillin 500mg (as sodium salt) + clavulanic acid 100mg (as potassium salt); amoxicillin 1g (as sodium) + clavulanic acid 200mg (as potassium salt) in vial |
| Indications | Infection due to β-lactamase-producing bacteria, in cases where amoxicillin alone is not effective, including respiratory tract infections, diabetic foot, genito-urinary and abdominal infections, cellulites, animal bites, severe dental infections, otitis media, neutropenic fever, bone and joint infections, surgical prophylaxis. |
| Dose and administration | *All doses are expressed as amoxicillin*  **Infections due to susceptible β- lactamase producing organisms and when amoxicillin alone is not effective**:  **Oral:**  **Child < 3 months:** 30mg/kg daily in 2 divided doses  **Child > 3 months and <40kg:** 25-45mg/kg daily in 3 divided doses  **Child> 3 months and 40 kg**: Use adult dose  **Adult:** 250mg every 8 hours, doubled in severe infections; for community acquired pneumonia, 875 mg every 12 hours  **Slow IV injection:**  **Neonate** and **premature infant:** 25mg/kg every 12 hours  **Infant up to 3 months:** 25mg/kg every 8 hours  **Child 3 months to 12 years:** 25mg/kg every 8 hours increased to 25 mg/kg every 6 hours in more severe infections  **Adult and Child over 12 years**: 1g every 8 hours, increased to 1g every 6 hours in severe infections  **Surgical prophylaxis in adults:**  **IV injection:** 1g at induction, with up to 2 to 3 further doses of 1g every 8 hours in high-risk procedures. |
| Contraindications | Hypersensitivity to the drug, history of amoxicillin + clavulanic acid, or penicillin associated jaundice or hepatic dysfunction. |
| Drug interactions | Refer to amoxicillin. |
| Side effects | Diarrhea, nausea, vomiting, abdominal discomfort, anorexia, flatulence, rash, urticaria, headache, dizziness, oral thrush (candidiasis), Stevens- Johnson syndrome. |
| Cautions | Pregnancy, breastfeeding, hepatic impairment, history of allergy, renal impairment, erythematous rashes. |
| Storage condition | Store below 30°C  Note: *for oral suspension, once reconstituted it should be stored between 2 and 8 o C, and discard after 10 days.* |
| **Ampicillin (Access)** | |
| Pharmacological class | Penicillin |
| Dosage form | Powder for injection: 250 mg, 500 mg, 1 g in vial (sodium salt) |
| Indications | Intrapartum prophylaxis, GI endoscopy (for high-risk patients undergoing high-risk procedures), respiratory tract infections, cholecystitis and gastrointestinal tract infections including typhoid. |
| Dose and administration | **Infections due to susceptible organisms**  **Adult and child 20 kg**  **IM:** 500mg 6 hourly  **IV (**By slow injection or infusion over 30-60 minutes**):** 500mg 4 or 6 hourly (up to 12g daily for severe infections including meningitis and septicemia), maximum 300 mg/kg/day  **Note**: In patients with renal impairment: GFR 10 to 50ml/min, dose interval 6-12 hours; GFR <10ml/min, dose interval 12-24 hours  **Child; IM or IV:**  **Child**: 20-50 mg/kg/dose 12 hourly. For meningitis or severe infections, 100mg/kg dose 12 hourly, IV  **Neonates:**  **IM or IV:** 50-200mg/kg/day in 2-4 divided doses |
| Contraindications | Refer to amoxicillin. |
| Drug interactions | Refer to amoxicillin. |
| Side effects | Refer to amoxicillin. |
| Cautions | Refer to amoxicillin. |
| Storage condition | Store below 30°C. |
| **Ampicillin + sulbactam (Watch)** | |
| Pharmacologicalclass | Penicillin and β-lactamase inhibitor combination |
| Dosage form | Powder for injection**:** 1000mg (ampicillin) + 500mg (sulbactam) |
| Indications | Infections caused by susceptible microorganisms: upper and lower respiratory tract infections, urinary tract infections, intra-abdominal infections, cholecystitis, endometritis, bacterial septicemia, skin and soft tissue infections, bone and joint infections, gonococcal infections, pre-or post-operatively in surgeries, and in termination of pregnancy or cesarean section pre-operatively to reduce postoperative sepsis. |
| Dose and  administration | **Adult**:  **IM or IV:** 1.5 to 3 grams (1 to 2 grams, Ampicillin and 500 mg to 1 gram, sulbactam) every 6 hours  **Child:**  **Child >1 month- 1 year**: 100-150 mg/kg (ampicillin component) IV every 6 hours, doubled in severe infections  **Child**  **1 year**: 100-200 mg/kg (ampicillin component) IV every 6 hours, doubled in severe infections  *Note:**Adults with impaired renal function may require a reduction in dose. The total sulbactam dose should not exceed 4 grams daily.* |
| Contraindications | Refer to amoxicillin and clavulanic acid. |
| Drug interactions | Refer to amoxicillin and clavulanic acid. |
| Side effects | Allergic reactions including anaphylaxis, serum sickness like reactions (skin rash, joint pain, fever), chest pain, antibiotic associated diarrhea, oral candidiasis, vaginal candidiasis, dysuria, edema, hepatic dysfunction, glossitis, leukopenia, platelet dysfunction, pain at injection site, thrombophlebitis, diarrhea, rash, seizures. |
| Cautions | Renal impairment, congestive heart failure, gastrointestinal disease, severe skin reactions such as Stevens-Johnson syndrome. |
| Storage condition | Store below 30oC. |
| **Benzathine benzylpenicillin (Access)** | |
| Pharmacological class | Penicillin |
| Dosage form | Powder for injection: 0.6 MIU, 1.2 MIU, 2.4 MIU; MIU= million international unit |
| Indications | Streptococcal pharyngitis, diphtheria carrier state, syphilis, rheumatic fever prophylaxis. |
| Dose and administration | **Primary prophylaxis of rheumatic fever:**  **Adult** and **Child** 30 Kg body weight: 1.2MIU as a single dose  **Child** < 30 Kg body weight: 600, 000 IU as a single dose  **Secondary prophylaxis of rheumatic fever:**  **Adult** and **Child** 30 Kg body weight, 1.2 MIU once every 3 – 4 weeks  **Child** < 30 Kg body weight: 0.6 MIU (450 mg) once every 3 – 4 weeks.  **Primary Syphilis:**  **Adult:** 2.4MIU as a single dose, divided between 2 sites.  **Late syphilis:**  **Adult:** 2.4 MIU divided between two sites, once weekly for 3 consecutive weeks.  **Congenital syphilis (where no evidence of CSF involvement):** **Child up to 2 years**: 37.5 mg/kg as a single dose.  **Note:** *administer in Deep IM injection.* |
| Contraindications | Hypersensitivity to the drug and other pencillins, intrathecal route. |
| Drug interactions | Refer to amoxicillin. |
| Side effects | Hypersensitivity reactions including urticaria, fever, joint pains, rashes, angioedema, anaphylaxis, serum sickness like reactions, hemolytic anemia, interstitial nephritis, neutropenia, thrombocytopenia, coagulation disorders and central nervous system toxicity including convulsions (especially with high doses or in severe renal impairment), paresthesia (with prolonged use), antibiotic associated diarrhea. |
| Cautions | History of allergy, renal failure, pregnancy, breastfeeding. |
| Storage condition | Store below 30oC. |
| **Benzyl penicillin (Access)** | |
| Pharmacological class | Penicillin |
| Dosage form | Powder for injection (sodium or potassium salt): 1 MIU (6oomg), 5MIU (3g), 10 MIU (6g) |
| Indications | Throat infections, otitis media, endocarditis, meningococcal disease, pneumonia, cellulitis, anthrax, prophylaxis in limb amputation and neurosyphilis. |
| Dose and administration | **Infections due to sensitive organisms;** IM or by slow IV injection or by infusion:  **Adult:** 2.4-4.8 g daily in 4 divided doses, increased, if necessary, in serious infections (single doses over 1.2 g intravenous route only)  **Preterm neonate and neonate under 1 week:** 50 mg/kg daily in 2 divided doses; doubled in meningococcal disease  **Neonate 1-4 weeks:** 75 mg/kg daily in 3 divided doses; doubled in meningococcal disease  **Child 1 month–12 years:** 100 mg/kg daily in 4 divided doses; doubled in meningococcal disease  **Endocarditis:**  **Adult:** in combination with another antibacterial, if necessary, 7.2 g daily in 6 divided doses, increased to 14.4 g if necessary (e.g. in enterococcal endocarditis or if benzyl penicillin used alone)  **Neurosyphilis:**  **Adult,** by slow IV injection: 1.8–2.4 g every 4 hours for 2 weeks  **Anthrax:**  **Adult:** in combination with other antibacterial, 2.4 g every 4 hours, in adults; and in child 150 mg/kg daily in 4 divided doses  **Intrapartum prophylaxis;** against group B streptococcal infection:  **Adult:** initially 3 g then 1.5 g every 4 hours until delivery  *Note:* *IV route is recommended in neonates and infants* |
| Contraindications | Penicillin hypersensitivity, intrathecal route. |
| Drug interactions | Allopurinol, methotrexate, probenecid, oral anticoagulants, aminoglycosides, mycophenolate mofetil, oral contraceptives, bacteriostatic antibacterials (e.g., erythromycin, tetracyclines). |
| Side effects | Hypersensitivity reactions including urticaria, fever, joint pains, rashes, angioedema, anaphylaxis, serum sickness-like reaction, CNS toxicity including convulsions, interstitial nephritis, hemolytic anemia, leucopenia, thrombocytopenia, coagulation disorder, antibiotic-associated diarrhea. |
| Cautions | History of β-lactam allergy, seizure disorder, renal failure, heart failure, pregnancy, breastfeeding, diabetes mellitus. |
| Storage condition | Store below 30oC. |
| **Cloxacillin (Access)** | |
| Pharmacological class | Penicillin |
| Dosage form | Capsule: 250mg, 500mg, 1gm (as sodium salt)  Powder for reconstitution:125mg/5ml, 250mg/5ml  Powder for Injection: 250mg, 500mg in vial |
| Indications | Infections due to β-lactamase-producing staphylococci including impetigo, cellulitis and other soft-tissue infections, staphylococcal endocarditis, septicemia, pneumonia and osteomyelitis. |
| Dose and administration | **For infections caused by sensitive organisms:**  **Adult**:  **Skin and soft-tissue infections:**  **Oral:** 250 to 500mg (base) every 6 hours  **IV:** 250 to 500mg (base) every 6 hours  **Osteomyelitis, endocarditis, bloodstream infections:**  **IV:** 2g (base) every 4 hours  **Child < 20kg:**  **Oral:** 25 – 50 mg/kg/day (base), in 4 divided doses, maximum 4gm.  **IV:** 25 – 50 mg/kg/day (base), di in 4 divided doses, maximum 4gm  **Child > 20kg: use adult dose**  *Note:* *for oral cloxacillin, take 1 hour before or 2 hours after meals* |
| Contraindications | Hypersensitivity to the drug or any other penicillins. |
| Drug interactions | Refer to amoxicillin. |
| Side effects | Gastrointestinal complaints including nausea, vomiting, diarrhea; hematologic abnormalities including neutropenia, leukopenia and thrombocytopenia, hypersensitivity reactions including urticaria, fever, joint pain, rashes, angioedema, coagulation disorders, antibiotic- associated diarrhea, hepatitis and cholestatic, electrolyte disturbances, pain, inflammation, phlebitis or thrombophlebitis at injection sites. |
| Cautions | History of allergy, renal and hepatic function impairment, antibiotic associated diarrhea, premature and newborn infants, risk of fungal superinfections. |
| Storage condition | Store below 30 oC. |
| **Piperacillin + tazobactam (watch)** | |
| Pharmacological class | Penicillin and β-lactamase inhibitor combination |
| Dosage form | Powder for injection: piperacillin 2 g (as sodium salt) + tazobactam 250 mg (as sodium salt); piperacillin 4 g (as sodium salt) + tazobactam 500 mg (as sodium salt) in vial. |
| Indications | Intra-abdominal infections, skin and soft tissue infections, female pelvic infections, urinary tract infections, community-acquired pneumonia and hospital-acquired pneumonia. |
| Dose and administration | **IV;**  **Adult:** 3.375-4.5g every 6 hours  **Child < 2 months**: 60-75mg/kg every 6 hours (maximum daily dose 16g/day)  **Child 2-9 months:** 90mg/kg every 8 hours  **Child > 9 months (below 40kg)**: 112.5 mg/kg every 8hours  **Child > 9 months (above 40kg)**: use adult dose |
| Contraindications | Hypersensitivity to the drugs or any other β-lactam antibiotics. |
| Drug interactions | Vancomycin, heparin, oral anticoagulants, live cholera vaccine, tobramycin in haemodialysis patients, vecuronium and other non-depolarizing muscle relaxants, aminoglycosides and methotrexate. |
| Side effects | Diarrhea, constipation, nausea, dyspepsia, oral candidiasis, headache, insomnia, pseudomembranous colitis, hypersensitivity reactions like rash, fever, exfoliative dermatitis, Steven’s-Johnson syndrome (SJS), anaphylaxis. |
| Cautions | Renal impairment, prolonged treatment may increase superinfections, sodium accumulation for sodium-restricted patients, and previous history of hypersensitivity. |
| Storage condition | Store below 30°C. Protect from light and moisture. |
| **Procaine- benzylpenicillin (Access)** | |
| Pharmacological class | Penicillin |
| Dosage form | Powder for injection: 1 g (≈1 million IU); 3 g (≈3 million IU) in vial |
| Indications | Diphtheria (when oral treatment is not possible), congenital syphilis, neurosyphilis, anthrax, relapsing fever, moderately severe to severe infections of the upper respiratory tract, skin and soft-tissue infections, bacterial endocarditis, and scarlet fever. |
| Dose and administration | **Diphtheria: IM,**  **Child:** 50 000 IU/kg (= 50 mg/kg) once daily (max. 1.2 MIU = 1.2 g daily)  **Adult:** 1.2 MIU (= 1.2 g) once daily  **Pneumonia** (pneumococcal); moderately severe (uncomplicated):  **Adult:** 600,000 to 1,000,000 IU daily  **Relapsing fever:**  **IM,**  **Adult:** 400,000-600,000 IU, single dose  **Children:** 200,000-400,000 units, single dose. Use the lower doses to decrease the risk of Jarisch–Herxheimer reaction  **Congenital syphilis**  **Neonate:** 50,000 IU/kg (= 50 mg/kg) once daily  **Anthrax-cutaneous**  **Adult:** 600,000 to 1,000,000 units once daily  **Child:** Inhaled (post-exposure): 25,000 units/kg every 12 hours; not to exceed 1.2 million units every 12 hours, then switch to oral treatment (total treatment 60 days)  *Note:* *Procaine benzylpenicillin is not recommended as first-line treatment for neonatal sepsis / sepsis except in settings with high neonatal mortality. There is high risk of abscess and procaine toxicity in neonates.* |
| Contraindications | Hypersensitivity to the drug and other β-lactam antibiotics. |
| Drug interactions | Cholera vaccine, sulfamethoxazole/trimethoprim, dapsone, hydroxyurea, lidocaine, nitroglycerin, nitrofurantoin, phenytoin, aspirin, warfarin. |
| Side effects | Hypersensitivity reaction, Jarisch-Herxheimer reaction, Antibiotics-associated diarrhea, Hoigne's syndrome. |
| Cautions | Histories of significant allergies and/or asthma. |
| Storage condition | Store below 30 °C. |

**Cephalosporins**

Cephalosporins are bactericidal β-lactams, act by inhibiting synthesis of the bacterial cell wall. Cephalosporins are commonly classified into four generations with successive generations becoming broader in spectrum adding anti-anaerobic activity, antipseudomonal activity, and enhanced stability to β-lactamase. However, currently there is fifth generation of cephalosporins (ceftaroline). First generation cephalosporins are active against a wide spectrum of Gram-positive bacteria including penicillinase producing and non-penicillinase producing organisms. Their activity against Gram- negative bacteria is modest. Cefadroxil and cefalexin are available in oral formulations, while cefazolin is administered parenterally and widely used for surgical prophylaxis.

Second-generation cephalosporins have similar or slightly less activity than first generations against Gram-positive bacteria, but greater stability to hydrolysis by beta lactamases produced by Gram-negative bacteria and enhanced activity against many of the Enterobacteriaceae and *Haemophilus influenzae*. Cefaclor, Cefprozil and Cefuroxime are second-generation cephalosporins.

Compared to second generations, third generation cephalosporins have expanded gram-negative coverage and some are able to cross the blood-brain barrier. The third generations ceftazidime and cefoperazone are active against *Pseudomonas aeruginosa*. Cefepime is the only fourth-generation cephalosporin, which is more resistant to hydrolysis by chromosomal β lactamases. However, like the third-generation compounds, it is hydrolysed by extended spectrum β lactamases.

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| **Cefalexin/cephalexin (Access)** | |
| Pharmacological class | First-generation cephalosporin |
| Dosage form | Capsule: 250 mg, 500 mg  Syrup: 125 mg/5ml, 250mg/5ml (anhydrous)  Tablet (dispersible): 125mg, 250mg |
| Indications | Treatment of susceptible bacterial infections including respiratory tract infections, otitis media, skin and soft-tissue infections, bone infections and genitourinary tract infections including acute prostatitis and catheter associated urinary tract infection, alternative therapy for acute bacterial endocarditis prophylaxis. |
| Dose and administration | **Susceptible infections due to sensitive Gram-positive and Gram-negative bacteria; Oral:**  **Child 1 month–11 years**: 25 mg/kg 2–4 times a day (max. per dose 1 g 4 times a day)  **Child 12–17 years**: 1–1.5 g 3–4 times a day  **Adult**: 250 mg every 6 hours, alternatively 500 mg every 8–12 hours; increased to 1–1.5 g every 6–8 hours, increased dose to be used for severe infections  **Hospital-acquired pneumonia/Acute diverticulitis [in Combination with metronidazole]; Oral:**  **Adult**: 500 mg 2–3 times a day; use increased dose in severe infection  **Prophylaxis of recurrent urinary-tract infection; Oral:**  **Child 3 months–15 years**: 12.5 mg/kg once daily (max. per dose 125 mg), dose to be taken at night, Child 16–17 years: 125 mg once daily, dose to be taken at night, alternatively 500 mg for 1 dose, following exposure to a trigger  **Adult**: 125 mg once daily, dose to be taken at night, alternatively 500 mg for 1 dose, following exposure to a trigger  **Acute pyelonephritis/Urinary-tract infection (catheter associated); Oral:**  **Child 3 months-11 years:** 12.5 mg/kg twice daily, increased ifnecessary to 25 mg/kg 2–4 times a day (max. per dose1 g 4 times a day), increased dose used in severeinfections  **Child 12–17 years:** 500 mg 2–3 times a day for 7 to 10 days; increased to 1–1.5 g 3–4 times a day, high dose used in severe infections  **Adult:** 500 mg 2–3 times a day, increased dose used in severe infections  **Lower urinary-tract infection; Oral:**  **Child 3 months –11 years**: 12.5 mg/kg twice daily, alternatively 125 mg twice daily for 3 days  **Child 12–15 years**: 500 mg twice daily for 3 days  **Pregnant mothers:** 500 mg twice daily for 7 days  **Uncomplicated cystitis; Oral:**  **Adult:** 500 mg every 12 hours for 7 - 14 days  **Streptococcal pharyngitis, skin infections; Oral:**  **Adult:** 500 mg every 12 hours  **Otitis media; Oral:**  **Child and Adult:** 75 to 100mg/kg/day in 4 divided doses |
| Contraindications | Hypersensitivity to the drug or other penicillins or cephalosporins, acute porphyria. |
| Drug interactions | Probenecid, live cholera vaccine, aminoglycosides, metformin. |
| Side effects | Nausea, vomiting, diarrhea, dyspepsia, transient hepatitis, cholestatic jaundice, agitation, joint disorders, arthritis, confusion, fungal infection, vaginal discharge, genital pruritus, hypersensitivity, fatigue, hallucination, headache, slight elevation in liver enzymes. |
| Cautions | Severe renal impairment, penicillin allergy or sensitivity to β-lactam antibacterials, pregnancy, breastfeeding, false positive urinary glucose and false positive Coombs’ test, poor nutritional status. |
| Storage condition | Store below 30⁰C, away from light and moisture. |
| **Cefazolin (Access)** | |
| Pharmacological class | First generation cephalosporin |
| Dosage form | Powder for Injection: 500mg, 1g, 2g |
| Indications | Surgical prophylaxis, respiratory tract infections, skin and soft tissue infection, genito-urinary tract infection, biliary tract infection, bone and joint infections, septicaemia. |
| Dose and administration | **Surgical prophylaxis;** IV injection, IV infusion or deep IM:  **Adult:** 1-2 g as a single dose, 60 minutes before procedure (may be repeated in 2-5 hours intraoperatively)  **Child:** 25 mg/kg (maximum, 1 g) at induction of anesthesia, or after cord clamping in caesarean section, followed by 0.5–1 g during surgery for lengthy procedures (repeated if necessary) then 0.5–1 g every 6–8 hours after surgery for 24 hours  **Respiratory tract, skin and soft tissue infections, genital, urinary tract, biliary tract, bone and joint infections, septicemia;** IV injection, IV infusion or deep IM**:**  **Adult:** 250 mg-2 g every 6–12 (usually 8) hours, depending on severity of infection, maximum dose is 12 g/day.  **Child older than 1 month**: 25–100 mg/kg/day divided every 6–8 hours, maximum: 6 g/day  **Neonates** **< 7 days**: 40mg/kg/day every 12 hours  **Neonates > 7 days**: 40-60mg/kg/day every 8 hours |
| Contraindications | Hypersensitivity to the drug and other cephalosporins. |
| Drug interactions | Rifampin, mycophenolate mofetil, live cholera vaccine, probenecid, aminoglycosides, warfarin, heparin, enoxaparin. |
| Side effects | Fever, seizure, rash, pruritus, Stevens-Johnson syndrome, diarrhea, nausea, vomiting, abdominal cramps, anorexia, pseudomembranous colitis, oral candidiasis, vaginitis, hepatitis, eosinophilia, neutropenia, thrombocytopenia, leukopenia, pain at injection site, phlebitis, renal failure, transient increase in BUN, serum creatinine increment. |
| Cautions | Moderate to severe renal impairment, history of penicillin allergy, pregnancy, and breast-feeding, use may result in false positive urinary glucose and false positive Coombs’ test. |
| Storage condition | Store below 30⁰C. Protect from light and moisture. |
| **Cefepime (Watch)** | |
| Pharmacological class | Fourth generation cephalosporin |
| Dosage form | Powder for injection: 0.5g, 1 g, 2g  Infusion solution: 1g/50mL, 2g/100mL |
| Indications | Lower respiratory tract infections: Nosocomial and community acquired pneumonia caused by *P. aeruginosa*, *S. pneumoniae*, *Escherichia coli*, and *H. influenzae*;Uncomplicated and complicated urinary tract infections, including pyelonephritis caused by *P. aeruginosa*, *E. coli*, *K. pneumoniae*, and *Proteus mirabills*;Skin and skin structure infections caused by *Staphylococcus aureus* (methicillin susceptible strains), *Streptococcus pyogenes*, and *P. aeruginosa*;Peritonitis due to gangrenous and perforated appendicitis caused by *E. coli*;Bacterial septicemia caused by *E. coli*, *Streptococcus pneumoniae* and *Klebsiella pneumoniae*;Empiric therapy in febrile neutropenic patients. |
| Dose and administration | **Usual dose; IV:**  **Adults**: 1-2 gm/kg every 8-12 hours  **Children** (two months of age or less than 40 kg body weight)**:** 50 mg/kg every 8-12 hours  **Mild to moderate urinary tract infections**  **Adult** (body weight 41 kg and above): 0.5–1 g every 12 hours  **Mild to moderate infections due to sensitive Gram positive and Gram-negative bacteria:**  **Adult** (body weight 41 kg and above): 1 g every 12 hours  **Severe infections due to sensitive Gram-positive and Gram-negative bacteria:**  **Adult** (body weight 41 kg and above): 2 g every 12 hours, increased if necessary to 2 g every 8 hours, increased dose used for very severe infections |
| Contraindications | Hypersensitivity to the drug and other cephalosporins. |
| Drug interactions | Probenecid, aminoglycosides, warfarin, live cholera vaccine. |
| Side effects | Anemia, gastrointestinal disorders, increased risk of infection, anaphylactic shock, antibiotic associated colitis, coma, confusion. |
| Cautions | Pregnancy, breastfeeding, renal impairment. |
| Storage condition | Store below 30°C in a dry place. Protect from light. |
| **Cefixime (Watch)** | |
| Pharmacological class | Third-generation cephalosporin |
| Dosage form | Tablet: 100mg, 200mg, 400mg (as trihydrate)  Powder for suspension: 100/5ml, 200mg/5ml, 500mg/5ml |
| Indications | Acute exacerbations of chronic bronchitis, acute otitis media, uncomplicated acute cystitis, uncomplicated pyelonephritis, acute bacterial pharyngitis, uncomplicated acute gonorrhea. |
| Dose and administration | **Acute infections due to sensitive Gram-positive and Gram-negative bacteria; Oral:**  **Child 6 months–12 years; =<45kg: 8** mg/kg/day in 1-2 divided doses  **Child >12 years and >45kg:** 400 mg/ day in 1-2 divided doses  **Adult:** 200–400 mg daily in 1–2 divided doses  **Uncomplicated cervical/urethral gonorrhea due to *N. gonorrhoeae***:  **Oral:**  **Adult:** 400mg as a single dose. |
| Contraindications | Hypersensitivity to the drug and other cephalosporins, previous allergy to carbapenems, penicillin or monobactams. |
| Drug interactions | Aminoglycosides, ciprofloxacin, furosemide, mycophenolate mofetil, live cholera vaccine, probenecid, estrogen containing contraceptives, warfarin. |
| Side effects | Diarrhea, abdominal pain, nausea, dyspepsia, flatulence, loose stools, acute renal failure, anaphylactic reactions, angioedema, dizziness, drug fever, headache, rash, seizure, Stevens-Johnson syndrome, acute kidney injury, arthralgia, genital pruritus, hypereosinophilia, jaundice, serum sickness like reaction, thrombocytosis. |
| Cautions | Renal impairment, history of penicillin allergy, pregnancy, breastfeeding (avoid unless essential). |
| Storage condition | Store below 30°C. Do not refrigerate or freeze. |
| **Cefotaxime sodium (Watch)** | |
| Pharmacological class | Third-generation cephalosporin |
| Dosage form | Injection: 250mg, 0.5g, 1g, 2g, in vial |
| Indications | Susceptible infections in respiratory tract, skin, bone and joint, urinary tract, gynecologic as well as septicemia, and documented or suspected meningitis and other infections due to gram-negative bacilli, gram-positive cocci and penicillin- resistant pneumococci, Pseudomonal lung infection in cystic fibrosis, complicated urinary-tract infection, gonorrhea, gonococcal arthritis, gonococcal eye infection, septicemia, febrile neutropenia, meningitis, surgical prophylaxis. |
| Dose and administration | **Susceptible infections due to sensitive Gram-positive and Gram-negative bacteria;** By IV Infusion, Deep IM Injection**:**  **Adult**: 1–2 g every 8 hours; for septicemia, IV: 2 g every 6 - 8 hours.  **Gonorrhoeae infections:**  **Adult:** 500mg IM single dose (for uncomplicated); for disseminated infection, 1 g every 8 hours for 7 days, may be switched 24–48 hours after symptoms improve to a suitable oral antibacterial  **Emergency treatment of suspected bacterial meningitis or meningococcal disease**:  Before urgent transfer to hospital, in patients who cannot be given benzylpenicillin (e.g. because of an allergy)  **Child 1 month–11 years:** 50 mg/kg for 1 dose  **Child 12–17 years:** 1 g for 1 dose  **Adult:** 1 g for 1 dose  **Pseudomonal lung infection in cystic fibrosis:**  **Adult**: 100–150 mg/kg daily in 3 divided doses, IV; maximum 9 g per day  **Complicated urinary-tract infection:**  **Adult**: 1–2 g every 8–12 hours  **Surgical prophylaxis:**  **Adult:** 1-2g IV 60 minutes before surgical procedure |
| Contraindications | Hypersensitivity to cefotaxime or other cephalosporins or penicillins. |
| Drug interactions | Probenecid, furosemide, aminoglycosides, bacteriostatic antibacterials (e.g. tetracycline, erythromycin, chloramphenicol or sulfonamides). |
| Side effects | Hypersensitivity, nausea, vomiting, diarrhea, candidiasis, rashes, fever, Stevens- Johnson syndrome, thrombocytopenia, eosinophilia, leukopenia, liver enzyme abnormality, transient pain at the site of injection, pseudomembranous colitis, superinfection, Jarisch-Herxheimer reaction, hemolytic anemia, haemorrhage, headache. |
| Cautions | Severe renal impairment, patients with colitis, history of allergy or asthma, serious bullous reactions, *Clostridioides difficile* (formerly known as *Clostridium difficile*) associated disease. |
| Storage condition | Store below 30⁰C. |
| **Cefpodoxime (Watch)** | |
| Pharmacological class | Third generation cephalosporin |
| Dosage form | Tablet: 100mg, 200mg,  Granules for oral suspension: 40mg/5ml |
| Indications | Acute otitis media caused by *S. pneumoniae*, *H. influenzae* or *M. catarrhalis*; pharyngitis and tonsillitis caused by *S. pyogenes;* sinusitis, mild to moderate community acquired pneumonia caused by *S. pneumoniae* and *H. influenzae*; uncomplicated skin and skin structure infections caused by *S. aureus* or *S. pyogenes*, and uncomplicated UTI caused by *E. coli,* *Klebsiella*, and *Proteus*. |
| Dose and administration | **Adult and Child≥ 12 years;** **Oral:**  **Acute community-acquired pneumonia and acute maxillary sinusitis**: 200 mg every 12 hours  **Skin and skin structure:** 400mg every 12 hours  **Uncomplicated gonorrhea (male and female) and rectal gonococcal infections (female):** 200mg as a single dose  **Pharyngitis/tonsillitis and Uncomplicated urinary tract infection:** 100mg every 12 hours  **Child 2 months to 12 years; Oral:**  **Acute otitis media and acute maxillary sinusitis:** 10mg/kg/day divided every 12 hours (maximum: 200mg/dose)  **Pharyngitis/tonsillitis:** 5mg/kg/day divided every 12 hours (maximum: 100mg/dose)  *Note:* *the duration of treatment differs based on the severity of the disease.* |
| Contraindications | Refer to cefepime. |
| Drug interactions | Probenecid, furosemide, aminoglycosides, live cholera vaccine. |
| Side effects | Diarrhea, nausea, vomiting, abdominal pain, loss of appetite, hypersensitivity reactions (rash and urticaria), hematological disorders (reduction in hemoglobin, thrombocytosis, thrombocytopenia, leukopenia and eosinophilia), headache, paresthesia, dizziness and bloody diarrhea (signs of enterocolitis). |
| Cautions | Renal impairment, prolonged use, history of penicillin allergy, breastfeeding. |
| Storage condition | Store below 30°C. |
| **Ceftazidime (Watch)** | |
| Pharmacological class | Third-generation cephalosporin |
| Dosage form | Injection: 250mg, 0.5g, 1g, 2g (as pentahydrate) in vial |
| Indications | Infections due to sensitive bacteria, especially those due to *Pseudomonas spp*. and including those resistant to aminoglycosides. Pseudomonal lung infection in cystic fibrosis, complicated urinary-tract infection, septicemia (hospital-acquired pneumonia), febrile neutropenia, meningitis, susceptible infections due to sensitive Gram-positive and Gram-negative bacteria, prophylaxis for transurethral resection of prostate. |
| Dose and administration | **Administration:** IV injection/ infusion, IM:  **Prophylaxis for transurethral resection of prostate:**  **Adult:** 1 g, single dose to be administered up to 30 minutes before procedure and may be repeated, if necessary, when catheter removed.  **Complicated urinary-tract infection:**  **Adult:** 1–2 g every 8–12 hours  **Pseudomonal lung infection in cystic fibrosis.**  **Adult:** 100–150 mg/kg daily in 3 divided doses; maximum 9 g per day**.**  **Septicemia/Hospital-acquired pneumonia, febrile neutropenia, Meningitis:**  **Adult:** 2 g every 8 hours  **Susceptible infections due to sensitive Gram-positive and**  **Gram-negative bacteria**  **Adult:** 1–2 g every 8 hours  **Neonates:** 30mg/kg every 12 hours  **Infants and Children up to 12 years:** 30-50mg/kg/dose every 8 hours; maximum dose: 6g/day  **Child>12 years**: use adult dose |
| Contraindications | Hypersensitivity to the drug and other cephalosporin, previous allergy to carbapenems, penicillin or monobactams. |
| Drug interactions | Aminoglycosides, ciprofloxacin, furosemide, mycophenolate mofetil, live cholera vaccine, probenecid, estrogen containing contraceptives, warfarin. |
| Side effects | Allergic reactions including rashes, pruritus, urticaria, serum sickness like reaction, fever, arthralgia, anaphylaxis, blood disorders such as thrombocytosis and thrombophlebitis, diarrhea, nausea, vomiting, abdominal discomfort, headache, antibiotic associated colitis (particularly with higher doses), fungal infection, liver enzymes abnormalities, transient hepatitis. |
| Cautions | Breastfeeding, concomitant nephrotoxic agent administration, renal impairment. |
| Storage condition | Store below 30⁰C. |
| **Ceftazidime + avibactam (Reserve)** | |
| Pharmacological class | Third generation cephalosporin and β-lactamase inhibitor combination |
| Dosage form | Powder for injection: 2g + 0.5g in vial |
| Indications | Complicated intra-abdominal infection, complicated urinary tract infection including pyelonephritis, hospital-acquired pneumonia, including ventilator associated pneumonia, infections due to aerobic Gram-negative organisms in patients with limited treatment options. |
| Dose and administration | *Doses are expressed as ceftazidime/avibactam*  **IV infusion**  **Complicated intra-abdominal infection:**  Adult: 2/0.5 g every 8 hours  **Complicated urinary tract infection, including pyelonephritis:**  Adult: 2/0.5 g every 8 hours  **Hospital-acquired pneumonia, including ventilator associated**  **pneumonia**:  **Adult:** 2/0.5 g every 8 hours  **Complicated intraabdominal infections:**  **Child 3 to <6months:** 40/10 mg/kg every 8 hours (infusion time 2 hours)  **Child 6 months–17 years:** 50/12.5mg/kg to maximum of 2/0.5g every 8 hours (infusion time two hours)  **Complicated UTI including pyelonephritis:**  **Child 3 to <6months:** 40/10 mg/kg every 8 hours (infusion time 2 hours)  **Child 6months–17 years:** 50/12.5mg/kg to maximum of 2/0.5g every 8 hours (infusion time 2hours)  **Hospital acquired pneumonia including ventilator associated pneumonia:**  **Child 3 to <6months:** 40/10 mg/kg every 8 hours (infusion time 2 hours)  **Child 6 months -17 years:** 50/12.5mg/kg to maximum of 2/0.5g every 8 hours (infusion time over2 hours) |
| Contraindications | Hypersensitivity to the drugs or other β-lactam antibacterial agents. |
| Drug interactions | Probenecid, nephrotoxic agents (e.g. aminoglycosides, vancomycin), furosemide, chloramphenicol, mycophenolate mofetil, cholera vaccine, estrogen-containing contraceptive, warfarin. |
| Side effects | Pseudomembranous colitis, nephrotoxicity, candidiasis (vulvovaginal and oral), eosinophilia, thrombocytosis, thrombocytopenia, headache, dizziness, maculo-papular rash, urticaria, pruritus, liver enzyme abnormalities, infusion site thrombosis, infusion site phlebitis, pyrexia. |
| Cautions | Pregnancy, breastfeeding, patients who are on a controlled sodium diet, renal impairment, machine operation (e.g. driving and skilled tasks). |
| Storage condition | Store below 30°C. Protect from light. |
| **Ceftriaxone (Watch)** | |
| Pharmacological class | Third-generation cephalosporin |
| Dosage form | Injection: 0.25g, 0.5g, 1g, 2g (as sodium salt) in vial |
| Indications | Serious infections due to sensitive bacteria, including septicemia, pneumonia (community-acquired pneumonia and hospital-acquired pneumonia), meningitis, surgical prophylaxis, prophylaxis of meningococcal meningitis and gonorrhea, intra-abdominal infections, complicated urinary-tract infections, acute exacerbations of chronic obstructive pulmonary disease, cellulitis, erysipelas, moderate to severe diabetic foot infection, complicated skin and soft tissue infections, infections of bones and joint and suspected bacterial infection in neutropenic patients. |
| Dose and administration | **Administration**: IV infusion or IV injection or IM injection  **Community-acquired pneumonia, hospital-acquired pneumonia, intra-abdominal infections, complicated urinary-tract infections and acute exacerbations of chronic obstructive pulmonary disease:**  **Adult**: 1–2 g once daily, 2 g dose to be used for hospital-acquired pneumonia and severe cases  **Child**: 50 – 80 mg once daily, doses at the higher end of the recommended range used in severe cases and hospital acquired pneumonia, maximum 2g per day  **Cellulitis, Erysipelas, Moderate to severe diabetic foot infection, Leg ulcer infection, Complicated skin and soft tissue infections and Infections of bones and joints**:  **Adult:** 2 g once daily  **Prophylaxis of infection from animal and human bites [in combination with other drugs):**  **Adult:** 2 g once daily  **Suspected bacterial infection in neutropenic patients:**  **Adult**: 2–4 g daily, doses at the higher end of the recommended range used in severe cases  **Surgical prophylaxis:**  **Adult**: 2 g for 1 dose, dose to be administered 30–90 minutes before procedure  **Bacterial meningitis and bacterial endocarditis:**  **Adult**: 2–4 g daily, doses at the higher end of the recommended range used in severe cases  **Child 1 month–11 years** (body weight up to 50 kg): 80–100 mg/kg once daily, 100 mg/kg once daily dose should be used for bacterial endocarditis; maximum 4 g per day.  **Child 9–11 years (**body weight 50 kg and above): 2–4 g once daily, doses at the higher end of the recommended range used in severe cases.  **Child 12–17 years**: 2–4 g once daily, doses at the higher end of the recommended range used in severe cases  **Gonococcal conjunctivitis, uncomplicated gonorrhea [anogenital and pharyngeal infection, when sensitivity unknown]:**  **Adult**: 1 g for 1 dose  **Gonococcal epididymo-orchitis:**  **Adult**: 1 g for 1 dose, followed an additional antibacterial course  **Disseminated gonococcal infection:**  **Adult:** 1 g every 24 hours for 7 days, may be switched 24–48 hours after symptoms improve to a suitable oral antibacterial  **Syphilis:**  **Adult**: 0.5–1 g once daily for 10–14 days, dose increased to 2 g once daily for neurosyphilis  **Lyme disease (affecting central nervous system) and Lyme carditis:**  **Adult**: 2 g twice daily for 21 days, alternatively 4 g oncedaily  **Lyme arthritis:**  **Adult:** 2 g once daily for 28 days  **Acute otitis media:**  **Adult:** 1–2 g for 1 dose, dose can be given for 3 days if severely ill or previous therapy failed  **Acute prostatitis:**  **Adult:** 2 g once daily. |
| Contraindications | Hypersensitivity to the drug or other cephalosporins, certain neonates (premature or hyperbilirubinemia), patient requiring calcium-containing IV solutions. |
| Drug interactions | Calcium containing IV fluids, calcium gluconate, aminoglycosides, warfarin, heparin, enoxaparin, chloramphenicol, probenecid, oral contraceptives, live cholera vaccine. |
| Side effects | Diarrhea, nausea and vomiting, abdominal discomfort, headache, antibiotic-associated colitis, allergic reactions (rashes, pruritus, urticaria, serum sickness like reactions, fever, arthralgia, and anaphylaxis), abnormality in liver enzymes, transient hepatitis and cholestatic jaundice, eosinophilia, blood disorders, reversible interstitial nephritis, nervousness, sleep disturbances, confusion, hypertonia, dizziness, anemia, coagulation disorder, fungal infection. |
| Cautions | Sensitivity to beta lactam antibacterials, renal impairment, hepatic impairment, concomitant use of total parenteral nutrition (TPN), pregnancy, breastfeeding, GI disease (e.g., colitis), hypercalciuria, impaired vitamin K synthesis or low vitamin K stores. |
| Storage condition | Store below 30°C. |
| **Cefuroxime (Watch)** | |
| Pharmacological class | Second-generation cephalosporin |
| Dosage form | Tablet or capsule: 125 mg, 250 mg, 500mg  Oral suspension:125mg/ml, 250mg/ml  Powder for injection: 250 mg; 750 mg; 1.5 g (as sodium) in vial |
| Indications | Bone and joint infections; upper and lower respiratory tract infections (sinusitis, pneumonia or bronchitis), skin and soft-tissue infections, cellulitis /erysipelas, Lyme disease, acute prostatitis, acute pyelonephritis, urinary tract infection, surgical and open fracture prophylaxis, animal bite, gonorrhea. |
| Dose and administration | **In most infections including mild to moderate lower respiratory tract infections (e.g. bronchitis); Oral:**  **Adult:** 250 mg twice daily; doubled for more severe lower respiratory-tract infections or if pneumonia suspected  **Urinary-tract infection**; **Oral:**  **Adult:** 125-250 mg twice daily  **Gonorrhea; Oral:**  **Adult**: 1 g as a single dose  **Child over 3 months:** 125 mg twice daily, if necessary, doubled  **Lyme disease; Oral:**  **Adult and child 12–17 years**: 500 mg twice daily for 14–21 days  **Child 3 months–11 years**: 15 mg/kg twice daily (max. per dose 500 mg)  **Gonococcal Infection – Disseminated; IM or IV injection or infusion:**  **Adult:** 750 mg every 6 – 8 hours; 1.5 g every 6 – 8 hours in severe infections; single doses over 750 mg intravenous route only  **Gonococcal infection - uncomplicated**  **Adult:** 1.5 g as a single dose by intramuscular injection (divided between 2 sites)  **Surgical prophylaxis**  **Adult:** 1.5 g by IV injection at induction; may be supplemented with 750mg IM 8 and 16 hours later abdominal, pelvic, and orthopedic operations) or followed by 750 mg IM every 8 hours for further 24-48 hours (cardiac, pulmonary, esophageal, and vascular operations)  **Meningitis; IV:**  **Adult:** 3 g every 8 hours  **Child:** 200 to 240 mg/kg daily (in 3 – 4 divided does) reduced to 100 mg/kg daily after 3 days or on clinical improvement  **Neonate:** 100 mg/kg daily reduced to 50 mg/kg daily  **Cellulitis/Erysipelas; IV:**  **Adult:** 750 mg every 6–8 hours; increased, if necessary  **Child:** 20 mg/kg every 8 hours (max. per dose 750 mg); increased if necessary  **Acute prostatitis; IV:**  **Adult:** 1.5 g every 6–8 hour |
| Contraindications | Hypersensitivity to the drug or other beta-lactam antibiotics. |
| Drug interactions | Refer to ceftazidime. |
| Side effects | Antibiotic associated colitis, nausea and vomiting, abdominal discomfort, headache, allergic reactions, Jarisch- Herxheimer reaction, Candida overgrowth, blood disorders, eosinophilia, headache, dizziness, transient rise in liver enzymes, sleep disturbances, confusion, dizziness. |
| Cautions | Penicillin sensitivity, renal impairment, severe cutaneous adverse reactions including Stevens- Johnson syndrome, concurrent use of aminoglycosides and diuretics, infections like colitis and candidiasis, pregnancy and breast feeding. |
| Storage condition | Store below 30°C. Protect from light. |

**Macrolides**

The macrolides are bacteriostatic or bactericidal, depending on the concentration and type of microorganism, and work by interfering bacterial protein synthesis. Their antimicrobial property includes gram positive bacteria, and they are also active against organisms such as *Legionella* *pneumophila*, *Mycoplasma pneumoniae*, and some rickettsias, chlamydias, and chlamydophilas. Macrolides have post-antibiotic effect: that is, antibacterial activity persists after concentrations have dropped below the minimum inhibitory concentration.

The prototype drug, erythromycin, was discovered in 1952 from *Streptomyces erythreus*. Clarithromycin and azithromycin are semisynthetic derivatives of erythromycin. The macrolides are an alternative for oral infections in penicillin-allergic patients or where a beta-lactamase producing organism is involved. However, many organisms are now resistant to macrolides or rapidly develop resistance; their use should therefore be limited to short courses.

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| **Azithromycin (Access)** | |
| Pharmacological class | Macrolide |
| Dosage form | Powder for oral suspension: 200mg/5ml (anhydrous)  Tablet or Capsule: 250mg, 500mg (anhydrous) |
| Indications | Acute otitis media, pharyngitis/tonsillitis, mild to moderate upper and lower respiratory tract infections, infections of the skin, pelvic inflammatory disease, sexually transmitted diseases (urethritis/cervicitis, genital ulcer), acute bacterial exacerbations of chronic obstructive pulmonary disease (COPD), acute bacterial sinusitis, prevention of secondary case of invasive group A streptococcal infection in patients who are allergic to penicillin. |
| Dose and administration | **Respiratory tract infections (including Community acquired pneumonia), otitis media, skin and soft tissue infections:**  **Adults**: 500 mg once daily for 3 days, alternatively initially 500 mg once daily for 1 day, then 250 mg once daily for 4 days.  **Child 6 months–17 years**: 10 mg/kg once daily (max. per dose 500 mg) for 3 days  **Bacterial exacerbation of COPD and Bacterial sinusitis:**  **Adult**: 500 mg/day for a total of 3 days  **Urethritis, cervicitis and chancroid:**  **Adult**: 1-2 g as a single dose  **Prevention of secondary case of invasive group A streptococcal infection in patients who are allergic to penicillin:**  **Adult and child 12 – 17 years:** 500mg once daily for 5 days.  **Child 6 months–11 years:** 12 mg/kg once daily (max. per dose 500 mg) for 5 days |
| Contraindications | Hypersensitivity to the drug or other macrolide antibiotics, history of cholestatic jaundice, hepatic dysfunction associated with prior use of azithromycin. |
| Drug interactions | Quinidine, amiodarone, chloroquine, efavirenz, ergot alkaloids, bromocriptine, carbamazepine, cyclosporine, digoxin, aluminum and magnesium containing antacids, oral contraceptives. |
| Side effects | Arthralgia, diarrhea/loose stools, nausea, vomiting, abdominal pain, numbness, edema, photosensitivity, reaction, acute kidney injury, aggression, akathisia, hemolytic anemia, syncope, fulminant hepatitis leading to liver failure, prolonged cardiac repolarization and QT interval, cardiac arrhythmia, torsades de pointes. |
| Cautions | Hepatic and renal impairment, pregnancy, breastfeeding, myasthenia gravis, electrolyte disturbance (hypokalemia and hypomagnesaemia), cardiac disorders, congenital or documented prolongation of QT interval. |
| Storage condition | Store below 30°C. |
| **Clarithromycin (watch)** | |
| Pharmacological class | Macrolide |
| Dose and administration | Powder for Oral suspension: 125mg/5ml, 250mg/5ml  Tablet: 250mg, 500mg  Powder for IV infusion: 500mg/vial |
| Indications | *H. pylori* eradication (in combination with other medicines), respiratory tract infections/pneumonia, mild to moderate skin and soft tissue infections, mild diabetic foot infection, leg ulcer infection, cellulitis, erysipelas, impetigo. |
| Dose and administration | **Oral:**  ***H. pylori* eradication** (in combination with other medicines):  **Adult**: 500 mg twice daily for 7 – 14 days, eradication therapy  **Community-acquired pneumonia:**  **Adult:** 500 mg twice daily  **Child >3 months**: 15 mg/kg/day in 2 divided doses  **Hospital-acquired pneumonia:**  **Child 1 month–11 years (body-weight 30–40 kg):** 250 mg twice daily for 5 days then review  **Child 12–17 years**: 500 mg twice daily for 5 days then review  **Respiratory-tract infections, mild to moderate skin and soft-tissue infections:**  **Adult and Child 12–17 years**: 250 mg twice daily increased to 500 mg twice daily (severe cases)  **Acute exacerbation of COPD and bronchiectasis:**  **Adult**: 500 mg twice daily  **Child 12–17 years**: 250–500 mg twice daily  **Acute cough, acute sore throat and acute otitis media:**  **Adult and Child 12–17 years**: 250–500 mg twice daily for 5 days  **Prevention of pertussis:**  **Adult and Child 12–17 years**: 500 mg twice daily for 7 days  **Mild diabetic foot infection, leg ulcer infection, cellulitis and erysipelas:**  **Adult**: 500 mg twice daily  **Child 12–17 years**: 250–500 mg twice daily  **Impetigo:**  **Adult and Child 12–17 years**: 250 – 500 mg twice daily (higher dose for severe cases  **Acute sinusitis:**  **Adult**: 500 mg twice daily for 5 days  **Child 12–17 years**: 250-500 mg twice daily  **IV**:  IV therapy may be given for 2 to 5 days and should be changed to oral clarithromycin therapy whenever possible.  **Adults**: 1gram daily, divided into two 500 mg doses  **Child**  **Child older than 12 years**: As for adults.  **Note:** Use of clarithromycin IV for children younger than 12 years is not recommended for children younger than 12 years. Use clarithromycin pediatric suspension. |
| Contraindications | Hypersensitivity to the drug or other macrolide antibiotics, previous history of QT prolongation, concurrent use of statins, hypomagnesemia, hypokalemia. |
| Drug interactions | Statins, amiodarone, cisapride, pimozide, calcium channel blockers, cyclosporine, quinidine, sildenafil, midazolam, triazolam, ergot alkaloids, warfarin, azole antifungals, ciprofloxacin, diclofenac, doxycycline, erythromycin, isoniazid, nefazodone, propofol. |
| Side effects | Gastrointestinal disturbances (diarrhea, nausea, abnormal taste, dyspepsia, abdominal pain), headache, burping, dry oral, muscle complaints, oral disorders, thrombocytosis and tremor, abnormal dreams, agranulocytosis, depersonalization, depression, mania, myopathy, cardiac arrest, dyskinesia, hemorrhage, loss of consciousness, pulmonary embolism. |
| Cautions | Hepatic and renal impairment, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C. |
| **Erythromycin (Watch)** | |
| Pharmacological class | Macrolide |
| Dose and administration | Tablet (stearate): 250mg, 500mg, Capsule, 250mg  Oral suspension: 125mg/5ml, 250mg/5ml . |
| Indications | Conjunctivitis in newborns, genitourinary tract infection during pregnancy, pneumonia in infants, legionnaires disease, pharyngitis, sinusitis, pertussis (whooping cough), gonorrhea, syphilis, urethritis, osteomyelitis, lymphogranuloma venereum, diphtheria, prostatitis, scarlet fever.  Skin and soft tissue infections: boils and carbuncles, abscesses, pustular acne, paronychia, impetigo, cellulitis, erysipelas, prophylaxis of bacterial endocarditis and for long-term prophylaxis of rheumatic f ever (alternative to penicillin in hypersensitive patients). |
| Dose and administration | **Endocarditis (prophylaxis); Oral:**  **Adult**:1gm (base) one hour prior to the procedure, and 500mg 6 hours following the procedure  **Child**: 20mg (base) per kg of body weight one hour prior to the procedure, and 10mg per kg of body weight six hours following the procedure  **Genitourinary tract infection, including chlamydial; Oral:**  **Adult**: 500mg (base) every six hours  **Child**: 12.5mg (base) per kg of body weight every 6 hours  **Legionnaires’ disease;** Oral:  **Adult**: 500mg (base) to 1gm(base) every six hours  **Long-term prophylaxis of Streptococcal infections in patients with a history of rheumatic heart disease; Oral**:  **Adult**: 250mg (base) every twelve hours  **Pertussis:**  **Adult**: 250 mg every six hours  **Child**: 10 to 12.5mg (base) per kg, every six hours  **Pneumonia, chlamydial; Oral**:  **Child**: 12.5mg (base) per kg every 6 hours for two weeks  **Streptococcal pharyngitis; Oral:**  **Child**: 5-12.5mg (base) per kg every 6 hours  **Neonates**:7.5mg to 12.5mg (base)per kg every 6 hours |
| Contraindications | Hypersensitivity to the drug or other macrolides, patients with a history of QT prolongation, concurrent use of simvastatin, tolterodine, mizolastine, amisulpride, astemizole, domperidone, cisapride or pimozide. |
| Drug interactions | Simvastatin, alfentanil, carbamazepine, chloramphenicol, itraconazole, ciclosporins, terfenadine, warfarin, xanthines such as aminophylline, caffeine, oxtriphylline, theophylline. |
| Side effects | Nausea, vomiting, diarrhea, abdominal, stomach cramping and discomfort, reversible loss of hearing, recurrent fainting, hypersensitivity (skin rash, redness or itching), cholestatic jaundice, pancreatitis, liver problems. |
| Cautions | Pregnancy, breastfeeding, renal and hepatic impairment, myasthenia gravis, cardiac arrhythmias (prolongation of QT interval), porphyria, neonates less than two weeks, hypokalemia, hypomagnesemia. |
| Storage condition | Store below 30⁰C. |

**Carbapenems/Imipenem**

The cell wall synthesis inhibitor carbapenems are β-lactam antibacterials with a broad-spectrum of activity against many Gram-positive and Gram-negative bacteria, and anaerobes. imipenem (with cilastatin) and meropenem have good activity against *Pseudomonas aeruginosa*. However, carbapenems are not active against methicillin-resistant *Staphylococcus aureus* and *Enterococcus faecium*. Imipenem (with cilastatin) and meropenem are used for the treatment of severe hospital-acquired infections and polymicrobial infections including septicemia, hospital-acquired pneumonia, intra-abdominal infections, skin and soft-tissue infections, and complicated urinary tract infections.

Imipenem is partially inactivated in the kidney by enzymatic activity, and it is therefore administered in combination with cilastatin, a specific enzyme inhibitor, which blocks its renal metabolism. Meropenem and ertapenem are stable to the renal enzyme, which inactivates imipenem and therefore can be given without cilastatin. Side effects of imipenem with cilastatin are like those of other β-lactam antibiotics. Meropenem has less seizure-inducing potential and can be used to treat central nervous system infection.

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| **Imipenem + cilastatin (Reserve)** | |
| Pharmacological class | Carbapenems |
| Dosage form | Powder for infusion: imipenem 250mg + cilastatin 250mg, imipenem 500mg + cilastatin 500mg |
| Indications | Treatment of respiratory tract, urinary tract, intra- abdominal, gynecologic, bone and joint, skin structure and polymicrobial infections as well as bacterial septicemia and endocarditis  **Note**: *Not indicated**for CNS infections* |
| Dose and administration | *Dose expressed in terms of imipenem.*  **Aerobic and anaerobic gram-positive and gram-negative**  **infection, hospital acquired septicemia; IV:**  **Adult:** 500 mg every 6 hours, alternatively 1 g every 8 hours  **Infection caused by *Pseudomonas* or other less sensitive organisms**, **empirical treatment of infection in febrile patients with neutropenia and life-threatening infection; IV:**  **Adult:** 500mg-1 g every 6 hours  **General dosage for neonates; IV:**  **Neonates <1 week of age weighing ≥1.5 kg:** 25 mg/kg every 12 hours  **Neonates 1–4 weeks of age weighing ≥1.5 kg**: 25 mg/kg every 8 hours  **General Dosage for Infants and Children; IV:**  **Infants 1–3 months of age weighing ≥1.5 kg**: 25 mg every 6 hours.  **Children ≥3 months of age**: 15–25 mg/kg every 6 hours |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Ganciclovir, probenecid, valproate, typhoid vaccine (oral). |
| Side effects | Diarrhea, vomiting, nausea, eosinophilia, skin reactions, thrombophlebitis, bone marrow disorders, confusion, dizziness, drowsiness, hallucination, hypotension, leukopenia, movement disorders, psychiatric disorder, seizure, thrombocytopenia, thrombocytosis, agranulocytosis, antibiotic associated colitis. |
| Cautions | CNS disorders, epilepsy, renal impairment, pregnancy, breastfeeding, prolonged use, history of seizures, elderly patients  Note: *IV and IM preparations cannot be interchanged.* |
| Storage condition | Store below 30°C. |
| **Meropenem (Reserve)** | |
| Pharmacological class | Carbapenem |
| Dosage form | Powder for injection (as trihydrate): 500mg/vial, 1g/ vial |
| Indications | Treatment of intra-abdominal infections (complicated appendicitis and peritonitis), bacterial meningitis (pediatric patients, >3 months caused by *S. pneumonia*, *H. influenza*, and *N. meningitides*), complicated skin and soft tissue infections caused by susceptible organism, exacerbations of chronic lower respiratory-tract infection in cystic fibrosis, endocarditis (in combination with other antibacterials). |
| Dose and administration | **Adult dose;** IV:  **Intraabdominal infection:** 1g every 8 hours  **Meningitis:** 1 to 2g every 8 hours  **Skin or soft tissue infection** (Complicated infection): 500 mg every 8 hours  **Exacerbations of chronic lower respiratory-tract infection in cystic fibrosis**: 2 g every 8 hours  **Endocarditis (in combination with another antibacterial):** 2 g every 8 hours  **Pediatric dose; IV:**  **Intraabdominal infection:**  **Child 3 months or older**: 20 mg/kg IV every 8 hours; Maximum daily dose is 3 g/day  **Child 50 kg or more**: 1 g IV every 8 hours  **Meningitis:**  **Child 3 months or older:** 40 mg/kg IV every 8 hours, Maximum daily dose is 6 g/day  **Child 50 kg or more**: 2 g IV every 8 hours  **Skin and structure infection-complicated**:  **Child 3months or older:** 10 mg/kg IV every 8 hours. Maximum daily dose is 1.5 g/day.  **Children** 50 kg or more: 500 mg IV every 8 hours  *Note:**IV (infusion over 15 to 30 minutes; bolus injection over 3 to 5 minutes****)*** |
| Contraindications | Hypersensitivity to meropenem or other carbapenems or other β- lactams. |
| Drug interactions | Probenecid, valproic acid, digoxin, conjugated estrogen, [mycophenolate mofetil](https://www.drugs.com/drug-interactions/meropenem-with-mycophenolate-mofetil-1566-0-1671-0.html), tramadol, live cholera vaccine. |
| Side effects | Abdominal pain, nausea, vomiting, inflammation, pain, headache, skin reactions, thrombocytosis, injection site reaction, *Clostridioides difficile* associated diarrhea, Steven’s Johnson syndrome (SJS). |
| Cautions | Pregnancy, breastfeeding, renal impairment, epilepsy (history of seizures), children <3 months of age, history of sensitivity to β-lactams. |
| Storage condition | Store below 30°C. |
| **Meropenem + vaborbactam (Reserve)** | |
| Pharmacological class | Carbapenem and β-lactamase inhibitor combination |
| Dosage form | Powder for injection: meropenem 1gm + vaborbactam1gm |
| Indications | Treatment of complicated urinary tract infection (cUTI), complicated intra-abdominal infection (cIAI), hospital-acquired pneumonia (HAP), including ventilator associated pneumonia (VAP) and infections due to aerobic gram-negative organisms in adults with limited treatment options. |
| Dose and administration | *Doses are expressed in terms of meropenem*  **Complicated urinary-tract infection [including pyelonephritis] and complicated intra-abdominal infection; IV infusion:**  **Adult:** 2 g every 8 hours for 5–10 days; may be continued for up to 14 days  **Hospital-acquired pneumonia, Ventilator-associated pneumonia:**  **Adult:** 2 g every 8 hours for 7–14 days  **Bacteremia with cUTI or cIAIs:**  **Adult:** 2 g every 8 hours  **Aerobic Gram-negative infections with limited treatment options**  **Adult:** 2 g every 8 hours  **Note:** *No evidence for child dose and administration.* |
| Contraindications | Hypersensitivity to the drug or other beta-lactam antibacterial agents. |
| Drug interactions | Refer to meropenem. |
| Side effects | Diarrhea, nausea, vomiting, electrolyte imbalance, headache, hypoglycemia, hypotension, thrombocytosis, hypersensitivity reactions, seizures, hepatic impairment. |
| Cautions | Refer to meropenem. |
| Storage condition | Store below 30°C. |

**Aminoglycosides**

Aminoglycosides are bactericidal inhibitors of protein synthesis that interfere with ribosomal function. These agents are useful mainly against aerobic gram-negative microorganisms such as *E. coli*. This class of antimicrobials have poor effect against anaerobic bacteria. The aminoglycosides include streptomycin, neomycin, kanamycin, amikacin, gentamicin, tobramycin, sisomicin, netilmicin, and others. Amikacin, gentamicin, and tobramycin are active against *Pseudomonas aeruginosa*. Streptomycin is active against *Mycobacterium tuberculosis* and is now almost entirely reserved for tuberculosis.

These antibacterials have a similar antimicrobial spectrum and most widely used in combination with a β-lactam antibiotic in serious infections with gram-negative bacteria, in combination with vancomycin or a β-lactam antibiotic for gram-positive endocarditis, and for treatment of tuberculosis. The aminoglycosides are not absorbed from the gut (although there is a risk of absorption in inflammatory bowel disease and liver failure) and should therefore be given by injection for systemic infections.

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| **Amikacin (Watch)** | |
| Pharmacological class | Aminoglycoside |
| Dosage form | Injection: 50 mg/mL (as sulfate), 250 mg/mL (as sulfate) in 2 mL vial |
| Indications | Urinary tract infection, bacterial septicemia, health-care-associated lower respiratory tract infections including severe pneumonia, intraabdominal infections including peritonitis, pelvic inflammatory disease, treatment of bacterial endocarditis, MDR-TB in conjunction with at least two other antituberculosis agents (see under anti-tuberculosis) |
| Dose and administration | **Serious Gram-negative infections resistant to gentamicin,** IV**:**  **Adult**: 15 mg/kg daily in 2 divided doses, increased to 22.5 mg/kg daily in 3 divided doses for up to 10 days, higher dose to be used in severe infections; maximum 1.5 g per day; maximum 15 g per course  **Acute prostatitis, Acute pyelonephritis and Urinary tract infection (catheter-associated),** IV**:**  **Adult**: Initially 15 mg/kg once daily (max. per dose 1.5 g once daily). Maximum 15 g per course  **Treatment of MDR-TB,** **in combination with other medicines**, IV or IM:  **Adult:** 15 mg/kg once daily (maximum 1 g), weight categorization:  Body weight 33–50 kg: 500–750 mg  Body weight 51–70 kg: 1000 mg  Body weight >70 kg: 1000 mg  **Note**: *To avoid excessive dosage in obese patients, use ideal weight for height to calculate dose and monitor serum amikacin concentration closely.* |
| Contraindications | Hypersensitivity to the drug or other aminoglycosides, myasthenia gravis. |
| Drug interactions | Vancomycin, amphotericin B, bacitracin, cisplatin, ciclosporin, paromomycin, polymyxin B, colistin, tacrolimus, mannitol, capreomycin or other aminoglycosides, anesthetics, neuromuscular blocking agents, indomethacin, pyridostigmine and neostigmine, furosemide, ethacrynic acid., chlorothiazide, amphotericin erythromycin, heparin, nitrofurantoin, phenytoin, warfarin, penicillins, cephalosporins. |
| Side effects | Neurotoxicity, arthralgia, impaired balance, ototoxicity, nephrotoxicity, allergic reaction, dyspnea, eosinophilia. |
| Cautions | Pre-existing vertigo, tinnitus or hearing loss, vestibular damage, neuromuscular disorders (e.g., Parkinson’s disease), hypocalcaemia, concomitant or sequential administration of oral or topical neurotoxic, ototoxic or nephrotoxic drugs, potent diuretics, dehydrated patients, renal impairment, premature infants, neonates, children, elderly, pregnancy, breastfeeding. |
| Storage condition | Store below 30⁰C. |
| **Gentamicin (Access)** | |
| Pharmacological class | Aminoglycoside |
| Dosage form | Injection: 20mg/2ml, 80mg/2ml (as sulfate) in 2mL vial |
| Indications | Biliary tract infection, skin and soft tissue infections including severe burns, bone and joint infection, meningitis and other CNS infection, urinary tract infection, bacterial septicemia, health-care-associated lower respiratory tract infections (severe pneumonia), intraabdominal infections (peritonitis), pelvic inflammatory disease, treatment of bacterial endocarditis, surgical prophylaxis***.*** |
| Dose and administration | **Infections with susceptible organisms;** IM or slow IV or IV infusion:  **Adult**: 3–5 mg/kg daily in divided doses every 8 hours  **Child over 10 years:** 6 mg/kg once daily (maximum dose 240–360 mg)  **Infant or child under 10 years:** 7.5 mg/kg once daily  **Term neonate:** 3.5–5 mg/kg once daily  **Endocarditis** (as part of combination therapy):  **Adult**: 1 mg/kg every 8-12 hours  **Surgical prophylaxis**  **Adult**: 5mg/kg as a single dose at induction  **Note**: *Usual adult prescribing limit is up to 7mg (base) per kg of body weight daily in severe, life-threatening infections.* |
| Contraindications | Hypersensitivity to the drug or other aminoglycoside, myasthenia gravis, severe cirrhosis of grades B and C. |
| Drug interactions | Refer to Amikacin. |
| Side effects | Antibiotic associated colitis, allergic skin rash, blood disorder, depression, encephalopathy, hallucination, hepatic reaction, nephrotoxicity, increased thirst, loss of appetite, nausea or vomiting, neurotoxicity (muscle twitching, numbness, seizures, tingling), ototoxicity, vestibular damage (dizziness, nausea, vomiting, unsteadiness). |
| Cautions | In premature infants and neonates, elderly, renal function impairment, dehydration, eighth-cranial nerve impairment, muscular weakness, obesity, hypocalcemia, hypokalemia, hypomagnesaemia, preexisting vertigo, tinnitus, hearing loss, family history of ototoxicity. |
| Storage condition | Store below 30⁰C. |
| **Neomycin (Reserve)** | |
| Pharmacological class | Aminoglycoside |
| Dosage form | Tablet: 500mg |
| Indications | Bowel sterilization before surgery, hepatic encephalopathy/hepatic coma. |
| Dose and administration | **Bowel sterilization before surgery /Preoperative intestinal antisepsis:**  Oral:  **Adult:** 1 g every 1 hour for 4 hours, then 1 g every 4 hours for 2–3 days  **Hepatic encephalopathy; Oral:**  **Adult:** Up to 4 g daily in divided doses for 5-7 days (in chronic cases) and 4-12g/day for acute cases  **Note**: *Neomycin is poorly absorbed after oral administration* |
| Contraindications | Hypersensitivity to the drug or other aminoglycosides, intestinal obstruction, myasthenia gravis. |
| Drug interactions | Oral anticoagulants, digoxin, methotrexate, furosemide, muscle relaxants, amphotericin B, amikacin, gentamicin, muscle relaxants, acyclovir. |
| Side effects | Diarrhea, nausea, vomiting, irritation or soreness of the oral or rectal area, dyspnea, eosinophilia, nephrotoxicity, neurotoxicity, ototoxicity, blood disorder, confusion, drug cross-reactivity, electrolyte imbalance, gastrointestinal disorders, hemolytic anemia, nephrotoxicity, nystagmus, oral disorders, paraesthesia, superinfection. |
| Cautions | Renal impairment, pre-existing hearing impairment, neuromuscular disorders. |
| Storage condition | Store below 30°C. |

**Fluroquinolones**

Fluoroquinolones are a class of broad-spectrum antibiotics that are active against both Gram-negative and Gram-positive bacteria. They are synthetic fluorinated analogues of nalidixic acid, which include antibiotics such as ciprofloxacin, levofloxacin, moxifloxacin, norfloxacin and ofloxacin.

Nalidixic acid and norfloxacin are effective in uncomplicated urinary tract infections. Ciprofloxacin is particularly active against Gram-negative bacteria, including *Salmonella,* *Shigella*, *Campylobacter*, *Neisseria*, and *Pseudomonas*. Ciprofloxacin has only moderate activity against Gram-positive bacteria such as *Streptococcus* *pneumoniae* and *Enterococcus* *faecalis* and it is not the drug of choice for Pneumococcal pneumonia. It is active against *Chlamydia* and some mycobacteria.

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| **Ciprofloxacin (Watch)** | |
| Pharmacological class | Fluoroquinolone |
| Dosage form | Injection: IV Infusion (as hyclate) 2mg/ml  Tablet (as hydrochloride): 100mg, 250mg, and 500mg  For oral suspension (anhydrous): 250mg/5ml |
| Indications | Gastroenteritis including cholera, shigellosis, travellers’ diarrhoea, campylobacter, salmonella enteritis, typhoid, gonorrhoea, chancroid, legionnaires’ disease, meningitis (including meningococcal meningitis prophylaxis), respiratory-tract infections including pseudomonal infections in cystic fibrosis, urinary tract infections, bone and joint infections, septicemia, anthrax, skin infections, prophylaxis in surgery. |
| Dose and administration | **Adult:**  **Infections due to susceptible organisms**: 250 – 750 mg twice daily  **Severe and/or complicated infections of the urinary tract (including chronic prostatitis), infectious diarrhoea**:  **Oral**: 500 mg two times daily  **IV infusion**: 400 mg 8 – 12 hours to be given over 60 minutes  **Severe and/or complicated lower respiratory tract infections, cystic fibrosis, severe and/or complicated infections of the skin**:  **Oral**: 750 mg two times daily  **IV infusion**: 400 mg 8 – 12 hours to be given over 60 minutes  **Uncomplicated gonorrhoea (when sensitivity confirmed ):**  **Oral**: 500 mg, one dose  **Disseminated gonococcal infection (when sensitivity confirmed):**  **Oral**: 500 mg two times daily  **Severe and/or complicated bone infections**: 750 mg twice daily.  **Oral**: 750 mg two times daily  **Prophylaxis of invasive infections due to *Neisseria meningitides***:  **Oral**: 500mg single dose tablet or oral suspension  **Surgical prophylaxis**  **Oral**: 750 mg, to be taken 60 minutes before procedure  **Anthrax (treatment and post-exposure prophylaxis)**  **Oral**: 500 mg twice daily  **IV** **infusion**: 400 mg every 12 hours, to be given over 60 minutes  **Child:**  **Complicated urinary tract infection**  **Oral**:10 mg/kg twice daily. Dose doubled in severe infections. Maximum dose 750 mg twice daily.  **IV infusion**:  **Child > 1 year**: 6 mg/kg every 8 hours; increased to 10 mg/kg every 8 hours (max. per dose 400 mg), in severe infection  **Severe respiratory tract infections (including cystic fibrosis), GI infections**  **Oral**: 20 mg/kg twice daily. Maximum dose 750 mg twice daily.  **IV infusion**:  **Child > 1 year:** 10 mg/kg every 8 hours  **Treatment and post-exposure prophylaxis of anthrax**  **Oral:** 15 mg/kg twice daily. Maximum 500 mg twice daily  **IV infusion:** 10 mg/kg every 12 hours (max. per dose 400 mg)  *Note:* *Fluoroquinolones should not be prescribed for treatment of mild to moderate infections (such as in acute exacerbation of chronic bronchitis and chronic obstructive pulmonary disease) unless other antibiotics that are commonly recommended for these infections are considered inappropriate.* |
| Contraindications | Hypersensitivity to the drug or any other quinolone. |
| Drug interactions | Antacids, ondansetron, iron preparations, opioid analgesics, live cholera vaccine, erythromycin, oral anticoagulants, ciclosporin, theophylline. |
| Side effects | Rash, itching, GI intolerance (e.g. nausea, vomiting, dyspepsia, diarrhoea, abdominal pain), metallic taste, headache, dizziness, insomnia, depression, restlessness, tremors, arthralgia, arthritis, myalgia, tendinitis, raised liver enzymes, erythema, pain or thrombophlebitis at IV infusion site. |
| Cautions | Pregnancy, breastfeeding, history of tender disorder, acute myocardial infarction, history of epilepsy or conditions that predispose to seizures, myasthenia gravis, exposure to excessive sunlight, hepatic and renal impairment. |
| Storage condition | Store below 30°C. |
| **Norfloxacin (Watch)** | |
| Pharmacological class | Fluoroquinolone |
| Dosage form | Tablet: 400 mg |
| Indications | Uncomplicated urinary tract infections and cystitis caused by susceptible gram-negative and gram-positive bacteria, sexually transmitted disease (e.g., uncomplicated urethral and cervical gonorrhea) caused by *N. gonorrhoeae*, prostatitis caused by *E. coli* |
| Dose and administration | **Adult**  **Urinary-tract infections:** 400 mg twice daily for 7 – 10 days (for 3 days in uncomplicated lower urinary tract infections)  **Chronic relapsing urinary tract infections:** 400 mg twice daily for up to 12 weeks; may be reduced to 400 mg once daily if adequate suppression within first 4 weeks  **Uncomplicated gonorrhea:** 800 mg in a single dose oral  **Chronic prostatitis:** 400 mg twice daily for 28 days |
| Contraindications | Hypersensitivity to the drug or any other quinolone. |
| Drug interactions | Refer to ciprofloxacin. |
| Side effects | Rash, itching, GI intolerance, metallic taste, headache, dizziness, insomnia, depression, restlessness, tremors, arthralgia, arthritis, myalgia, tendinitis, raised liver enzymes, erythema, pain or thrombophlebitis at IV infusion site, euphoria, anxiety, tinnitus, polyneuropathy, exfoliative dermatitis, pancreatitis, vasculitis. |
| Cautions | Refer to ciprofloxacin. |
| Storage condition | Store below 30 °C. |

**Tetracycline**

Tetracyclines are broad-spectrum bacteriostatic antibiotics that inhibit protein synthesis. Their activity spectrum includes Gram-positive and Gram-negative bacteria. Despite increasing bacterial resistance (especially by oral streptococci), they remain the treatment of choice for infections caused by chlamydia (trachoma, psittacosis, salpingitis, urethritis, and lymphogranuloma venereum), rickettsia (including Q-fever). They are often used in combination with other antibiotics.

Doxycycline is a second-generation tetracycline and is a broad- spectrum antibiotic effective for conditions caused by chlamydia, rickettsia, brucella and spirochaete, *Borrelia burgdorferi* (Lyme disease). It is a preferred tetracycline since it has a more favorable pharmacokinetic profile than tetracycline.

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| **Doxycycline (Access)** | |
| Pharmacological class | Second generation tetracycline |
| Dosage form | Tablet/Capsule: 100mg  Powder for oral liquid: 25 mg/5 mL (monohydrate)  Oral liquid: 50 mg/5 mL (calcium)  Powder for injection: 100mg in vial |
| Indications | Respiratory tract infections, genito-urinary tract infections, sexual transmitted diseases, Lyme disease, brucellosis (with rifampicin), leptospirosis, scrub typhus, travellers’ diarrhea, psittacosis, cholera, melioidosis, plague, anthrax, Q fever, acne vulgaris, acne conglobata, malaria treatment and prophylaxis. |
| Dose and administration | **Infections due to susceptible organisms:**  **Adult and Child over 8 years**: 200 mg on first day then 100 mg daily; in severe infections, 200 mg daily  **Syphilis**:  **Adult**: 200–300 mg daily in 1–2 divided doses  **Uncomplicated genital chlamydia, non-gonococcal urethritis**:  **Adult**: 100 mg twice daily  **Louse and tick-borne relapsing fevers, epidemic typhus, cholera:**  Adult: 100 mg or 200 mg (300 mg in cholera) as a single dose  **Child over 8 years**: 4.4 mg/kg (maximum 100mg) as single dose  **Acute pelvis affection, Lymphogranuloma venereum**:  **Adult:** 100 mg twice daily  **Child under 45 kg:** 2 to 2.2 mg/kg (max. 100 mg) 2 times daily  **Acne**:  **Adult:** 50 mg daily  **Malaria prevention:**  **Adult and child 12 – 17 years**: 100 mg daily |
| Contraindications | Hypersensitivity to the drug or other tetracyclines. |
| Drug interactions | Antacids, amoxicillin, ampicillin, carbamazepine, ciclosporin, oral contraceptives, ergotamine, ferrous salts, phenobarbital, phenytoin, rifampicin and warfarin. |
| Side effects | Dyspnea, hypotension, peripheral edema, tachycardia, gastrointestinal discomfort (nausea, vomiting), antibiotic associated colitis, anxiety, arthralgia, flushing, myalgia, skin hyperpigmentation (with long-term use), stomatitis, tinnitus, vision disorders, photosensitivity. |
| Cautions | Pregnancy, breastfeeding, alcohol dependence, children under 8 years, known esophageal reflux disorders, renal impairment, hepatic impairment, concomitant use of hepatotoxic drugs, myasthenia gravis, exposure to sunlight or sunlamps. |
| Storage condition | Store below 30°C. |

**Miscellaneous antibacterials**

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| **Clindamycin (Watch)** | |
| Pharmacological class | Lincosamide |
| Dosage form | Capsule: 75mg, 150mg (as hydrochloride)  Injection: 150mg/ml (as phosphate) in ampoule  Oral solution: 75mg/5ml (as palmitate hydrochloride) |
| Indications | Infections with susceptible anaerobic and aerobic (Gram positive cocci) organisms where there is allergy to penicillin and resistance to first-line drugs, including staphylococcal bone and joint infections, bacterial vaginosis, pelvic inflammatory disease, orofacial/parapharyngeal space infections, peritonitis, pyomyocistis, bite wound and pneumonia, moderate to severe diabetic foot infection, endocarditis and surgical prophylaxis |
| Dose and administration | **Staphylococcal bone and joint infections:**  **Oral:**  **Adult:** 150 - 300 mg every 6 hours; up to 450 mg every 6 hours in severe infections.  **Child**: 8-25 mg/kg/day in 3 or 4 equal divided doses  **IM or IV infusion:**  **Adult**: 600 - 2700 mg daily in 2 - 4 divided doses, increased up to 4.8 g daily in life-threatening infections **Neonates:** 15 - 20 mg/kg daily  **Child** over 1 month: 15 - 40 mg/kg daily in 3 - 4 divided doses; severe infections, at least 300 mg daily, regardless of weight  *Note:* *Single IM injection dose should not exceed 600mg and IV infusion should be administered over 60 minutes* |
| Contraindications | Hypersensitivity to the drug or lincomycin, existing diarrhea, injections containing benzyl alcohol, porphyria. |
| Drug interactions | Suxamethonium, vecuronium, neostigmine, pyridostigmine, erythromycin, oral typhoid vaccine, live cholera vaccine, warfarin. |
| Side effects | Skin reactions, urticaria, angioedema, anaphylaxis, diarrhea, nausea, vomiting, abdominal discomfort, antibiotic associated colitis, jaundice, neutropenia, eosinophilia, agranulocytosis, and thrombocytopenia, abscess after IM injection, thrombophlebitis after IV injection, Stevens-Johnson syndrome. |
| Cautions | Pregnancy, breastfeeding, renal impairment, hepatic impairment, atopic individuals, history of gastro-intestinal disease (colitis). |
| Storage condition | Store below 30°C. |
| **Colistin (Reserve)** | |
| Pharmacological class | Polymyxin E |
| Dosage form | Powder for Injection: 1 million IU (as colistemethate sodium) |
| Indications | Serious infections due to selected aerobic Gram-negative bacteria in patients with limited treatment options. It is particularly indicated when the infection is caused by sensitive strains of *Pseudomonas aeruginosa*. |
| Dose and administration | **Serious infections due to selected aerobic Gram-negative bacteria in patients with limited treatment options;** IV infusion**:**  **Adult:** 9 million units daily in 2–3 divided doses, an initial loading dose of 9 million units should be used in those who are critically ill  **Child (body weight up to 41 kg):** 75 000–150 000 units/kg daily in 3 divided doses  **Child (body weight 41 kg and above):** 9 million units daily in 2–3 divided doses |
| Contraindications | Hypersensitivity to the drug, myasthenia gravis. |
| Drug interactions | Aminoglycosides, amphotericin B, polymyxin, tubocurarine, succinylcholine, gallamine, live cholera vaccine, decamethonium, sodium citrate, sodium cephalothin, mycophenolate mofetil |
| Side effects | Confusion, nephrotoxicity, presyncope, psychosis, respiratory disorder, paresthesia, slurred speech, visual impairment. |
| Cautions | Pregnancy, breastfeeding, hepatic impairment, renal impairment, children below 1 year of age. |
| Storage condition | Store below 30°C. |
| **Linezolid (Reserved)** | |
| Pharmacological class | Oxazolidinone |
| Dosage form | Injection for intravenous administration: 2 mg/mL in 300 mL bag  Powder for oral liquid: 100 mg/5 mL  Tablet (dispersible): 150 mg, 600mg |
| Indications | Drug-resistant TB as a primary regimen drug for the intensive phase of treatment (6 months) in an appropriate combination, pneumonia and complicated skin and soft-tissue infections when other antibacterials cannot be used, severe diabetic foot infection. |
| Dose and administration | **Adult;** Oral or IV infusion**:** 600 mg every 12 hours  **Child:** Oral:  **Child less than 12 years**: 10 mg/kg every 12 hours  **Child 12 to 18 years**: Usual adult doses |
| Contraindications | Hypersensitivity to the drug, concomitant use or within 2 weeks of discontinuing monoamine oxidases inhibitors. |
| Drug interactions | Rifampicin, phenytoin, insulin or oral antidiabetics, tramadol, serotonergic drugs (e.g., bupropion, fluoxetine, mirtazapine, amoxapine, buspirone, maprotiline, meperidine, trazodone, nefazodone), sumatriptan, carbamazepine, cyproheptadine, vasopressive agents (e.g., epinephrine, norepinephrine), sympathomimetic agents (e.g., pseudoephedrine, salbutamol), dopaminergic agents (e.g., dopamine, dobutamine), warfarin, tyramine-rich foods. |
| Side effects | Anemia, GI discomfort, constipation, diarrhea, taste altered, nausea, vomiting, thirst, tongue discoloration, dizziness, insomnia, seizure, headache, hypertension, increased risk of infection, localized pain, skin reactions, arrhythmia, transient ischemic attack, thrombocytopenia, thrombophlebitis, tinnitus, vision disorders, antibiotic associated colitis, bone marrow disorders. |
| Cautions | Pre-existing myelosuppression, history of seizure, diabetes mellitus, phenylketonuria, severe renal impairment, hepatic impairment, acute confusional states, bipolar depression, schizophrenia, carcinoid tumour, elderly, thyrotoxicosis, uncontrolled hypertension, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C |
| **Metronidazole (Access)** | |
| Pharmacological class | Nitroimidazole |
| Dosage form | Intravenous infusion: 5mg/ml in 100ml  Tablet/Capsule: 250mg, 500mg  Oral liquid: 125mg (benzoate)/5ml  Suppository: 500mg, 1gm |
| Indications | Anaerobic infections (caused by species of bacteroides, anaerobic streptococci, fusobacteria, clostridia), bone and joint infection, meningitis, bacterial endocarditis, prophylaxis of perioperative infection during colorectal surgery, lower respiratory tract infection including pneumonia, empyema and lung abscess, bacterial septicemia, skin and soft tissue infection, inflammatory bowel disease, antibiotic associated colitis, *Helicobacter pylori* associated duodenal ulcer, acute ulcerative gingivitis, urogenital trichomoniasis, acute dental infections, non-specific vaginitis. |
| Dose and administration | **Anaerobic infections(systemic):**  **Oral**:  **Adult:** 400 mg every 8 hours, alternatively 500 mg every 8 hours) or 7.5mg (base) per kg of body weight up to a maximum of 1 gm, every 6 hours  **IV Infusion**:  **Adult:** 500 mg every 8 hours to be given over 20 minutes or IV-infusion, 15mg (base) per kg of body weight initially, then 7.5mg per kg of body weight up to a maximum of 1gm, every 6 hours for seven days or longer  **Acute ulcerative gingivitis and acute oral infections;** Oral:  **Adult**: 500 mg 2-3 times daily  **Antibiotic associated colitis**: Oral:  **Adult**: 500mg (base) 3 or 4 times a day  ***Helicobacter pylori* associated gastritis or duodenal ulcer;** Oral:  **Adult**: 500mg (base) 2 times daily in combination with another antibacterial and PPI  **Perioperative infections, colonic (prophylaxis**); IV infusion:  **Adult**: 15mg (base) per kg of body weight one hour prior to start of surgery and 7.5mg per kg of body weight six and twelve hours after the initial dose  **Bacterial Vaginitis (notably Gardnerella vaginalis infection);** Oral:  **Adult**: 500 mg twice daily, alternatively 2 g for 1 dose.  **Child:**  **Anaerobic infection**: Oral:  **Child 1 month–11 years:** 7.5 mg/kg/dose every 8-12 hours (max. per dose 400 mg)  **Child 12–17 years:** 500 mg every 8 hours  **Acute ulcerative gingivitis and oral infection:** Oral:  **Child 1–2 years:** 50 mg every 8 hours for 3 days  **Child 3–6 years:** 100 mg every 12 hours for 3 days  **Child 7–9 years:** 100 mg every 8 hours for 3 days  **Child 10–17 years:** 200–250 mg every 8 hours for 3 |
| Contraindications | Hypersensitivity to the drug or other nitroimidazoles, co-administration with alcohol or propylene glycol containing products during or 3 days after therapy discontinuation. |
| Drug interactions | Phenytoin, warfarin, disulfiram, alcohol, cimetidine, fluorouracil, erythromycin, fentanyl, mebendazole, simvastatin, lithium, phenobarbitone, oral contraceptives, lopinavir. |
| Side effects | GI intolerance (nausea, dry oral, abdominal pain, vomiting, diarrhoea), anorexia, metallic taste, myalgia, CNS effects (e.g., dizziness, headache), thrombophlebitis, furry tongue, glossitis, stomatitis, paraesthesia, peripheral neuropathy, epileptiform seizures, Stevens Johnson syndrome, toxic epidermal necrolysis. |
| Cautions | Hepatic impairment/ encephalopathy, pregnancy, breastfeeding, active or chronic severe peripheral and central nervous system diseases. |
| Storage condition | Store below 30oC. |
| **Nitrofurantoin (Access)** | |
| Pharmacological class | Nitrofuran |
| Dosage form | Tablet: 50mg, 100mg  Oral liquid: 25mg/5mL |
| Indications | Prophylaxis and treatment of urinary tract infection against acute or recurrent, uncomplicated lower urinary tract infections or pyelitis either spontaneous or following surgical procedures. Treatment of infections due to susceptible strains of *Escherichia coli*, *Enterococci*, *Staphylococci*, *Citrobacter*, *Klebsiella* and *Enterobacter*. |
| Dose and administration | Oral;  **Adult:**  **Acute uncomplicated urinary tract infections:** 100 mg every 12 hours or 50 mg every 6 hours, with food \  **Severe recurrent urinary tract infection**: 100 mg every 6 hours with food \ (reduced to 200 mg daily in divided doses if severe nausea).  **Prophylaxis of chronic urinary tract infections**: 50–100 mg at night  **Prophylaxis of surgical infections**: 50–100 mg once daily; alternatively, 50 mg 4 times daily  **Child:**  **Treatment of acute uncomplicated urinary tract infection**  **Infant or child over 3 months:** 750 micrograms/kg four times daily for 3–7 days. Maximum dose 100 mg.  **Prophylaxis of urinary tract infection**  **Infant or child over 3 months**: 1 mg/kg at night. Maximum dose 100 mg.  **Prophylaxis of surgical infections**  **Child >3 months:** 1 mg/kg at bedtime |
| Contraindications | Hypersensitivity to the drug, infants less than 3 months, pregnancy, breastfeeding, glucose 6 phosphate dehydrogenase (G6PD) deficiency, porphyria. |
| Drug interactions | Probenecid, magnesium trisilicate, fluconazole, fluroquinolones (norfloxacin), folic acid, typhoid vaccine, live cholera vaccine, hemolytic agents, neurotoxic medications. |
| Side effects | Dose related GI disorders (including nausea and vomiting, anorexia, diarrhea and abdominal pain), hypersensitivity reactions (including urticaria, rash, sialadenitis, pruritus, angioedema), headache, drowsiness, vertigo, dizziness, skin reactions including erythema multiforme, Stevens-Johnson Syndrome, exfoliative dermatitis, lupus-like syndrome, anaphylaxis, drug fever, hepatitis, eosinophilia, arthralgia, pancreatitis, benign intracranial hypertension. |
| Cautions | Renal and hepatic impairment, pulmonary disease, neurological disorders, allergic diathesis, anemia, diabetes mellitus, electrolyte imbalance, vitamin B and folate deficiency, pulmonary disease, peripheral neuropathy. |
| Storage condition | Store below 30°C. |
| **Polymyxin B (Reserve)** | |
| Pharmacological class | Polymyxin |
| Dosage form | Powder for injection: 500,000 IU (equivalent to 50 mg polymyxin B base) in vial. |
| Indications | Acute infections caused by susceptible strains of *Pseudomonas aeruginosa*, serious infections caused by susceptible strains of *Haemophilus influenzae* (meningeal infections), *Escherichia coli* (urinary tract infections), *Aerobacter aerogenes* (bacteremia), *Klebsiella pneumoniae* (bacteremia). |
| Dose and administration | **Usual dose**  **Adult:**  **IV:** 15,000- 25,000 units/kg /day. Infusions may be given every 12 hours. *Dose reduced in renal impairment.*  **IM (not recommended routinely because of severe pain at injection sites, particularly in infants and children):** 25,000 - 30,000 units/kg/day in 4- or 6-hour intervals.  **Child:**  **IV:**  **Infant:** Infants with normal kidney function may receive up to 40,000 units/kg/day without adverse effects.  **Child:** 15,000 to 25,000 units/kg body weight/day in individuals with normal kidney function.  **IM:**  Infants with normal kidney function may receive up to 40,000 units/kg/day (commonly 25,000 to 30,000 units/kg/day) in 4 or 6 divided doses without adverse effects  ***P. aeruginosa* meningitis,** **intrathecal**  **Child > 2years**: 50,000 units once daily intrathecally for 3 to 4 days, then 50,000 units once every other day  **Infants:** 20,000 units once daily, intrathecally for 3 to 4 days or 25,000 units once every other day |
| Contraindications | Hypersensitivity to polymyxins, myasthenia gravis. |
| Drug interactions | Curariform muscle relaxant/neurotoxic drugs (ether, tubocurarine, succinylcholine, gallamine, decamethonium and sodium citrate), aminoglycosides, amphotericin B, live cholera vaccine, neomycin. |
| Side effects | Neurotoxicity, nephrotoxicity, paresthesia, skin hyperpigmentation, *Clostridioides difficile* associated diarrhea. |
| Cautions | Intramuscular and intrathecal administration, pregnancy and breastfeeding. |
| Storage condition | Store below 30°C. |
| **Sulfamethoxazole + Trimethoprim (Access**) | |
| Pharmacological class | Sulfonamides |
| Dosage form | Suspension: 240mg/5ml  Dispersible tablet:100mg + 20mg  Tablet: 400mg + 80mg; 800mg +160mg  Injection: 80mg + 16mg/ml (5ml, 10ml, 30ml) |
| Indications | Urinary tract, respiratory tract, typhoid/paratyphoid fevers and prostatic infections caused by susceptible organisms, prophylaxis and treatment of Pneumocystis Jirovecii pneumonia, toxoplasmosis, cystoisoporiasis (previously called *Isospora belli* diarrhea), nocardiosis. |
| Dose and administration | **Infection due to susceptible organisms: Adult;**  **Oral**: 160mg of trimethoprim and 800mg of sulfamethoxazole every 12 hours; may be increased to 320/1600 mg 12 hourly in severe infections.  **IV infusion**: 160/800 mg 12 hourly  **Child, Oral:**  **Child** **2 months to 5 months: 2**0/100 mg, 12 hourly  **Child** **6 months to 5 years:**  40/200 mg, 12 hourly  **Child** **6 years to 12 years:**  80/400mg, 12 hourly  **Child; IV infusion:** 6/30 mg/kg/day in 2 divided doses, increased to 9/45 mg/kg/day in severe infections.  **Pneumocystis jirovecii pneumonia; Oral:**  **Adult and Child:** sulfamethoxazole up to 100mg/kg daily with trimethoprim up to 20mg/kg daily in 2-4 divided doses for 14-21 days.  **CNS toxoplasmosis; oral:**  **Adult**: 320/1600mg twice daily for 4 weeks, then 160/800 mg twice daily for 3 months.  **Cystoisoporiasis, Cryptosporidiosis; oral:**  **Adult**: 160/800 mg 12 hourly  **Primary prophylaxis in HIV-infection associated opportunistic infections**: oral:  **Adult**: 160/800 mg daily  **Note**: *Avoid IM administration* |
| Contraindications | Hypersensitivity to sulfonamides or trimethoprim, children <2 months of age, pregnancy, breastfeeding. |
| Drug interactions | Warfarin, amiodarone, procainamide, heparin, indapamide, leucovorin, pentamidine, oral hypoglycemics, hemolytic, hepatotoxic medication, methenamine, methotrexate, folate antagonists |
| Side effects | Hypersensitivity, photosensitivity, blood disorders unusual bleeding or bruising, unusual tiredness or weakness, hepatitis, Steven Johnson syndrome, aching joints and muscles, redness, blistering, peeling, or loosening of the skin, unusual tiredness or weakness, toxic epidermal necrosis, dizziness, headache, GIT disturbance, loss of appetite. |
| Cautions | Renal and hepatic function impairment, glucose-6-phosphate dehydrogenase (G6PD) deficiency, elderly, asthmatic patients, pregnancy and lactation |
| Storage condition | Store below 30°C. |
| **Tedizolid (Reserved)** | |
| Pharmacological class | Oxazolidinone |
| Dosage form | Tablet: 200 mg, 400mg, 600mg, 600 mg  Oral suspension: 2 mg/ml  Solution for infusion: 600mg |
| Indications | Treatment of acute bacterial skin and skin structure infections. |
| Dose and administration | **Acute bacterial skin and skin structure Infections;** IV or oral:  **Adult and child>12 years:** 200 mg once daily for 6 days  Note: *for child <12 years, safety and efficacy are not established* |
| Contraindications | Hypersensitivity to the drug or oxazolidinone class of medicines. |
| Drug interactions | Cyproheptadine, amitriptyline, amoxapine, fentanyl, live cholera vaccine, fluoxetine, meperidine, metformin, tramadol, sumatriptan. |
| Side effects | Diarrhea, nausea, vomiting, altered taste, constipation, antibiotic associated colitis, dizziness, anxiety, fatigue, headache, skin reactions, arthralgia, bradycardia, chills, cough, sleep disorders, vasodilation, vision blurred. |
| Cautions | Pregnancy, breastfeeding, history of bleeding, concomitant use of antidepressant, renal impairment. |
| Storage condition | Store below 30°C. |
| **Vancomycin (Watch)** | |
| Pharmacological class | Glycopeptide |
| Dosage form | Capsule: 125mg, 250mg, 500mg  Injection: 500mg, 1000mg (as hydrochloride) in vial |
| Indications | Infections with susceptible organisms, including methicillin-resistant staphylococcal pneumonia, staphylococcal meningitis, *Clostridioides difficile* infection and infective endocarditis |
| Dose and administration | **Treatment of infections with susceptible organisms:** **IV infusion;**  **Adult:** 500 mg over at least 1 hour, 500 mg 6 hourly or 1 g 12 hourly.  **Child**: 10 mg/kg over at least 1 hour, 10 mg/kg 6 hourly or 20 mg/kg 12 hourly.  **Neonates** (under 1 week old): initially, 15 mg/kg followed by 10mg/kg 12 hourly.  **Neonates (**1 week - 1 month old), initially, 15 mg/kg followed by 10 mg/kg 8 hourly.  **Elderly** (over 65 years): 500 mg every 12 hours or 1 g once daily  **Endocarditis prophylaxis** (for procedures under general anesthetic); by IV infusion:  **Adult;** 1 g over at least 100 minutes, then gentamicin 120 mg at induction or 15 minutes before procedure  **Infective endocarditis treatment, septicemia;** by IV infusion:  **Adult:** 2 g in 2 or 4 divided doses  **Childmonth**: 10mg/kg/dose 4 times a day (recommended only for high-risk patients)  ***Clostridioides difficile* infection**:  **Adult**: 125–500 mg every 6 hours, orally  **Child**: 125mg every 6 hours, orally |
| Contraindications | Hypersensitivity to the drug, previous hearing loss. |
| Drug interactions | Aminoglycosides, amphotericin B, ciclosporin, live cholera vaccine, furosemide, halothane, ketamine, nitrous oxide, suxamethonium, thiopental. |
| Side effects | Nephrotoxicity, ototoxicity, nausea, vomiting, diarrhea, chills. dizziness, vertigo and tinnitus, thrombocytopenia, neutropenia, leukopenia, agranulocytosis, flushing of the upper body (“red man” syndrome, anaphylaxis, severe hypotension (with shock, cardiac arrest), superinfection, and local pain and thrombophlebitis (in IV infusion). |
| Cautions | Renal impairment, pregnancy, breastfeeding, inflammatory disorders of the intestinal mucosa, *Clostridioides* *difficile*-induced pseudomembranous colitis. |
| Storage condition | Store below 30°C. |

**Anti-tuberculosis (TB) medicines**

Antitubercular agents work by stopping the growth of the bacteria that causes tuberculosis (*Mycobacterium tuberculosis*).  Tuberculosis (TB) is an airborne infectious disease, which is spread by breathing in infected respiratory droplets from a person with infectious tuberculosis. The most common form of tuberculosis infection is in the lungs (pulmonary or PTB) but infection can also spread and develop in other parts of the body (extrapulmonary or EPTB). The infection can be active or latent, with approximately 10% of latent infections progressing to active status.

Antitubercular medications are a group of drugs used to treat tuberculosis. Isoniazid (INH), rifampin (or other rifamycin), pyrazinamide, ethambutol, and streptomycin are the five first-line agents for treatment of tuberculosis.

The standard treatment of active tuberculosis is completed in two phases; an initial phase using four drugs and a continuation phase using two drugs, in fully sensitive cases. The initial phase aims to render the patient non-infectious by rapidly reducing the bacillary load in the sputum and brings clinical improvement in most patients receiving effective treatment. The continuation phase aims to sterilize the remaining semi-dormant bacilli and is important to ensure cure/ completion of treatment and prevent relapse after completion of treatment. In all phases of treatment for tuberculosis, fixed-dose combination tablets should be used, and a daily dosing schedule should be offered in active pulmonary tuberculosis and considered as first choice in active extrapulmonary tuberculosis.

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| **Amikacin (Access)** | |
| Pharmacological class | Aminoglycoside |
| Dosage form | Injection: 250 mg/mL (as sulfate) in 2 mL vial |
| Indications | Treatment of MDR-TB in conjunction with at least two other antituberculosis agent. |
| Dose and administration | **IV:**  **Adult >15 years**: 15-20mg/kg, maximum 1g daily  **Child <15 years**: 15-20mg/kg, maximum 1g daily |
| Contraindications | Refer to amikacin (antibacterials). |
| Drug interactions | Refer to amikacin (antibacterials). |
| Side effects | Refer to amikacin (antibacterials). |
| Cautions | Refer to amikacin (antibacterials). |
| Storage condition | Store below 30oC.  Note: *following dilution in 0.9% sodium chloride and 5% glucose solutions chemical and physical in-use stability has been demonstrated for 24 hours at temperature not above 25° C.* |
| **Bedaquiline** | |
| Pharmacological class | Diarylquinoline |
| Dosage form | Tablet: 20mg, 100mg |
| Indications | MDR-TB, in combination with other antituberculosis agents |
| Dose and administration | **Adult; Oral:**  Week 1 and 2: 400 mg once daily  Week 3 – 24: 200 mg 3 times a week (intervals of at least 48 hours between each dose)  **Child** **(5 years – 18 years)**  **Weight 15-29 kg**: 200 mg once daily for week 1 and 2; then, 100 mg three times weekly for week 3 – 24  **Weight ≥ 30**: 400 mg once daily for week 1 and 2; then, 200 mg three times weekly for week 3 – 24  **Note:** *Not indicated for use in child less than 5 years* |
| Contraindications | Hypersensitivity to the drug, QTc prolongation, ventricular arrhythmia. |
| Drug interactions | CYP 3A4 inducers (rifampicin, phenytoin, carbamazepine) and inhibitors (azole antifungals, protease inhibitors), clofazimine, fluoroquinolones, delamanid, artemether, atazanavir, chloramphenicol, clarithromycin, dexamethasone, efavirenz, hydroxychloroquine. |
| Side effects | Arthralgia, diarrhea, dizziness, headache, abnormal hepatic function, myalgia, nausea, QT interval prolongation, vomiting, hemoptysis, rash. |
| Cautions | Hypothyroidism, risk factors for QT interval prolongation, hepatic impairment, renal impairment, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C. |
| **Clofazimine** | |
| Pharmacological class | Phenazine dye, antimycobacterial |
| Dosage form | Capsule: 50mg,100mg |
| Indications | MDR-TB and XDR-TB treatment |
| Dose and administration | **Oral;**  **Adults:** 100mg daily  **Children:** 2-5 mg/kg once daily |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Rifampicin, clarithromycin, azithromycin, fexinidazole, hydroxychloroquine, isoniazid, fluoroquinolones, delamanid, bedaquiline. |
| Side effects | Pink to brownish-black skin discoloration, ichthyosis, dry skin, melanosis, pruritis, rash, photosensitivity reactions, abdominal pain, nausea, vomiting, diarrhea, weight loss, bowel obstruction, GI haemorrhage, conjunctival pigmentation, subjective dimness of vision, dry eyes, burning, and other ocular irritation, risk of reactive depression due to skin discoloration, discoloration of body fluids, QT prolongation, ventricular tachyarrhythmias, increased blood glucose level. |
| Cautions | Pregnancy, breastfeeding, renal impairment, hepatic impairment.  **Note:** *Avoid if there is persistent abdominal pain and diarrhea.* |
| Storage condition | Store below 30 ºC. |
| **Cycloserine** | |
| Pharmacological class | Isoxazolines, antitubercular |
| Dosage form | Oral solid dosage form: 125mg, 250mg |
| Indications | Treatment of tuberculosis resistant to first- line agents, in combination with other second- line drugs. |
| Dose and administration | **Oral:**  **Adult and children > 14 years**: 250 mg every 12 hours for 14 days, then administer 500 mg to 1g/day in 2 divided doses for 18 - 24 months (maximum daily dose: 1 g).  **Child**: 10 - 20 mg/kg/day in 2 divided doses up to 1000 mg/day for 18 - 24 months |
| Contraindications | Hypersensitivity to the drug, severe renal insufficiency. |
| Drug interactions | Alcohol, isoniazid, ethionamide, phenytoin. |
| Side effects | Cardiac arrhythmia, drowsiness, headache, dizziness, vertigo, seizure, confusion, psychosis, hyperirritability, paresthesia, dysarthria paresis, coma, rash, vitamin B12 deficiency, folate deficiency, liver enzymes increased, tremor. |
| Cautions | Pregnancy, breastfeeding, epilepsy, depression, severe anxiety, psychosis, renal insufficiency, chronic alcoholism. |
| Storage condition | Store below 30 ºC. |
| **Delamanid** | |
| Pharmacological class | Imidazooxazole derivative, antitubercular |
| Dosage form | Tablet: 50 mg tablet  Tablet (dispersible): 25 mg |
| Indications | MDR-TB resistant to fluoroquinolones, in combination with other medicines. |
| Dose and administration | **Adult; Oral:** 100 mg twice daily for 24 weeks, continue appropriate combination therapy after delamanid |
| Contraindications | Hypersensitivity to delamanid, QTc interval prolongation, Serum albumin less than 28 g/L. |
| Drug interactions | Clofazimine, fluoroquinolones, bedaquiline, CYP 3A4 inducers (rifampicin, phenytoin) and inhibitors (azole antifungals, protease inhibitors). |
| Side effects | Nausea, vomiting, headache, insomnia, dizziness, tinnitus, hypokalemia, gastritis, decreased appetite, weakness, QT interval prolongation, reticulocytosis, sensation abnormal, skin reactions, sleep disorders, throat irritation, dyslipidemia, dyspnea. |
| Cautions | Pregnancy, breastfeeding, hypothyroidism, risk factors for QT interval prolongation, hepatic impairment, renal impairment. |
| Storage condition | Store below 30 ºC. |
| **Ethambutol** | |
| Pharmacological class | Ethylenediamine, antitubercular |
| Dosage form | Tablet: 100mg, 400mg (hydrochloride)  Tablet (dispersible): 100 mg |
| Indications | Tuberculosis, in combination with other drugs. |
| Dose and administration | **Initial phase of combination therapy**  Oral: 15mg/kg (15-20 mg/kg) daily, maximum 1600mg  Child 20mg/kg (15-25 mg/kg) daily  **Note**: *in child <13 years, data are limited* |
| Contraindications | Hypersensitive to the drug, optic neuritis, poor vision. |
| Drug interactions | Aluminium hydroxide, magnesium hydroxide, allopurinol, probenecid. |
| Side effects | Optic neuritis, red/green color blindness, peripheral neuritis, nerve disorders nausea, vomiting, rarely rash, pruritus, urticaria, hyperuricemia, thrombocytopenia |
| Cautions | Pregnancy, breastfeeding, visual disturbances, elderly, renal impairment, hepatic impairment, and patients unable to appreciate and report visual side effects or change in vision (age less than 5 years, unconscious patients). |
| Storage condition | Store below 30oC. |
| **Ethambutol + isoniazid + pyrazinamide + rifampicin** | |
| Pharmacological class | Antitubercular combination |
| Dosage form | Tablet: 275mg + 75mg + 400 mg + 150mg  Tablet: 75 mg (R) + 50 mg(H) + 150 mg(Z) and single 100 mg (E) |
| Indications | Treatment regimen in the intensive phase for newly diagnosed TB. |
| Dose and administration | **Intensive phase (2 months); Oral:**  **Adult:**  Body weight 20–29 kg: 1 tablets daily for 2 months  Body weight 30–39 kg: 2 tablets daily for 2 months  Body weight 40–54 kg: 3 tablets daily for 2 months  Body weight 55 kg: 4 tablets daily for 2 months  **Child:** RHZ 75/50/150 tabs +E 100mg  tabs  Body weight 4–7 kg: 1 tablet RHZ + 1 tablet ethambutol  Body weight 8–11 kg: 2 tablet RHZ + 2 tablet ethambutol  Body weight 12–15 kg: 3 tablet RHZ + 3 tablet ethambutol  Body weight 16– 24kg: 4 tablet RHZ + 4 tablet ethambutol  Body weight 55 kg: adult dose recommended |
| Contraindications | Refer to individual monograph. |
| Drug interactions | Refer to individual monograph. |
| Side effects | Refer to individual monograph. |
| Cautions | Refer to individual monograph. |
| Storage condition | Store below 30oC |
| **Ethambutol + isoniazid + rifampicin** | |
| Pharmacological class | Antitubercular combination |
| Dosage form | Tablet: 275mg + 75mg + 150mg |
| Indications | For the initial (intensive phase) treatment of tuberculosis due to *M. tuberculosis* |
| Dose and administration | **Typical recommended doses of RHE for initial (intensive phase) treatment in adults and children weighing more than 25 kg**; Oral:  **Body weight 25 -29.9 Kg:** 2 tablets once daily  **Body weight 30-34.9 Kg:** 3 tablets once daily  **Body weight 35-64.9 Kg:** 4 tablets once daily  **Body weight >65 Kg:** 5 tablets once daily  **Note**: The efficacy of the combination has not been established in children, and this product should not be used in children under 13 years of age since safe conditions for use have not been established. |
| Contraindications | Refer to individual monograph. |
| Drug interactions | Refer to individual monograph. |
| Side effects | Refer to individual monograph. |
| Cautions | Refer to individual monograph. |
| Storage condition | Store Below 30oC. |
| **Ethionamide** | |
| Pharmacological class | Pyridine derivative, second line antitubercular |
| Dosage form | Tablet: 125mg, 250mg  Tablet (dispersible): 125mg |
| Indications | In combination with at least 2, preferably 3 (new drugs known to be active against the resistant strain) other antituberculotic agents for the treatment of all forms of resistant tuberculosis. |
| Dose and administration | **Oral**:  **Adult:** 15 - 20 mg/kg/day as a single dose; Maximum 1 g/day.  **Child:** 10 -20 mg/kg/day in 2 – 3 divided doses after meals or 15mg/kg once daily. |
| Contraindications | Hypersensitivity to the drugs, severe hepatic disease. |
| Drug interactions | Isoniazid, rifampcin, cycloserine, terizidone. |
| Side effects | Nausea, vomiting, diarrhea and weight loss, anorexia, metallic taste, abdominal discomfort, hypoglycemia, headache, dizziness, drowsiness, asthenia, paresthesia, seizure, pellagra-like encephalopathy, acute psychosis, anxiety and depression, optic neuritis, peripheral neuropathy responsive to pyridoxine, liver enzyme abnormality, hepatotoxicity. |
| Cautions | Depression, psychiatric illness, chronic alcoholism, epilepsy, hypothyroidism, diabetes mellitus. |
| Storage condition | Store below 30oC. |
| **Imipenem + cilastatin** | |
| Pharmacological class | Carbapenem + dehydropeptidase inhibitor |
| Dosage form | Powder for injection: 500 mg+500 mg |
| Indications | In MDR-TB when an effective regimen with combination of other second line drugs is not possible. |
| Dose and administration | **For children and adults >15 years,** IV: (1 g + 1 g) daily (to be used with clavulanic acid)  *Note: Not used in patients < 15 years (use meropenem)* |
| Contraindications | Refer to Imipenem-cilastatin (antibacterials). |
| Drug interactions | Refer to Imipenem-cilastatin (antibacterials). |
| Side effects | Refer to Imipenem-cilastatin (antibacterials). |
| Cautions | Refer to Imipenem-cilastatin (antibacterials). |
| Storage condition | Store below 30oC |
| **Isoniazid** | |
| Pharmacological class | Carbohydrazide, antitubercular |
| Dosage form | Tablet: 100 mg, 300 mg  Tablet (dispersible): 100 mg |
| Indications | Tuberculosis treatment (in combination with other drugs), tuberculosis prophylaxis. |
| Dose and administration | **Tuberculosis, treatment (combination therapy);** Oral:  **Adult:** 5mg/kg (4-6 mg/kg) daily (maximum, 300 mg daily)  **Child**: 7 - 15 mg/kg daily (maximum, 300 mg daily)  **Tuberculosis, prophylaxis;** Oral:  **Adult:** 300mg daily for at least 6 months:  **Child 1 month-11 years: 10** mg/kg daily (maximum, 300 mg daily) for 6 months  **Child 12-17 years:** 300 mg daily for 6 months |
| Contraindications | Hypersensitive to the drug, drug-induced liver disease. |
| Drug interactions | Carbamazepine, rifampin, ethosuximide, warfarin, aluminium hydroxide, phenytoin, serotonergic agents, ketoconazole, alfuzosin, bedaquiline, clopidogrel, erythromycin, esomeprazole/omeprazole, fentanyl, fluticasone, linezolid, valproate, inhibitor of monoamine oxidase (MAO), benzodiazepine, food containing tyramine and histamine. |
| Side effects | Hypersensitivity reactions including fever, skin rash, sleepiness and lethargy, peripheral neuropathy (paresthesia, numbness and limb pain), hepatitis, convulsions, pellagra, arthralgia, hypoglycemia, blood disorders including agranulocytosis, agranulocytosis, aplastic anemia, hemolytic anemia, gynaecomastia, convulsion. |
| Cautions | Acute porphyrias, alcohol dependence, diabetes mellitus, epilepsy, history of psychosis, HIV infection, malnutrition, slow acetylator status, pregnancy, breastfeeding, renal impairment, hepatic impairment. |
| Storage condition | Store below 30oC. |
| **Isoniazid + pyrazinamide + rifampicin** | |
| Pharmacological class | Antitubercular combination |
| Dosage form | Tablet: 75 mg + 400 mg + 150 mg.  Tablet (dispersible): 50 mg + 150 mg + 75 mg. |
| Indications | For the initial intensive phase of the short-course treatment of pulmonary TB (in combination with ethambutol). |
| Dose and administration | **Adult**  **Body weight 20–29 kg**: 1 1/2 tablets daily  **Body weight 30–39 kg**: 2 tablets daily  **Body weight 40–54 kg**: 3 tablets daily  **Body weight ≥ 55 kg**: 4 tablets daily  **Child**  **Body weight 4–7 kg:**  1 tablet RHZ  **Body weight 8–11 kg:** 2 tablet RHZ  **Body weight 12–15 kg:** 3 tablet RHZ  **Body weight 16– 24kg**: 4 tablet RHZ  **Body weight ≥ 55 kg**: adult dose recommended |
| Contraindications | Refer to individual monograph. |
| Drug interactions | Refer to individual monograph. |
| Side effects | Refer to individual monograph. |
| Cautions | Refer to individual monograph. |
| Storage condition | Store below 30° C. |
| **Isoniazid + Rifampicin** | |
| Pharmacological class | Antitubercular combination |
| Dosage form | Tablet: 75 mg + 150 mg; 150 mg + 300 mg.  Tablet (dispersible): 50 mg + 75 mg |
| Indications | Treatment of tuberculosis (Continuation phase) for 4 months |
| Dose and administration | **Adult**:  For continuation phase, 150mg /300mg tablet:  Body weight 20-29 kg: 1 tablet administered as a single dose, daily  Body weight 30-39kg: 2 tablets administered as a single dose, daily  Body weight 40-54kg: 3 tablets administered as a single dose, daily  Body weight > 55 kg: 3 tablets administered as a single dose, daily  **Child**:  For continuation phase, 50mg /75 mg tablet:  Body weight 4-7kg: 1 tablet administered as a single dose, daily.  Body weight 8-11kg: 2 tablets administered as a single dose, daily.  Body weight 12-15kg: 3 tablets administered as a single dose, daily.  Body weight 16-24kg: 4 tablets administered as a single dose, daily.  Body weight 25+kg: use adult dose |
| Contraindications | Refer to individual monograph. |
| Drug interactions | Refer to individual monograph. |
| Side effects | Refer to individual monograph. |
| Cautions | Refer to individual monograph. |
| Storage condition | Store under 30° C. |
| **Isoniazid + rifapentine** | |
| Pharmacological class | Antitubercular combination |
| Dosage form | Tablet: 300 mg + 300 mg |
| Indications | Tuberculosis prophylaxis. |
| Dose and administration | **Oral:**  **Adult and** **child** 15 years: 3 tablets once weekly for a period of 3 months  **Child 2-14 years:**  Body weight 10-15 kg: 1 tablet once weekly  Body weight 16-23 kg: 1tablets once weekly  Body weight 24-30 kg: 2 tablets once weekly  Body weight > 30 kg: 2 tablets once weekly |
| Contraindications | Refer to individual monograph. |
| Drug interactions | Refer to individual monograph. |
| Side effects | Refer to individual monograph. |
| Cautions | Refer to individual monograph. |
| Storage condition | Store below 30°C. |
| **Levofloxacin** | |
| Pharmacological class | Fluoroquinolone |
| Dosage form | Tablet: 250mg, 500mg, 750mg  Tablet (Dispersible): 100mg |
| Indications | In combination with other second line drugs for treating tuberculosis, resistant to first line agents. |
| Dose and administration | **For treatment of TB disease** (standardized or individually adjusted based on result of sensitivity test)  **Adult**: 10–15 mg/kg once daily  Child< 5 years:5-10 mg/kg twice daily  **Child** **> 5 years:**10 mg/kg twice daily |
| Contraindications | Hypersensitivity to the drug or other quinolones, pregnancy, breastfeeding, history of tendon disorders related to fluroquinolones, epilepsy, prolonged QTc. |
| Drug interactions | Warfarin, class IA and class III antiarrhythmics, erythromycin, antacids, oral electrolyte supplements, sucralfate, cimetidine, corticosteroids, digoxin, antidepressants, antidiabetic agents, NSAIDs, probenecid, artemether, cholera vaccine, ferrous preparation, hydroxyl chloroquine sulphate, indapamide, parentral iron preparation, ondansetron, pentamidine, sodium bicarbonate. |
| Side effects | Dizziness, fever, headache, insomnia, anxiety, confusional state, nervousness. headache, dizziness, vertigo, abdominal pain, dyspepsia, nausea, vomiting, diarrhea, constipation, appetite loss, decreased vision, pharyngitis, dyspnea, fungal infection including candida infection, hepatic enzyme increased tendon disorders, Stevens-Johnson syndrome (rare). |
| Cautions | Children < 18 years of age, CNS disorders or renal dysfunction, history of prolonged QT interval, peripheral neuropathy, patients with G-6-phosphate dehydrogenase deficiency, diabetes mellitus, hepatotoxicity, hematologic toxicity, tendinitis, tendon rupture. |
| Storage condition | Store below 30oC. |
| **Linezolid** | |
| Pharmacological class | Oxazolidinone, antibacterials (antitubercular) |
| Dosage form | Tablet: 600mg  Tablet (dispersible): 150 mg |
| Indications | For MDR-TB as a primary regimen drug for the intensive phase of treatment (6 months) in an appropriate combination. |
| Dose and administration | **Oral**:  **Adult** **>30 kg**: 600 mg daily (if there is a severe adverse drug reaction, reduce to 300 mg)  **Neonates up to 7 days old**: 10 mg/kg every 12 hours, increasing to every 8 hours if response is poor  **Neonate and child 7 days to 12 years**: 10 mg/kg (to a maximum of 600 mg) every 8 hours  **Child 12 to 18 years**: Usual adult doses |
| Contraindications | Refer to linezolid (antibacterials). |
| Drug interactions | Refer to linezolid (antibacterials). |
| Side effects | Refer to linezolid (antibacterials). |
| Cautions | Refer to linezolid (antibacterials). |
| Storage condition | Store below 30oC. |
| **Meropenem** | |
| Pharmacological class | Carbapenem |
| Dosage form | Powder for injection (as trihydrate): 500mg, 1g in vial |
| Indications | MDR-TB with at least 5 effective drugs (i.e. primarily 4 core second line medicines plus pyrazinamide). |
| Dose and administration | **IV:**  **For children and adults >15 years:** 1g 3 times per day or 2g twice per day  **Children < 15 years:** 20–40 mg/ kg IV every 8 hours (to be used with clavulanic acid) |
| Contraindications | Refer to meropenem (antibacterials). |
| Drug interactions | Refer to meropenem (antibacterials). |
| Side effects | Refer to meropenem (antibacterials). |
| Cautions | Refer to meropenem (antibacterials). |
| Storage condition | Store below 30oC |
| **Moxifloxacin** | |
| Pharmacological class | Fluoroquinolone |
| Dosage form | Tablet: 400mg  Tablet (Dispersible): 100mg |
| Indications | Treatment of MDR- TB in combination with other second line drugs. |
| Dose and administration | Oral:  **Adult and children** 15 years of age: Standard dose: 400 mg once daily; High dose: 800 mg once daily  **Children < 15 years of age**:10 – 15 mg/kg |
| Contraindications | Hypersensitivity to the drug or other quinolones. |
| Drug interactions | Class IA and class III antiarrhythmics, tricyclic antidepressants, cisapride cimetidine, corticosteroids, alfuzosin, artemether, chlorpromazine, cholera vaccine, clarithromycin, efavirenz, epinephrine, erythromycin, fluconazole, ketoconazole, ondansetron, haloperidol, antacids, iron, multivitamins, mineral supplements, loop and thiazide diuretics. |
| Side effects | GI intolerance (nausea, vomiting, dyspepsia, diarrhea, abdominal pain), QT prolongation, dizziness, seizure, confusion, tremor, hallucination, *Clostridioides diffcile* associated diarrhea, rash, itch, decreased serum glucose, increase serum chloride, increase serum ionized calcium, headache, insomnia, tendinopathy and tendon rapture. |
| Cautions | Children or adolescents younger than 18 years of age, pregnancy breastfeeding, CNS disorders, prolongation of QT interval, peripheral neuropathy. |
| Storage condition | Store below 30 °C. |
| **P-aminosalicylate sodium** | |
| Pharmacological class | Aminobenzoic acid, antitubercular |
| Dosage form | Sachet: 5.52 g in sachet (equivalent to 4 g p-aminosalicylic acid) |
| Indications | Treatment of MDR- TB (second-line agent) |
| Dose and administration | **Oral:**  **Adult and children 15 years of age**: 10 -12 g daily in 2-3 divided doses  **Children < 15 years of age**: 200–300 mg/kg in 2 divided doses |
| Contraindications | Hypersensitivity to the drug, severe renal disease. |
| Drug interactions | Vitamin B12, digoxin, ethionamide, diphenylhydramine. |
| Side effects | Anorexia, diarrhea, nausea, epigastric pain, abdominal distress, high fever, joint pain, malaise, sore throat, haematological abnormalities. |
| Cautions | Pregnancy, breastfeeding, mild to moderate renal impairment, gastric ulcer, hepatic impairment, Glucose-6-phosphate dehydrogenase (G6PD) deficiency, congestive heart failure. |
| Storage condition | Store below 30 °C. |
| **Pretomanid** | |
| Pharmacological class | Nitroimidazole, antitubercular |
| Dosage form | Tablet: 200mg |
| Indications | In combination with bedaquiline, linezolid and moxifoxacin (BPaLM) for the treatment of pulmonary XDR or intolerant MDR-TB. |
| Dose and administration | **Oral:**  **Adult:** 200mg once daily for 26 weeks; longer duration therapy may be considered in patients who have not responded to therapy at 26 weeks on a case-to-case basis.  **Note:** *Safety and effectiveness of pretomanid in pediatric patients have not been established* |
| Contraindications | Hypersensitivity to pretomanid or other nitroimidazoles |
| Drug interactions | Methotrexate, lopinavir, efavirenz, rifampin, digoxin, CYP3A4 inhibitors, inducers. |
| Side effects | Hepatotoxicity, QT prolongation, anemia, decreased appetite, hypoglycemia, lactic acidosis, insomnia, anxiety, depression, peripheral neuropathy, headache, dizziness |
| Cautions | hepatic impairment, renal impairment, pregnancy, breastfeeding, visual impairment, hypotension, hematemesis, dyspepsia, musculoskeletal pain, QT prolongation, alcohol use. |
| Storage condition | Store below 30°C. |
| **Prothionamide** | |
| Pharmacological class | Thioamides / pyridines and derivatives, antitubercular |
| Dosage form | Tablet: 250 mg |
| Indications | Drug resistant tuberculosis in conjunction with at least 2, preferably 3 (new drugs known to be active against the resistant strain) other antituberculosis agents. |
| Dose and administration | **Oral**:  **Adult**: 15 - 20 mg/kg/day as a single dose; Maximum 1 g/day.  **Child**: 10 -20 mg/kg/day in 2 – 3 divided doses after meals or 15mg/kg once daily. |
| Contraindications | Hypersensitivity to the drug, severe hepatic disease, cerebral seizure disorder, pregnancy, breastfeeding. |
| Drug interactions | Hormonal contraceptives, concomitant use of alcohol, barbiturates, isoniazid, cycloserine and terizidone. |
| Side effects | Nausea, vomiting, dry oral, but also increased salivation, loss of appetite, metallic taste, abdominal discomfort, diarrhea and weight loss, seizures, pellagra-like encephalopathy responsive to niacin, anemia, methemoglobinemia, acute psychosis, confusion, anxiety and depression, Dizziness, headaches, optic neuritis, and peripheral neuropathy pyridoxine responsive to, hepatotoxicity. |
| Cautions | Depression, psychiatric illness, chronic alcoholism, epilepsy, hypothyroidism, diabetes mellitus. |
| Storage condition | Store below 30oC. |
| **Pyrazinamide** | |
| Pharmacological class | Antitubercular |
| Dosage form | Tablet: 400 mg, 500mg  Tablet (dispersible): 150 mg. |
| Indications | Tuberculosis, in combination with other drugs. |
| Dose and administration | **Tuberculosis (initial phase of combination therapy);** Oral:  **Adult**: 25-mg/kg (20-30mg/kg) daily, maximum 2000mg per day  **Child body weight up to 50 kg**: 35 mg/kg once daily for 2 months (initial phase); maximum 1.5 g per day  **Child body weight 50 kg and above**: 35 mg/kg once daily for 2 months (initial phase); maximum 2.5g per day |
| Contraindications | Hypersensitivity to the drug, severe hepatic impairment, porphyria, acute attack of gout. |
| Drug interactions | Uricosurics (probenecid, sulfinpyrazone), allopurinol, cyclosporine, co-treatment with hepatotoxic drugs, Ofloxacin and levofloxacin. |
| Side effects | Hepatotoxicity including fever, anorexia, hepatomegaly, jaundice, liver failure, nausea, vomiting, arthralgia, hyperuricemia, gout, pellagra, thrombocytopenia, sideroblastic anemia, urticaria, skin flushing. |
| Cautions | Pregnancy, breastfeeding, diabetes mellitus, gout, hepatic impairment, renal impairment, patients hypersensitive to ethionamide, isoniazid, niacin. |
| Storage condition | Store below 30oC. |
| **Rifabutin** | |
| Pharmacological class | Rifamycin, antitubercular |
| Dosage form | Solid oral dosage form: 150 mg |
| Indications | Treatment of pulmonary tuberculosis in combination with other agents, for the prevention of disseminated *Mycobacterium avium* complex (MAC) disease in patients with advanced HIV infection, treatment of non-tuberculous mycobacteria. |
| Dose and administration | **Tuberculosis, in combination with other antituberculosis agent**;  **Adult 15 years of age or older,** oral: 5mg/kg (up to 300mg) given once daily or 5mg/kg 2 or 3 times weekly daily  **Pediatrics**: 10-20mg/kg (up to 300mg) can be given daily or twice weekly.  **Non- tuberculous mycobacteria treatment**: 450 - 600 mg daily  **Non-tuberculous mycobacteria prophylaxis:** 300 mg daily |
| Contraindications | Hypersensitivity to rifamycins, neutropenia or other hematologic effects (e.g. thrombocytopenia). |
| Drug interactions | Clarithromycin, azithromycin, ciprofloxacin, azole antifungals, isoniazid, protease inhibitors (PIs), non-nucleoside reverse transcriptase inhibitors (NNRTIs), artemether/lumefantrine, amiodarone, atorvastatin, carbamazepine, clopidogrel, dexamethasone, phenytoin, praziquantel, prednisolone. |
| Side effects | Rash, gastrointestinal intolerance (nausea, vomiting, anorexia, abdominal pain and diarrhea), headache, insomnia, seizure, paresthesia, aphasia, confusion, and haematological effects (leukopenia, neutropenia, thrombocytopenia and anemia), hepatotoxicity, hypersensitivity reactions (flu-like syndrome, chest pain, eosinophilia, bronchospasm, shock) are reported rarely, urine discoloration, inflammation inside eye (may be unilateral or bilateral). |
| Cautions | Pregnancy, breastfeeding, joint stiffness, uveitis, swelling, hepatic or renal dysfunction, acute porphyria, prevention of MAC infection in patients with active TB. |
| Storage condition | Store below 30oC. |
| **Rifampicin** | |
| Pharmacological class | Rifamycin, antitubercular |
| Dosage form | Oral liquid: 20 mg/ ml.  Solid oral dosage form: 150 mg; 300 mg |
| Indications | Tuberculosis (in combination with other drugs), leprosy |
| Dose and administration | **Tuberculosis (combination therapy)**  **Oral**:  **Adult and children 15 years of age or older**:10mg/kg (8 to 12mg/kg) daily (maximum dose, 600mg daily).  **Children <15 years:** 10 to 20mg/kg (up to 600mg) daily |
| Contraindications | Hypersensitivity to the drug and other rifamycins, jaundice, acute porphyrias, concurrent use with the combination of saquinavir/ ritonavir. |
| Drug interactions | Clarithromycin, cefazolin, ciprofloxacin, chloramphenicol, atovaquone, clofazimine, PIs, NNRTIs, anticonvulsants, antifungals, fluconazole, antiarrhythmics, azathioprine, ciclosporin, contraceptives, dexamethasone, fludrocortisone, glibenclamide, haloperidol, levonorgestrel, medroxyprogesterone, nelfinavir, calcium channel blocker, norethisterone, phenytoin, prednisolone, guanidine, warfarin. |
| Side effects | Severe gastrointestinal disturbances including anorexia, nausea, vomiting, diarrhea, rashes, fever, influenza-like syndrome, hemolytic anemia, leucopoenia, acute renal failure, and thrombocytopenic purpura, headache, dizziness, alterations of liver function jaundice and potentially fatal hepatitis, stains body fluid, Severe cutaneous adverse reactions including Steven-Johnson syndrome, adrenocortical insufficiency. |
| Cautions | Hepatic impairment, renal impairment, elderly, pregnancy, breastfeeding, porphyria, risk of discoloration soft contact lenses. |
| Storage condition | Store below of 30ºC. |
| **Rifapentine** | |
| Pharmacological class | Rifamycin, antitubercular |
| Dosage form | Tablet (dispersible): 150 mg, 300 mg |
| Indications | Active pulmonary tuberculosis and latent tuberculosis. |
| Dose and administration | **Active pulmonary tuberculosis**  **Initial** phase (2 Months): 600 mg twice weekly for two months in combination with other antituberculosis drugs as part of an appropriate regimen which includes daily companion drugs such as isoniazid (INH), ethambutol (EMB) and pyrazinamide (PZA).  **Continuation** phase (4 Months): Rifapentine 600 mg once weekly for 4 months in combination with isoniazid or another appropriate antituberculosis agent  **Latent tuberculosis infection**  Rifapentine once weekly in combination with isoniazid for 12 weeks  Body weight 10.0-14.0kg; 300mg  Body weight 14.1-25.0kg: 450mg  Body weight 25.1-32.0kg: 600mg  Body weight 32.1-50.0kg: 750mg  Body weight >50kg: 900mg |
| Contraindications | Hypersensitivity to the drug or other rifamycins. |
| Drug interactions | Protease inhibitors, reverse transcriptase inhibitors, hormonal contraceptives. |
| Side effects | Refer to rifampicin. |
| Cautions | Refer to rifampicin. |
| Storage condition | Store below 30oC. |
| **Streptomycin** | |
| Pharmacological class | Aminoglycoside, antibacterial (first line antitubercular) |
| Dosage form | Powder for injection: 1gm, 5gm base |
| Indications | Tuberculosis, in combination with other drugs |
| Dose and administration | **Tuberculosis (initial phase of combination therapy);** deep IM injection or IV:  **For children and adults >15 years**: 15mg/kg (12-18mg/kg) daily as a single dose, maximum 1000mg (patients over 60 years may not tolerate doses above 500 to 750mg daily)  **Child < 15 years or weighing 40kg or less**: 20-40mg/kg daily (up to 1g) |
| Contraindications | Hypersensitivity to the drug or other minoglycosides, myasthenia gravis, severe haemoptysis, vestibular disorder, hearing disorders. |
| Drug interactions | Alcuronium, ciclosporin, cisplatin, furosemide, neostigmine, pyridostigmine, suxamethonium, vecuronium, nephrotoxic and ototoxic agents. |
| Side effects | Ototoxicity, nephrotoxicity, nausea, vomiting, hypersensitivity reactions withdraw treatment, rash, hypomagnesaemia on prolonged therapy, antibiotic associated colitis, hemolytic anemia, aplastic anemia, agranulocytosis, thrombocytopenia, pain and abscess at injection site. |
| Cautions | Renal impairment, hearing problem, elderly, excessive dosage in pediatrics, breastfeeding, pregnancy. |
| Storage condition | Store below 30oC. |
| **Terizidone** | |
| Pharmacological class | Cycloserine derivative, second-line antitubercular |
| Dosage form | Tablet: 300 mg |
| Indications | Second-line agent for MDR-TB |
| Dose and administration | **MDR-TB; Oral:**  **Adult:** The usual target dose is 15–20 mg/kg/day; maximum1 g per day.  Body weight 33–50 kg: 500 mg daily  Body weight 51–70 kg: 750 mg daily  Body weight >70 kg: 750–1000 mg daily  **Child:** Target dose is 10–20 mg/kg/day, given in two divided doses; maximum 1 g per day.  **Note**: *All patients should receive pyridoxine (vitamin B6) while taking terizidone. Avoid**high-fat meals at the time of taking terizidone*. |
| Contraindications | Hypersensitivity to the drug or cycloserine, epilepsy, depression, severe anxiety, psychotic states, concurrent use of alcohol. |
| Drug interactions | Alcohol, isoniazid, ethionamide, stavudine, didanosine, high fat meal. |
| Side effects | Cardiac arrhythmias, and sudden development of congestive heart failure, headache, tremor, dysarthria, vertigo, paresthesia, peripheral neuropathy, depression, confusion, seizure, anxiety, nervousness, drowsiness, dizziness, somnolence, lethargy, Vitamin B12 and/or folic acid deficiency, megaloblastic anemia or sideroblastic anemia, rash and photosensitivity, Stevens-Johnson syndrome. |
| Cautions | Pregnancy, breastfeeding, renal impairment, personality change. |
| Storage condition | Store below 30oC. |

**Antileprotic medicines**

Leprosy (Hansen's disease) is a chronic disease caused by *Mycobacterium leprae*; it affects the peripheral nervous system, the skin, and some other tissues. It is transmitted from person to person when bacilli are shed from the nose and skin lesions of infected patients, but most individuals are naturally immune, and symptoms are suppressed. For treatment purposes patients may be classified as having paucibacillary (PB) or multibacillary (MB) leprosy. The 2 forms may be distinguished by skin smears, but facilities are not always available to process them and their reliability is often doubtful.

Drugs recommended for leprosy treatment are dapsone, rifampicin and clofazimine. A three-drug regimen is recommended for multibacillary leprosy and a two-drug regimen for paucibacillary leprosy. Any patient with a positive skin smear should be treated with the multidrug therapy regimen for MB leprosy. The regimen for PB leprosy should never be given to a patient with MB leprosy. If diagnosis in a particular patient is not possible the multi drug therapy regimen for MB leprosy must be used.

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| **Clofazimine** | |
| Pharmacological class | Phenazine dye |
| Dosage form | Capsule: 50mg,100mg |
| Indications | Multibacillary and paucibacillary leprosy in combination with rifampicin and dapsone (3-drug regimen), lepromatous lepra reactions, severe type II (erythema nodosum leprosum) reactions. |
| Dose and administration | **Multibacillary leprosy (for 12 months) and Paucibacillary leprosy (for 6 months) in combination with rifampicin and**  **Dapsone; oral:**  **Adult:** 300 mg once a month, to be administered under supervision and 50 mg daily, to be self-administered  **Children (10– 14 years):** 150 mg once a month, 50 mg on alternate days  **Children < 10 years or <40kg:** 100 mg once a month, 50 mg on alternate days |
| Contraindications | Refer to clofazimine (anti-tuberculosis). |
| Drug interactions | Refer to clofazimine (anti- tuberculosis). |
| Side effects | Refer to clofazimine (anti- tuberculosis). |
| Cautions | Refer to clofazimine (anti- tuberculosis). |
| Storage condition | Store below 30 ºC. |
| **Dapsone** | |
| Pharmacological class | Aniline derivative |
| Dosage form | Tablet : 25mg, 50mg, 100mg |
| Indications | Multibacillary and paucibacillary leprosy in combination with rifampicin and dapsone (3-drug regimen), dermatitis herpetiformis, |
| Dose and administration | **Multibacillary leprosy (for 12 months) and Paucibacillary leprosy (for 6 months) in combination with rifampicin and**  **clofazimine, Oral:**  **Adult:** 100 mg daily, to be self-administered  **Children (10– 14 years):** 50 mg daily  **Children < 10 years or <40kg:** 2mg/kg daily  *Note:* *Folic acid (higher dose) should be given to mother throughout pregnancy* |
| Contraindications | Hypersensitivity to dapsone or other sulfones, severe anaemia, porphyria, G6PD deficiency |
| Drug interactions | Aluminium hydroxide, calcium carbonate, famotidine, lansoproazole, sodium bicarbonate**,** rifampicin, probenecid. |
| Side effects | Dapsone syndrome (rash with fever and eosinophilia may progress to exfoliative dermatitis, hepatitis, hypoalbuminaemia, psychosis and death), GI irritation, photosensitivity, hemolysis, methemoglobinemia, insomnia, headache. |
| Cautions | Hepatic impairment, pregnancy, breastfeeding, blood disorder, peripheral neuropathy, risk of superinfection, performing tasks requiring attention or coordination. |
| Storage conditions | Store below 30oC. |
| **Rifampicin** | |
| Pharmacological class | Rifamycin |
| Dosage form | Oral liquid: 20 mg/ ml.  Solid oral dosage form: 150 mg; 300 mg |
| Indications | Multibacillary and paucibacillary leprosy in combination with rifampicin and dapsone (3-drug regimen). |
| Dose and administration | **Multibacillary leprosy (for 12 months) and Paucibacillary leprosy (for 6 months) in combination with dapsone and**  **clofazimine, Oral:**  **Adult:** 600 mg once a month  **Children (10– 14 years):** 450 mg once a month  **Children < 10 years or <40kg:** 10mg/kg once a month |
| Contraindications | Refer to rifampicin, (anti- tuberculosis). |
| Drug interactions | Refer to rifampicin (anti- tuberculosis). |
| Side effects | Refer to rifampicin (anti- tuberculosis). |
| Cautions | Refer to rifampicin (anti- tuberculosis). |
| Storage condition | Store below 30ºC. |

## Antifungals

Antifungal medicines are used to treat fungal infections, which most commonly affect skin, hair and nails. These agents work by either killing fungal cells or inhibiting their growth.  Human fungal infections have increased dramatically in incidence owing mainly to advances in surgery, cancer treatment, treatment of patients with solid organ and bone marrow transplantation, the HIV epidemic, and increasing use of broad-spectrum antimicrobial therapy in critically ill patients. These changes have resulted in increased numbers of patients at risk for fungal infections: There are different classes of antifungal agents:

**Triazole antifungals:** Triazole antifungal drugs have a role in the prevention and systemic treatment of fungal infections. For example, fluconazole and itraconazole.

**Imidazole antifungals:** The imidazole antifungals include clotrimazole, econazole nitrate, ketoconazole, and tioconazole.

**Polyene antifungals:** The polyene antifungals include amphotericin B and nystatin; neither drug is absorbed when given by oral. Nystatin is used for oral, oropharyngeal, and perioral infections by local application in the oral.

**Echinocandin antifungals**: The echinocandin antifungals include anidulafungin, caspofungin and micafungin. They are only active against Aspergillus spp. and Candida spp.; however, anidulafungin and micafungin are not used for the treatment of aspergillosis. Echinocandins are not effective against fungal infections of the CNS.

**Other antifungals:** as an example,flucytosine is used with amphotericin B in asynergistic combination. Bone marrow depression can occurwhich limits its use, particularly in HIV-positive patients;weekly blood counts are necessary during prolonged therapy.

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| **Amphotericin B** | |
| Pharmacological class | Polyene antifungal |
| Dosage form | Powder for injection: liposomal 50mg/vial |
| Indications | Life-threatening fungal infections including histoplasmosis, coccidioidomycosis, paracoccidioidomycosis, blastomycosis, aspergillosis, chronic mycetoma, cryptococcosis, mucormycosis,  sporotrichosis, candidiasis and visceral leishmaniasis. |
| Dose and administration | **Extrapulmonary cryptococcosis,** **candidemia (in patients without neutropenia), mucormycosis or invasive aspergillosis,**  IV infusion:  Child and Adult: 3 -5 mg/kg/day  *Note:* *A test dose (1 mg) should be infused slowly for up to 10 minutes and the patient carefully observed for 30 minutes afterwards.* |
| Contraindications | Hypersensitivity to amphotericin. |
| Drug interactions | Cardiac glycosides, ciclosporin, corticosteroids, tacrolimus. |
| Side effects | Nausea, vomiting, diarrhea, nephrotoxicity, hypokalmeia, hypomagnesemia, liver toxicity, chills, fever, irregular heartbeat, muscle cramps or pain, unusual tiredness or weakness, blood disorders, neurological disorders (including hearing loss, diplopic, convulsions, peripheral neuropathy), rash, anaphylactoid reactions, pain and thrombophlebitis at injection site. |
| Cautions | Renal impairment, risk of arrhythmias), risk of electrolyte imbalance. |
| Storage condition | Store below 30° C. |
| **Caspofungin** | |
| Pharmacological class | Echinocandins |
| Dosage form | Powder for injection: 50 mg/vial, 70 mg/vial |
| Indications | Invasive aspergillosis, invasive candidiasis, empirical treatment of systemic fungal infections in patients with neutropenia. |
| Dose and administration | **Adult:** 70 mg once daily as loading dose, then 50 mg once daily maintenance dose  **Child (3 months – 17 years):** 70 mg /m2 (up to 70 mg) for 1 day, then 50 mg/m2 (up to 50 mg) once daily  **Note**: *Administer by slow IV infusion.* |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | CYP3A4 inducers, antiepileptics (carbamazepine, fosphenytoin, phenytoin), rifampicin, ciclosporin. |
| Side effects | Pyrexia, diarrhea, chills, decreased potassium, increased alkaline phosphatase, decreased haemoglobin, hypotension, respiratory failure, liver enzyme abnormalities, fever, decreased haematocrit, phlebitis, vomiting, rash, nausea, headache, increased bilirubin, septic shock, decreased WBC, peripheral edema, cough, pneumonia, increased creatinine, anemia, abdominal pain, dyspnea, increased blood urea, pleural effusion, increased conjugated bilirubin, decreased albumin, tachycardia, decreased magnesium. |
| Cautions | Pregnancy, breastfeeding, hypersensitivity, hepatic and renal impairment. |
| Storage condition | Store between 2°C - 8°C. |
| **Clotrimazole** | |
| Pharmacological class | Imidazole antifungal |
| Dosage form | Tablet (vaginal): 100mg, 200mg, 500mg |
| Indications | Vaginal candidiasis. |
| Dose and administration | **Vaginal candidiasis:** vaginal administration (pessary),  **Adult:** 500 mg at night as a single dose; or 200 mg at night for 3 days; or 100 mg at night for 7 days, preferably at night  **Note:** not recommended for pediatrics |
| Contraindications | Hypersensitivity to the drug or other aozle antifungals, irregular or abnormal vaginal bleeding, vaginal ulcers, foul smelling discharge. |
| Drug interactions | Tacrolimus, latex contraceptives, other antifungals. |
| Side effects | Nausea, vomiting, itching, cramping, pain, bleeding, vulvar lesions, rash. |
| Cautions | Pregnancy, breastfeeding, sexually transmitted diseases. |
| Storage condition | Store below 30°C. |
| **Fluconazole** | |
| Pharmacological class | Triazole antifungal |
| Dosage form | Capsule/tablet : 50mg, 100mg, 200mg  Oral liquid : 50mg/5ml, 200mg/5ml  Injection: 2 mg/ mL in vial |
| Indications | Vaginal and oropharyngeal candidiasis, esophageal and systemic candidiasis, tinea pedis, corporis, cruris, pityriasis versicolor, cryptococcal meningitis and maintenance therapy to prevent relapse of cryptococcal disease in patients with AIDS |
| Dose and administration | **Adult:**  **Vulvovaginal candidiasis:** Oral: 150mg as a single dose.  **Oropharyngeal candidiasis**: Oral: 100- 200mg daily for 7-14 days: 200mg PO on day 1, then 100 mg daily  **Esophageal candidiasis:** Oral: 100-400mg daily; 200mg PO on day 1, then 100 mg daily, dose can increase up to 400mg/day based on response  **Systemic candidiasis**: Oral or IV: 400mg daily.  **Cryptococcal meningitis**:  **Oral or IV**: 400mg on day 1 then 200mg daily, prevention of relapse in patients with AIDS, 200mg daily. dose can increase up to 400mg/day based on response  **Treatment of cryptococcal disease for adults and adolescents living with HIV:** Oral: 600 mg BID  **Tinea pedis:** Oral: 50 to 200mg once weekly  **Child** (Oral or IV):  **Oropharyngeal and esophageal candidiasis:**  **Child > 1 month:** 6 mg/kg on the first day, then 3 mg/kg daily; not to exceed 600mg per day (for esophageal candidiasis dose up to 12mg/kg/day can be used)  **Systemic candidiasis, cryptococcal meningitis:**  Child: 12 mg/kg on the first day, then 6 mg/kg daily;  **Prevention of fungal infections in immunocompromised patients following cytotoxic chemotherapy or radiotherapy**  **Child:** 3 to 12 mg/kg/day, depending on extent and duration of neutropenia  **Adult:** 400mg PO daily |
| Contraindications | Hypersensitivity to the drug or other azole antifungals, acute porphyrias. |
| Drug interactions | Enzyme-inducing agents (e.g. rifampicin), hydrochlorthiazide, phenytoin, sulphonylureas, hypoglycaemic agents, cyclosporin, nortriptyline, zidovudine, terfenadine, quinidine, pimozide, amiodarone,oral anticoagulants, theophylline. |
| Side effects | Exfoliative skin disorders including Stevens-Johnson syndrome, agranulocytosis, thrombocytopenia, diarrhea, nausea, vomiting, gastrointestinal discomfort, flatulence, headache, hepatic disorders, seizure, taste altered, alopecia, dyslipidaemia, hypokalaemia, leukopenia, neutropenia, QT interval prolongation. |
| Cautions | Renal or hepatic impairment, breastfeeding, pregnancy. |
| Storage condition | Store below 30°C. |
| **Flucytosine** | |
| Pharmacological class | Fluorinated pyrimidine analogue, antifungal |
| Dosage form | Capsule, 250mg, 500mg  IV Infusion: 10mg/ml, 2.5 g per 250 mL infusion |
| Indications | Adjunct to amphotericin B (or fluconazole) in cryptococcal meningitis and in systemic candidiasis. |
| Dose and administration | **Systemic candidiasis and cryptococcosis:**  **Child and adult**:  **IV infusion**: 150 mg/kg daily in 4 divided doses  **Oral**: 100 mg/kg daily in 4 divided doses, dose increased to 150 mg/kg/day for severe cases  **Neonates:** 80-160mg/kg/day in 4 divided doses |
| Contraindications | Hypersensitivity to the drug, dihydropyrimidine dehydrogenase deficiency. |
| Drug interactions | Amphotericin B, bacitracin, mylosuppresant drugs, nephrotoxic drugs, cytarabine, zidovudine. |
| Side effects | Bone marrow suppression, GI effects (anorexia, abdominal bloating or pain, diarrhea, dry oral, duodenal ulcer, GI hemorrhage, nausea, vomiting, ulcerative colitis, enterocolitis); hepatic effects; renal effects; CNS effects (confusion, hallucinations, psychosis). |
| Cautions | Impaired renal function, pregnancy, breastfeeding, hypokalemia, hematologic abnormality. |
| Storage condition | Store below 30°C. |
| **Griseofulvin** | |
| Pharmacological class | Benzofuran antifungal |
| Dosage form | Tablet : 125mg, 250mg  Oral suspension : 125mg/5ml |
| Indications | Superficial fungal infections: dermatophyte infections of the skin, scalp, hair and nail where topical therapy has failed or is inappropriate and tinea capitis caused by *Trichophyton tonsurans.* |
| Dose and administration | **Superficial fungal infections; Oral**:  **Adult and child**: 20 to 25mg/kg /day for 6 to 8 weeks; don’t exceed maximum dose of 1000mg and 500mg for adult and child, respectively |
| Contraindications | Hypersensitivity to the drug, pregnancy, breastfeeding, severe liver disease, acute porphyria, systemic lupus erythematosus. |
| Drug interactions | Phenobarbitone, primidone, coumarin anticoagulants, oral contraceptives, aspirin, ethanol, ethinyl estradiol, medroxyprogesterone. |
| Side effects | Diarrhea, nausea, vomiting, epigastric discomfort, headache, anorexia, confusion, dizziness, drowsiness, insomnia, irritability, peripheral neuropathy, photosensitivity reaction, skin reactions, taste altered, toxic epidermal necrolysis. |
| Cautions | Hepatic impairment, renal impairment, penicillin hypersensitivity, blood disorders, may impair performance of skilled tasks.  **Note:** *effective contraception required during and for at least 1 month after administration to women.* |
| Storage condition | Store below 30°C. |
| **Itraconazole** | |
| Pharmacological class | Triazole |
| Dosage form | Capsule: 100mg, 200mg  Oral solution: 10mg/ml |
| Indications | Oropharyngeal candidiasis, vulvovaginal candidiasis, pityriasis versicolor, dermatophytosis, nail infections, cryptococcal meningitis, tinea pedis,tinea corporis,candidal paronychia, aspergillosis, prophylaxis of deep fungal infections |
| Dose and administration | **Adult; oral:**  **Oropharyngeal candidiasis:** 100 mg (or 200 mg in patients with aids or neutropenia) daily for 15 days  **Vulvovaginal candidiasis**: 200 mg twice daily for 1 day.  **Pityriasis versicolor**: 200 mg daily for 7 days.  **Dermatophytosis**: 100 mg daily for 15 days or 200mg daily for 7 days in tinea corporis or tinea cruris  **Nail infections**: 200 mg daily for 3 months or pulse therapy with 200 mg twice daily for 7 days repeated once (for fingernails) or twice (for toenails) after drug free intervals of 21 days.  **Systemic infections:** Given in usual doses of 100 to 200 mg once daily, increased to 200 mg twice daily for invasive or disseminated infections, including cryptococcal meningitis  **Prophylaxis of deep fungal infections:** 200 mg daily  **Pediatric (oral):**  **Oropharyngeal candidiasis:**  **Child up to 11 years:** 3-5 mg/kg once daily, maximum 100 mg per day.  **Child 12-17 years:** 100 mg once daily  **Systemic candidiasis when other antifungal drugs inappropriate or ineffective:**  **Child 1 month-11 years**: 3–5 mg/kg once daily (max. per dose 200 mg) for 7 days.  **Tinea pedis, tinea manuum,** **tinea corporis, tinea cruris, tinea capitis:**  **Child 1 month–11 years**: 3–5 mg/kg once daily (max. per dose 100 mg)  **Onychomycosis:**  **Child 1–11 years**: 5 mg/kg daily (max. per dose 200mg)  **Prophylaxis of deep fungal infections** (when standard therapy inappropriate) in patients with hematological malignancy or undergoing bone marrow transplantation at risk of neutropenia:  **Child**: 2.5 mg/kg twice daily |
| Contraindications | Known hypersensitivity to the drug, acute porphyria |
| Drug interactions | Clarithromycin, erythromycin, indinavir, ritonavir, calcium channel blockers, antacids, PPIs, H-2 histamine antagonists, oral anticoagulants, medicinal products known to prolong QTc interval. |
| Side effects | Alopecia, constipation, diarrhea, dyspnea, gastrointestinal discomfort, headache, heart failure, hepatic disorders, hyperbilirubinemia, nausea, edema, pulmonary oedema, skin reactions, vision disorders, hepatitis, cholestatic jaundice. |
| Cautions | Breastfeeding, pregnancy, susceptibility to congestive heart failure, active liver disease, history of hepatotoxicity with other drugs, elderly, hepatic impairment, renal impairment  **Note:** *ensure effective contraception during treatment and until the next menstrual period following end of treatment.* |
| Storage condition | Store below 30°C. |
| **Micafungin** | |
| Pharmacological class | Echinocandins |
| Dosage form | Powder for injection: 50 mg, 100 mg |
| Indications | Treatment of invasive candidiasis, esophageal candidiasis, prophylaxis of Candida infection in patients undergoing allogeneic hematopoietic stem cell transplantation |
| Dose and administration | **Invasive candidiasis,** by IV Infusion:  **Adult** (body weight up to 40 kg): 2 mg/kg- 4mg/kg once  **Adult** (body weight 40 kg and above): 100 – 200 mg once daily  **Child** (4 months – 16 years): 2 mg/kg once daily (<40 kg)  **Child** (4 months – 16 years) :100 mg once daily (>40 kg)  **Newborn** – 4 months: 4- 10 mg per day  **Esophageal candidiasis**, by IV infusion:  **Adult** (body weight up to 40 kg): 3 mg/kg once daily.  **Adult** (body weight 40 kg and above): 150 mg once daily.  **Prophylaxis of Candida infections:** administered for at least one week after neutrophil recovery; IV:  **Body weight 40 kg**: 50 mg once daily  **Body weight < 40 kg**: 1 mg/kg once daily  **Newborn – 4 months**: 2 mg/kg per day |
| Contraindications | Hypersensitivity to the drug or other echinocandins. |
| Drug interactions | Mycophenolate mofetil, ciclosporin, tacrolimus, sirolimus, nifedipine, fluconazole, ritonavir, rifampicin, itraconazole, voriconazole, amphotericin B. |
| Side effects | GI effects (diarrhea, nausea, vomiting, abdominal pain, abdominal distention), pyrexia, infusion-related reactions, hypoglycemia, hypomagnesemia, hypernatremia, hyperkalemia, epistaxis, hematologic effects (thrombocytopenia, neutropenia, anemia, febrile neutropenia), liver enzyme abnormality, rash, pruritus, urticaria, headache, insomnia, anxiety, decreased urine output, hematuria, atrial fibrillation, tachycardia, injection site reactions (inflammation, phlebitis, thrombophlebitis). |
| Cautions | Pregnancy, breast feeding, hepatic and renal impairment, neonates and infants less than 4 months. |
| Storage condition | Store below 30°C. |
| **Miconazole** | |
| Pharmacological class | Imidazole |
| Dosage form | Tablet (vaginal): 100mg, 200mg, 400mg  Topical: Cream 2%  Ointment 2% |
| Indications | Vulvovaginal candidiasis. |
| Dose and administration | ***Vaginal tablets:***  **Intravaginal**, 100mg once a day at bedtime for seven days. if needed or 200mg or 400mg  ***Vaginal cream:***  **Intravaginal**, one applicatorful once a day at bedtime |
| Contraindications | Hypersensitivity to the drug, porphyria, hepatic impairment, milk protein allergy. |
| Drug interactions | Oral anticoagulants, sulfonylurea and other hypoglycemic drugs, phenytoin, amphotericin, terfenadine, tadalafil. |
| Side effects | Local irritation (around or inside the vagina), discomfort, itching or burning sensation of the treated area, headache, urinary tract infections, pain when passing urine, painful periods, vaginal discharge, nausea, diarrhea, skin rash, angioedema |
| Cautions | Pregnancy, breastfeeding. |
| Storage condition | Store below 30°C. |
| **Nystatin** | |
| Pharmacological class | Polyene macrolide |
| Dosage form | Oral suspension : 100,000 IU/ml,  Pessary : 100000 IU  Lozenge: 100000 IU |
| Indications | Oral candidiasis,vulvo-vaginal candidiasis, intestinal and esophageal candidiasis, prophylaxis and treatment of candidiasis of skin and mucous membranes |
| Dose and administration | **Oral candidiasis,** oral:  **Adult:**400,000-600,000 units 4 times daily, after food; swish in mouth several minutes and then swallow  **Intestinal and esophageal candidiasis,** **oral:**  **Adult:** 500,000 units 4 times daily  **Vulvo-vaginal candidiasis,** per vaginum:  **Adult:**100,000 IU daily  **Pediatric**  **Oral candidiasis,** oral**:**  **Child over 1 month:** 100,000 units 4 times daily after feeds.  **Intestinal and esophageal candidiasis**,  **Child over 1 month**: 100,000 units 4 times daily after feeds; immunocompromised children may require 500,000 units four times daily |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | There are no known significant interactions. |
| Side effects | Abdominal distress, angioedema, diarrhea, vomiting, face edema, nausea, skin reactions, Stevens-Johnson syndrome |
| Cautions | Renal impairment, hepatic impairment, pregnancy, breastfeeding, fructose intolerance, glucose-galactose malabsorption. |
| Storage condition | Store below 30°C. |
| **Terbinafine hydrochloride** | |
| Pharmacological class | Allylamine |
| Dosage form | Tablet : 125mg, 250mg |
| Indications | Dermatophyte infections of the nails, onychomycosis, ringworm infections (including tinea pedis, cruris, and corporis) |
| Dose and administration | Oral:  **Adult:** 250 mg daily usually for 2–6 weeks in tinea pedis, 2–4 weeks in tinea cruris, 4 weeks in tinea corporis, 6 weeks–3 months in nail infections (occasionally longer in toenail infections)  **Child:** usually for 4 weeks, tinea capitis, over 1 year, body weight 10–20 kg: 62.5 mg once daily; body weight 20–40 kg: 125 mg once daily; body weight over 40 kg: 250 mg once daily |
| Contraindications | Chronic or active liver disease. |
| Drug interactions | Tricyclic antidepressants (TCAs), beta-blockers, selective serotonin reuptake inhibitors (SSRIs), antiarrhythmics (including class 1A, 1B and 1C) and monoamine oxidase inhibitors (MAO-Is) Type B |
| Side effects | Depression, rash, urticaria, anxiety, headache, nausea, diarrhea, malaise, paresthesia, altered tase perception, appetite decreased, visual impairment, photosensitivity, Stevens-Johnson syndrome, pyrexia, fatigue, elevated liver enzymes |
| Cautions | Pregnancy, breastfeeding, psoriasis, autoimmune disease, hepatic impairment, renal impairment,  **Note:** *periodic monitoring of liver function tests is recommended* |
| Storage condition | Store below 30°C |
| **Voriconazole** | |
| Pharmacological class | Azole antifungal |
| Dosage form | Tablet: 50mg, 200mg  Powder for injection: 200mg in vial  Powder for oral liquid: 40mg/ml |
| Indications | Invasive aspergillosis, serious infections caused by *Scedosporium* spp., Fusarium spp., or invasive fluconazole-resistant Candida spp. (including *C. krusei*) |
| Dose and administration | **Oral:**  **Adult (body weight up to 40 kg), children > 12 years:** Initially 200 mg every 12 hours for 2 doses, then 100 mg every 12 hours, increased if necessary to 150 mg every 12 hours  **Adult (body weight 40 kg and above), children > 12 years:** Initially 400 mg every 12 hours for 2 doses, then 200 mg every 12 hours, increased if necessary to 300 mg every 12 hours.  **IV Infusion**  **Adult, children > 12 years**: Initially 6 mg/kg every 12 hours for 2 doses, then 4 mg/kg every 12 hours; reduced if not tolerated to 3 mg/kg every 12 hours  **Children aged 2 to < 12 years**:  **Loading dose**: 9mg/kg every 12 hours for 2 doses (IV)  **Maintenance dose:**  **IV infusion**: 8 mg/kg every 12 hours  **Oral**: 9mg /kg (maximum 350 mg) every 12 hours  *Note: do not give IV bolus.* |
| Contraindications | Hypersensitivity to the drug or other azoles, acute porphyria, co-administration with carbamazepine, cisaprid, sirolimus, galactose intolerance |
| Drug interactions | Rifampicin, ritonavir, carbamazepine and phenobarbital, cimetidine, ranitidine, macrolide antibiotics, benzodiazepines, statins, vinca alkaloids, prednisolone, digoxin, mycophenolic acid, phenytoin, omeprazole, indinavir, efavirenz |
| Side effects | Visual impairment, hypokalemia, pyrexia, rash, pruritus, vomiting, nausea, diarrhea, headache, hallucination, peripheral oedema, liver function test abnormal, respiratory distress and abdominal pain. |
| Cautions | Co-administration with enzyme inhibitors and inducers, pregnancy, breastfeeding, hepatic impairment, renal impairment, proarrhythmic conditions (e.g. congenital or acquired QTc prolongation, cardiomyopathy) |
| Storage condition | Store below 30°C. |

## Antivirals

Antiviral drugs are a class of medicines particularly used for the treatment of viral infections. Viruses are among the major pathogenic agents that cause number of serious diseases in humans. They are obligate intracellular parasites; their replication depends primarily on synthetic processes of the host cell. Therefore, to be effective, antiviral agents must either block viral entry into or exit from the cell or be active inside the host cell.

Antiviral drugs that directly target the viruses include the inhibitors of virus attachment, inhibitors of virus entry, uncoating inhibitors, polymerase inhibitors, protease inhibitors, inhibitors of nucleoside and nucleotide reverse transcriptase and the inhibitors of integrase. The inhibitors of protease (ritonavir, atazanavir and darunavir), viral DNA polymerase (acyclovir, tenofovir, valganciclovir and valacyclovir) and of integrase (raltegravir) are listed among the top prescribed medications.

**Antiretrovirals**

The HIV is a retrovirus that causes immunodeficiency by infecting and destroying cells of the immune system, particularly the CD4 cells. AIDS occurs when the number of CD4 cells fall to below 200 cells/microlitre; opportunistic infections and malignancies (AIDS-defining illnesses) can develop. The prognosis of HIV and AIDS has greatly improved due to more effective and better-tolerated ART. The aims of treatment are to achieve an undetectable viral load, to preserve immune function, to reduce the mortality and morbidity associated with chronic HIV infection, and to reduce onward transmission of HIV, whilst minimizing drug toxicity. Treatment with a combination of ART (HAART) aims to improve the physical and psychological well-being of infected people; it is measured virologically and immunologically. Currently there are six categories of ARVs. Namely, nucleoside analogue reverse transcriptase inhibitors (NRTIs), non-nucleoside analogue reverse transcriptase inhibitors (NNRTIs), protease inhibitors (PIs), integrase inhibitors (IIs), chemokine receptor 5 (CCR5) inhibitors and fusion inhibitors (FIs).

The current Ethiopian national ARV guideline (2022) suggests that treatment should be initiated for all patients diagnosed as being HIV positive, irrespective of CD4 cell counts. The regimens are classified as first line (preferred and alternative) and second line regimens.

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| **Abacavir** | | |
| Pharmacological class | Nucleoside reverse transcriptase inhibitor, antiretroviral |
| Dosage form | Tablets, 60mg, 300mg (as sulfate) |
| Indications | Treatment of HIV infection, in combination with other antiretrovirals. |
| Dose and administration | **Adul**t: 300mg 12 hourly  **Child:** 3 months - 16 years, 8mg/kg twice daily |
| Contraindications | Hypersensitivity to abacavir, severe hepatic impairment, presence of HLA-B\*5701 allele |
| Drug interactions | Methadone, rifampin, alcohol, ganciclovir, valganciclovir |
| Side effects | Hypersensitivity reactions, nausea, vomiting, diarrhea, anorexia, lethargy, fatigue, fever, headache, pancreatitis, lactic acidosis, hypertriglyceridemia, musculoskeletal pain, anxiety depression |
| Cautions | Hepatic and renal impairment, pregnancy, breastfeeding, |
| Storage condition | Store below 30oC. |
| **Abacavir + lamivudine** | | |
| Pharmacological class | Nucleoside reverse transcriptase inhibitors (NRTIs) |
| Dosage form | Tablet (dispersible): abacavir/lamivudine; 600mg+300 mg, 120mg+60mg |
| Indications | Treatment of HIV infection, in combination with other antiretrovirals |
| Dose and administration | **Adult and child body weight** 25: 600mg/300mg once daily  **Child**: **Abacavir 120 + lamivudine 60**  Body weight 3 – 5.9: 1 tablet  Body weight 6 – 9.9: 1 tablets  Body weight 10 – 13.9: 2 tablets  Body weight 14 – 19.9: 2 tablets  Body weight 20 – 24.9: 3 tablets |
| Contraindications | Hypersensitivity to abacavir or lamivudine. |
| Drug interactions | Refer to individual drug monograph. |
| Side effects | Refer to individual drug monograph. |
| Cautions | Refer to individual drug monograph. |
| Storage condition | Store below 30oC. |
| **Abacavir + lamivudine + dolutegravir** | | |
| Pharmacological class | Combination of antiretrovirals |
| Dosage form | Tablet (dispersible): 60mg +30mg +5mg |
| Indications | Treatment of HIV infected adults, adolescents |
| Dose and administration | **Adult and child body weight 25**: 600mg/300mg/50 mg once daily  **child:**  Body weight 3 – 5.9 kg: 2 tablets  Body weight 6 – 9.9 kg: 3 tablets  Body weight 10 – 13.9 kg: 4 tablets  Body weight 14 – 19.9 kg: 5 tablets  Body weight 20 – 24.9 kg: 6 tablets |
| Contraindications | Refer to individual drug monograph. |
| Drug interactions | Refer to individual drug monograph. |
| Side effects | Refer to individual drug monograph. |
| Cautions | Refer to individual drug monograph. |
| Storage condition | Store below 30oC |
| **Atazanavir + ritonavir** | | |
| Pharmacological class | Combination of protease inhibitors |
| Dosage form | Tablet: 300mg + 100mg |
| Indications | Treatment of HIV in adults and children weighing at least 30 kg, in combination with other antiretrovirals. |
| Dose and administration | **Adult and child body weight** 30 kg: one tablet once daily |
| Contraindications | Hypersensitivity to the drug, severe hepatic impairment.  Coadministration with alfuzosin, triazolam, orally administered midazolam, ergot derivatives, rifampin, irinotecan, lovastatin, simvastatin, indinavir, cisapride, pimozide, St. John’s wort. |
| Drug interactions | Atazanavir/ritonavir combination interacts with substrates, CYP3A4 inducers and inhibitors. |
| Side effects | Nausea, diarrhea, vomiting, anorexia, abdominal pain, taste disturbances, headache, muscle weakness, fever, light-headedness, insomnia, sweating, abnormal sensations in the hands/feet /mouth. |
| Cautions | Cardiac conduction disorders, electrolyte disturbances, predisposition to QT interval prolongation, allergic reactions, hyperbilirubinemia, mild to moderate hepatic impairment, nephrolithiasis, diabetes mellitus. |
| Storage condition | Store below 30°C. |
| **Darunavir** | | |
| Pharmacological class | Protease inhibitor, antiretroviral |
| Dosage form | Tablet: 75mg, 50mg, 400mg, 600mg, 800mg  Suspension: 100mg/ml |
| Indications | Treatment of HIV infection. |
| Dose and administration | **Adult**: 600 mg twice daily  **Child over 6 years:**  Body weight over 40 kg: 600 mg twice daily  Body weight 20–30 kg: 375 mg twice daily  Body weight 30–40 kg: 450 mg twice daily |
| Contraindications | Hypersensitivity to darunavir, sulphonamides or any of the components of this product, severe hepatic impairment, Co-administration with alfuzosin, triazolam, orally administered midazolam, ergot derivatives, rifampin, irinotecan, lovastatin, simvastatin, indinavir, cisapride, pimozide, St. John’s wort. |
| Drug interactions | Darunavir/ritonavir combination interacts with substrates, inducers and inhibitors of CYP 3A4, alfusozin, erythromycin, phenobarbital, simvastatin, apixaban, bromocriptine, chloramphenicol, colchicine, conjugated estrogen, diazepam, efavirenz, fluticasone, medroxy progesterone, tamoxifen, tadalafil. |
| Side effects | Dark-coloured urine, jaundice, pale-coloured bowel movements, diabetes, nausea, vomiting, pain or tenderness, loss of appetite, tiredness, hypersensitivity reactions with fever, tiredness, muscle or joint pain, blisters or skin lesions, oral sores or ulcers, and conjunctivitis (redness or swelling of the eyes |
| Cautions | Hepatic impairment, nephrolithiasis, diabetes mellitus, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C. |
| **Dolutegravir** | | |
| Pharmacological class | Integrase strand inhibitor, antiretroviral |
| Dosage form | Tablet: 50mg  Dispersible tablets: 10mg and 25 mg |
| Indications | Treatment of HIV infection, in combination with other antiretrovirals. |
| Dose and administration | **Adult and Child 12–17 years:**  50 mg tablet once daily  **Child >4weeks:**  Body weight 3-5.9kg: 5mg once daily  Body weight 6-9.9kg: 15mg once daily  Body weight 10-13.9kg: 20mg once daily  Body weight 14-19.9kg: 25mg once daily  Body weight >20kg: 50mg once daily |
| Contraindications | Concomitant use with carbamazepine, efavirenz, etravirine, fosphenytoin, phenobarbital, phenytoin, primidone, nevirapine, oxcarbazepine, St John’s wort, rifampicin, tipranavir. |
| Drug interactions | Magnesium/aluminium-containing antacid, iron and calcium supplements, multivitamin, efavirenz, CYP3A4 inducers (e.g. rifampicin, carbamazepine). |
| Side effects | Depression, diarrhea, dizziness, fatigue, flatulence, GI discomfort, headache, nausea, skin reactions, sleep disorders, vomiting, arthralgia, hepatitis, hypersensitivity reactions, immune reconstitution inflammatory syndrome, myalgia, suicidal tendencies, hyperglycemia, increased cholesterol, triglycerides. |
| Cautions | Hepatic impairment, pregnancy, breast feeding. |
| Storage condition | Store below 30°C |
| **Dolutegravir + lamivudine + tenofovir** | | |
| Pharmacological class | Antiretroviral drug combinations |
| Dosage form | Tablets, 50mg + 300mg + 300mg |
| **Indications** | Treatment of HIV-1 infection |
| Dose and administration | Adult and children 30Kg: One tablet daily |
| Contraindications | Refer to individual monograph. |
| Drug interactions | Refer to individual monograph. |
| Side effects | Refer to individual monograph. |
| Cautions | Refer to individual monograph. |
| Storage condition | Store below 30°C. |
| **Efavirenz** | | |
| Pharmacological class | Non-Nucleoside reverse transcriptase inhibitor, antiretroviral |
| Dosage form | Capsule: 50mg, 100mg or 200mg  Tablet: 200mg (dispersible), 600mg |
| **Indications** | Treatment of HIV infection, in combination with other antiretrovirals. |
| Dose and administration | **Adult and Child 35 kg**: 600 mg once daily  **Pediatrics**  Body weight (10 – 13.9 kg): 200 mg once daily  Body weight (14 – 24.9 kg): 300mg once daily  Body weight (25 – 34.9 kg): 400 mg once daily  **Note:** *Efavirenz is not recommended for children under 3 years or under 13kg.* |
| Contraindications | Hypersensitivity to efavirenz. |
| Drug interactions | Cisapride, midazolam, triazolam, ergot alkaloids, terfenadine, rifampicin, phenytoin, carbamazepine, phenobarbital, warfarin, protease inhibitors, oral contraceptives, artemether, artemether/lumefantrine, atazanavir, azithromycin, bedaquiline, bromocriptine, carvidelol, chloroquine, clopidogrel, doltugravir, itraconazole, ondansetron, pentamidine, praziquentil, risperidone, sofosbuvir/velpatasvir  **Note:** *Efavirenz may either induce or inhibit metabolism of other hepatically metabolized drugs.* |
| Side effects | CNS side effects (dizziness, impaired concentration, dysphoria, vivid or disturbing dreams, and insomnia), psychiatric side effects (anxiety, depression, hallucinations, and/or mania), rash and hepatotoxicity, cough (children), increased total cholesterol, HDL, and glucose. |
| Cautions | Hepatic and renal impairment, breastfeeding, elderly, history of mental illness or substance abuse. |
| Storage condition | Store below 30°C. |
| **Efavirenz + lamivudine + tenofovir** | | |
| Pharmacological class | Combination of antiretrovirals |
| Dosage form | Tablet: 400mg + 300mg + 300mg |
| **Indications** | Treatment of HIV-1 infection |
| Dose and administration | **Adult and Child 35 kg**: One tablet once daily |
| Contraindications | Refer to individual monograph. |
| Drug interactions | Refer to individual monograph. |
| Side effects | Refer to individual monograph. |
| Cautions | Refer to individual monograph. |
| Storage condition | Store below 30ºC. |
| **Lamivudine** | | |
| Pharmacological class | Nucleoside reverse transcriptase inhibitors (NRTIs), antiretroviral |
| Dosage form | Tablets: 150mg  Oral Solution: 10mg/ml |
| Indications | Treatment of HIV infection, pre and post exposure prophylaxis (only in combination with other antiretrovirals) |
| Dose and administration | **Oral:**  **Adult**: 150 mg twice daily or 300 mg once daily |
| Contraindications | Hypersensitivity to lamivudine. |
| Drug interactions | Chloramphenicol, trimethoprim/sulfamethoxazole, cladribine, sorbitol solution. |
| Side effects | Nausea, vomiting, diarrhea, abdominal pain, cough, headache, insomnia, malaise, fever, rash, alopecia, muscle disorders, nasal symptoms; peripheral neuropathy, rarely pancreatitis (discontinue), neutropenia, anemia and thrombocytopenia, lactic acidosis; raised liver enzymes. |
| Cautions | Renal impairment, lactic acidosis, history of pancreatitis, hepatic disease, pregnancy, breastfeeding. |
| Storage condition | Store below 30oC. |
| **Lamivudine + tenofovir** | | |
| Pharmacological class | Combination of antiretrovirals |
| Dosage form | Tablet: 300mg + 300mg |
| Indications | Treatment of HIV-1 infection, in combination with other antiretrovirals |
| Dose and administration | **Adult and Child 35 kg**: One tablet once daily |
| Contraindications | Refer to individual monograph. |
| Drug interactions | Refer to individual monograph. |
| Side effects | Refer to individual monograph. |
| Cautions | Refer to individual monograph. |
| Storage condition | Store below 30ºC. |
| **Lamivudine + Zidovudine** | | |
| Pharmacological class | Combination of antiretrovirals |
| Dosage form | Tablet: 150mg + 300mg, 30mg + 60mg |
| **Indications** | Treatment and post-exposure prophylaxis of HIV-1 infection, in combination with other antiretrovirals |
| Dose and administration | **Adult and Child 25 kg:**  one tablet two times daily (150mg + 300mg)  **Lamivudine 30 mg + zidovudine 60 mg**  Child >4weeks (3-5.9kg): 1 tablet two times daily  Child >4weeks (6-9.9kg): 1 tablets two times daily  Child >4weeks (10-13.9kg): 2 tablets two times daily  Child >4weeks (14-19.9kg): 2 tablets two times daily  Child >4weeks (20 – 24.9 kg): 3 tablets two times daily |
| Contraindications | Refer to individual drug monograph. |
| Drug interactions | Refer to individual drug monograph. |
| Side effects | Refer to individual drug monograph. |
| Cautions | Refer to individual drug monograph. |
| Storage condition | Store below 30ºC. |
| **Lopinavir + ritonavir** | | |
| Pharmacological class | Combination of antiretrovirals |
| Dosage form | Oral suspension: 80mg + 20mg/ml  Tablet: 40mg + 10 mg, 200mg + 50mg, 100mg + 25mg |
| Indications | Treatment of HIV-1 infection, in combination with other antiretroviral agents. |
| Dose and administration | **Adult**: two 200/50 mg tablets twice daily  **Child; Lopinavir 40 mg + ritonavir 10 mg**  Child >4weeks (3-5.9kg): 2 tablets twice daily  Child >4weeks (6-9.9kg): 3 tablets twice daily  Child >4weeks (10-13.9kg): 4 tablets twice daily  Child >4weeks (14-19.9kg): 5 tablets twice daily  Child >4weeks (20 – 24.9 kg): 6 tablets twice daily  **Lopinavir 200 mg + ritonavir 50 mg**  Child >4weeks (25 – 35 kg): 2 tablets in the morning, 1 tablet at night |
| Contraindications | Hypersensitivity to the drugs, severe hepatic impairment, severe renal impairment, co administration of amiodarone, cisapride, calcium channel blockers. |
| Drug interactions | Lopinavir/ritonavir combination interacts with substrates, inducers and inhibitors of CYP 3A4, consider drug-drug interaction potential to reduce risk of serious or life-threatening adverse reactions. |
| Side effects | Diarrhea, vomiting, nausea, abdominal pain, dyspepsia, rash, hypercholesterolemia, triglyceride increase, hyperglycemia, hyperuricemia, fat redistribution, liver impairment, QT and PR interval prolongation. |
| Cautions | Cardiac conduction disorders, electrolyte disturbances, predisposition to QT interval prolongation, mild to moderate hepatic impairment, nephrolithiasis, diabetes mellitus. |
| Storage condition | Tablets: store below 30°C.  Oral solution: store between 2°C - 8°C. |
| **Nevirapine** | | |
| Pharmacological class | Non-Nucleoside reverse transcriptase inhibitors (NNRTIs), Antiretroviral |
| Dosage form | Syrup: 10mg/ml |
| Indications | Prevention of mother to child transmission |
| Dose and administration | **Children > 4 weeks of age (liquid formulation 10mg/ml**): **Oral;**  Body weight 3-5.9kg: 5 ml twice daily  Body weight 6-9.9 kg: 8ml twice daily  Body weight 10.13.9 kg: 10 ml twice daily  Body weight >14 kg: recommended to use adult dose |
| Contraindications | Hypersensitivity to nevirapine. |
| Drug interactions | Clarithromycin, fluconazole, calcium channel blockers, warfarin, arethemeter/lumefantrine, atazanavir, carbamazepine, efivarenz, erythromycin, ketoconazole, bedaquiline, darunavir, simvastatin, lopinavir |
| Side effects | Rash, Stevens-Johnson syndrome, toxic epidermal necrolysis, hepatitis or jaundice, nausea, vomiting, abdominal pain, diarrhea, headache, drowsiness, fatigue, fever, hypersensitivity reactions, anaphylaxis, angioedema, urticaria, neutropenia, ulcerative stomatitis, peripheral neuropathy. |
| Cautions | Hepatic and renal impairment. |
| Storage condition | Store below 30oC. |
| **Raltegravir** | | |
| Pharmacological class | Integrase inhibitor, antiretroviral |
| Dosage form | Tablet (chewable): 25mg, 100mg  Tablet, 400mg  Granules for oral suspension: 100mg /sachet |
| Indications | In combination with other antiretroviral drugs for HIV infection resistant to multiple antiretrovirals. |
| Dose and administration | **Oral**:  **Adult and child over 16 years**: 400 mg twice daily  **Children > 4 weeks of age (chewable tablet):**  Body weight 3-5.9kg: 25 mg twice daily  Body weight 6-9.9 kg: 50 mg twice daily  Body weight 10.13.9 kg: 75 mg twice daily  Body weight 14-19.9 kg: 100 mg twice daily  Body weight 20-24.9 kg: 150 mg twice daily  Body weight 25-34.9 kg: 400 mg twice daily |
| Contraindications | Hypersensitivity to raltegravir. |
| Drug interactions | Rifampicin, iron salts, aluminium and magnesium hydroxide antacid |
| Side effects | Diarrhoea, flatulence, nausea, vomiting, dyspepsia, Cough, peripheral neuropathy, muscloskeletal pain, nasophargitis lipodystrophy, dyslipidemia, hypercholesterolemia, hyperglycemia, Infections, anemia, iron deficiency anemia, lymph node pain, lymphadenopathy, neutropenia, thrombocytopenia, decreased appetite, abnormal dreams, insomnia, nightmare, abnormal behaviour, depression, dizziness, headache, psychomotor hyperactivity, vertigo, abdominal distention, abdominal pain, rash, liver enzyme abnormality. |
| Cautions | Pregnancy, breastfeeding, risk of myopathy or rhabdomyolysis, chronic hepatitis B or C, hepatic impairment, depression, previous psychiatric illness. |
| Storage condition | Store below 30oC. |
| **Ritonavir** | | |
| Pharmacological class | Protease inhibitor, Antiretroviral |
| Dosage form | Tablets (heat stable): 25 mg, 100 mg |
| Indications | Treatment of HIV infection; as a booster to increase effect of indinavir, lopinavir or saquinavir and in combination with two other antiretroviral drugs. |
| Dose and administration | **HIV infection (as a booster with other antiretroviral medicines); oral:**  **Adult**: 100 mg twice daily  **Child**:  Weight 7–14.9 kg: 3 mg/kg twice daily  Weight 15–40 kg: 2.5 mg/kg twice daily (maximum 100 mg twice daily) |
| Contraindications | Hypersensitivity to ritonavir, patients with severe hepatic impairment. |
| Drug interactions | Amiodarone, cisapride, clozapine, pethidine, pimozide, quinidine and terfenadine, ergot alkaloids and derivatives, sedatives and hypnotics, HMG CoA reductase inhibitors, rifabutin, anticonvulsants, ketoconazole, macrolides, oral contraceptives, protease inhibitors and other drugs metabolized by CYP3A. |
| Side effects | Nausea, vomiting, diarrhea, taste disturbances, dyspepsia, anorexia, peripheral paresthesia, dizziness, sleep disturbances, fatigue, rash, hypersensitivity reactions, sweating, pruritus, electrolyte disturbances, anemia, neutropenia, pancreatitis, lipodystrophy and metabolic syndrome, vasodilatation, hypotension, syncope, dizziness, dehydration, renal insufficiency. |
| Cautions | Hepatic impairment, diabetes mellitus, haemophilia, pancreatitis, cardiac conduction disorders, structural heart disease. |
| Storage condition | Store below 30oC |
| **Zidovudine** | | |
| Pharmacological class | Nucleoside reverse transcriptase inhibitors (NRTIs), antiretroviral |
| Dosage form | Capsule: 100mg, 250mg  Tablet: 300mg  Injection: IV Infusion, 10mg/ml  Oral liquid: 50mg/5ml |
| Indications | Treatment of HIV infection, reduction of perinatal transmission of HIV and for post-exposure prophylaxis (Usually in combination with other antiretrovirals). |
| Dose and administration | **HIV infection**  **Adult and adolescents**: 250-300 mg twice daily, oral tablet  **Children > 4 weeks of age (10mg/ml liquid formulation):**  Body weight 3-5.9kg: 6ml twice daily  Body weight 6-9.9 kg: 9ml twice daily  Body weight 10.13.9 kg: 12ml twice daily  Body weight >14-19.9 kg: adult dose recommended  **PMTCT:**  **Newborn:** 2mg/kg orally every 6 hours starting within 12 hours after delivery and up to 6 weeks |
| Contraindications | Abnormally low neutrophile counts or haemoglobin, neonates with hyperbilirubinemia or raised transaminase |
| Drug interactions | Ganciclovir, fluconazole, myelosuppressive agents, probenecid, pyrimethamine, phenytoin, rifampicin, stavudine. |
| Side effects | Hematological abnormalities (anemia, thrombocytopenia and leucopoenia or neutropenia), bone marrow disorders, dyspnea, nausea, vomiting, diarrhea, abdominal pain, headache, myalgia, insomnia, myopathy, metabolic syndrome, lactic acidosis, seizures, confusion, mania, and hepatotoxicity. |
| Cautions | Vitamin B12 deficiency, anemia, myelosuppression, renal impairment; hepatic impairment, risk of lactic acidosis, diabetes mellitus. |
| Storage condition | Store below 30oC. |

**Antihepatitis medicines**

**Medicines for hepatitis B**

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| **Entecavir** | |
| Pharmacological class | Purine analog, antiviral |
| Dosage form | Tablet: 0.5mg, 1mg  Oral solution: 0.05mg/ml |
| Indications | Chronic hepatitis B in patients with compensated liver disease with evidence of viral replication and histologically documented active liver inflammation or fibrosis and patients with decompensated liver disease. |
| Dose and Administration | **Adult and adolescents ≥ 16 years**  Compensated liver disease: 500 micrograms once daily  Lamivudine resistance and decompensated liver disease: 1 mg once daily  **Note:** *safety and efficacy not established in pediatrics < 2 years.* |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | aminoglycosides, amphotericin B, cyclosporine, tacrolimus, acyclovir, metformin, tenofovir, cycloserine, ganciclovir, mannitol, polymyxin and co-administration of other nephrotoxic drugs: |
| Side effects | Diarrhea, dizziness, drowsiness, dyspepsia, fatigue, headache, insomnia, nausea, vomiting, alopecia, rash, lactic acidosis. |
| Cautions | lamivudine-resistant chronic hepatitis B, liver impairment, renal impairment. |
| Storage | Store below 30°C. |
| **Tenofovir disoproxil fumarate** | |
| Pharmacological class | Nucleotide reverse transcriptase inhibitor, antiretroviral |
| Dosage form | Tablet: 300 mg |
| Indications | Chronic hepatitis B infection with compensated liver disease with evidence of viral replication and histologically documented active liver inflammation or fibrosis.  Treatment, pre and post exposure prophylaxis of HIV-1, in combination with other antiretroviral drugs. |
| Dose and administration | **Chronic hepatitis B**:  **Child** (**body weight 35 kg) and adult**: 300 mg once daily. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Didanosine, drugs that reduce renal function or compete for active tubular secretion (acyclovir, valaciclovir, ganciclovir), lopinavir- ritonavir, nephrotoxic agents (aminoglycosides). |
| Side effects | Headache, renal impairment (Fanconi syndrome, acute tubular necrosis, nephritis), decrease in bone mineral density, lactic acidosis, severe hepatomegaly with steatosis, abdominal pain, nausea, vomiting, pruritus, insomnia, dizziness, pyrexia, asthenia, diarrhea, peripheral neuropathy. |
| Cautions | Renal impairment, hepatic impairment, lactic acidosis, co-administration with nephrotoxic drugs, breastfeeding. |
| Storage | Store below 30°C. |

**Medicines for hepatitis C**

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| **Glecaprevir + pibrentasvir** | |
| Pharmacological class | Pangenotypic direct acting antiviral combination |
| Dosage form | Tablet: 100 mg + 40 mg |
| Indications | Chronic hepatitis C virus (HCV) infection |
| Dose and administration | Oral:  **Adults, adolescents aged 12 years and older, or children weighing at least 45 kg:** 300 mg/120 mg (three 100 mg/40 mg tablets), taken orally, once daily at the same time with food for 8 weeks |
| Contraindications | Hypersensitivity to the active substances, moderate or severe hepatic impairment (Child-Pugh B or C). |
| Drug interactions | Carbamazepine, Atazanavir, darunavir, efavirenz, statins, ciclosporin, oral anticoagulants, St. John’s wort. |
| Side effects | Headache, fatigue, diarrhea, nausea, elevation in total bilirubin |
| Cautions | Patients co-infected with HCV and HBV, hepatic impairment, co-administration of interacting drugs. |
| Storage condition | Store below 30°C. |
| **Sofosbuvir + daclatasvir** | |
| Pharmacological class | Pangenotypic, direct acting antivirals combination |
| Dosage form | Tablet: 400 mg sofosbuvir/60 mg daclatasvir co-formulated tablet |
| Indications | Chronic hepatitis C infection. |
| Dose and administration | **Adult: Oral:**  **Genotypes 1, 2, 4, 5, 6 without cirrhosis or with compensated cirrhosis and genotype 3 without cirrhosis:** 400 mg/60 mg tablet once daily for 12 weeks  **Genotype 3 with compensated cirrhosis or genotypes 1, 2, 3, 4, 5, 6 with decompensated cirrhosis:** 400 mg/60 mg tablet once daily for 24 weeks |
| Contraindications | Hypersensitivity to sofosbuvir or daclatasvir, pregnancy, breastfeeding |
| Drug interactions | Carbamazepine, phenobarbital, phenytoin, rifampicin, rifabutin, rifapentine, dexamethasone, amiodarone. |
| Side effects | Fatigue, nausea, headache, insomnia, dizziness, gastrointestinal disturbances, arthralgia, decreased appetite, dyspnea, nasal congestion, rash. |
| Cautions | Patients co-infected with hepatitis B virus, diabetes, concurrent use of interacting drugs, Severe bradycardia. |
| Storage condition | Store below 30 °C. |
| **Sofosbuvir + ledipasvir** | |
| Pharmacological class | Pangenotypic, direct acting antivirals combination |
| Dosage form | Tablet: 400 mg+ 90 mg. |
| Indications | Indicated for the treatment of patients with chronic hepatitis C genotypes 1, 4, 5, and 6, with or without ribavirin. |
| Dose and administration | **Oral**  **Adult**: sofosbuvir 400mg oral once daily + Ledipasvir 90mg oral once daily for 12 weeks. |
| Contraindications | Hypersensitivity to ledipasvir or sofosbuvir. |
| Drug interactions | Acid reducing agents, carbamazepine, antiarrhythmic (amiodarone and digoxin), rifamycins, tenofovir, rosuvastatin, atorvastatin, St. John's wort. |
| Side effects | Rash, fatigue, cough, headache, Stevens-Johnson syndrome. |
| Cautions | Patients co-infected with HCV and HBV, bradycardia, pregnancy and breastfeeding, co-administration of statins, concomitant use with carbamazepine, efavirenz containing regimens. |
| Storage condition | Store below 30oC. |
| **Sofosbuvir + velpatasvir** | |
| Pharmacological class | Pangenotypic, antivirals combination |
| Dosage form | Tablet: 400 mg + 100 mg, 200 mg + 50 mg |
| Indications | For the treatment of chronic hepatitis C genotypes 1 to 6 infection |
| Dose and administration | **Oral**  **Adult**: 400 mg of sofosbuvir and 100 mg of velpatasvir, one tablet once daily for 12 weeks. |
| Contraindications | Hypersensitivity to sofosbuvir or velpatasvir. |
| Drug interactions | Antacids (e.g., aluminum and magnesium hydroxide), Proton-pump inhibitors (e.g., omeprazole), amiodarone, digoxin, topotecan, carbamazepine, phenytoin, phenobarbital, rifabutin, rifampin, and rifapentine, efavirenz, regimens containing tenofovir, tipranavir/ritonavir, herbal Supplements (St. John's wort), statins |
| Side effects | Headache, fatigue, nausea, vomiting, asthenia, insomnia, loss of appetite, jaundice, angioedema. |
| Cautions | Liver transplant patients, diabetes, renal impairment, HCV/HBV co-infection, severe bradycardia and heart block, patients treated with vitamin K antagonists, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C |

**Other antivirals**

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| **Aciclovir** | |
| Pharmacological class | Synthetic nucleoside (purine) analog, antiviral |
| Dosage form | Capsule/Tablet: 200mg, 400mg Oral liquid: 200mg/5ml  Powder for Injection (as sodium salt): 250mg, 500mg |
| Indications | Treatment of primary genital herpes (herpes simplex infection); disseminated varicella-zoster (chickenpox), prophylaxis of herpes simplex infections in immunocompromised patients, herpes simplex encephalitis and herpes zoster. |
| Dose and administration | **Adult:**  **Treatment of primary genital herpes:**  **Oral**: 200mg 5 times daily for 7-10 days or 400 mg 3 times daily for 7-10 days.  **Prevention of recurrence of genital herpes:**  **Oral**: 400 mg twice daily.  **Disseminated varicella-zoster (chickenpox) in immunocompromised patients:**  **IV infusion**: 10 mg/kg 3 times daily for 7 days.  **Herpes simplex encephalitis:**  **IV infusion**: 10 mg/kg 3 times daily for 10 days.  **Herpes zoster:**  **Oral**: 800mg every 4 hours (5 times/day) for 7-10 days.  **Child:**  **Herpes simplex in the Immunocompromised patients**  For up to 12 years: IV infusion (over at least 1 hour), 250 mg/m2 8 hourly for 5-7 days. This may be doubled in herpes encephalitis and in varicella zoster in immunocompromised patients. |
| Contraindications | Hypersensitivity to acyclovir or valaciclovir. |
| Drug interactions | Mycophenolate mofetil, probenecid, any nephrotoxic drugs, amphotericin B, aminoglycoside, amoxicillin, carboplatin, cisplatin, cyclosporine, contrast media(iodinated), colistin, polymixin B, tenofovir. |
| Side effects | Nausea, vomiting, abdominal pain, diarrhea, headache, fatigue, rash, urticaria, pruritus, photosensitivity, jaundice, dyspnea, angioedema, anaphylaxis, neurological reactions, acute renal failure, decreases in hematological indices, fever, tremors, psychosis and convulsions. |
| Cautions | Renal impairment, elderly, poor hydration status, pregnancy, breastfeeding. |
| Storage condition | Store at controlled room temperature. |
| **Ganciclovir** | |
| Pharmacological class | Nucleoside analog of guanine, antiviral |
| Dosage form | Powder for injection: 500mg/Vial  Capsule: 250mg, 500mg |
| Indications | Treatment cytomegalovirus (CMV) infections in immuno-compromised patients, and for the prevention of CMV infection in transplant recipients. |
| Dose and administration | **Adult and adolescent >12 years:**  **CMV retinitis:**  **IV infusion:**  **Initially** 5mg/kg 12 hourly infused at a constant rate over 1 hour (10mg/kg/day) for 14 - 21 days.  **Maintenance**: 6mg/kg/day for 5 days /week; or 5mg/kg/day for 7 days/week.  **Oral**:  **Maintenance therapy** (in HIV – infected patients, when retinitis is stable): 1g 3 times daily or 500mg 6 times daily, with food. |
| Contraindications | Hypersensitivity to ganciclovir, abnormally low hemoglobin count, abnormally low neutrophil count, abnormally low platelet count |
| Drug interactions | Abacavir, bacitracin, and imipenem/cilastatin, probenecid, myelosuppressive agents, zidovudine |
| Side effects | Hypersensitivity, myelosuppression, neutropenia, anemia, thrombocytopenia, fever, skin rash, GI disturbances; liver function abnormalities, phlebitis, candida infections including oral candidiasis, upper respiratory infection, depression, confusion, headache, insomnia, visual impairment, cough, dyspnea, fever, decreased sperm count. |
| Cautions | Pregnancy, breastfeeding, renal impairment, cross-hypersensitivity, pre-existing hematological cytopenia, concurrent myelosuppressive use. |
| Storage condition | Store below 30oC. |

## Antiprotozoals

**Anti-malarial medicines**

Malaria is the most important parasitic disease of humans and causes hundreds of millions of illnesses per year. Four species of plasmodium typically cause human malaria: *Plasmodium falciparum*, *P. vivax*, *P. malariae*, and *P. ovale*. A fifth species, *P. knowlesi* but has recently been recognized to cause illness in humans. Malaria is transmitted by anopheles’ mosquitoes and rarely by congenital transmission, transfusion of infected blood or use of contaminated syringes among drug addicts. Although all the latter species may cause significant illness, *P. falciparum* is responsible for the majority of serious complications and deaths. Drug resistance is an important therapeutic problem, most notably with *P. falciparum*.

The various stage of malarial parasite life cycle that occur in humans differ from one another in their morphology, metabolism and drugs sensitivity. Thus, antimalarial drugs can be classified based on their activities during this life cycle as well as by their intended use for either chemoprophylaxis or treatment. Some antimalarial are related to chemoprophylaxis; However, because no antimalarial kills sporozoites, it is not truly possible to prevent infection. Drugs can only prevent the development of symptomatic malaria caused by asexual erythrocytic forms. Others are related to the treatment of established infection; no single antimalarial is effective against all liver and intra-erythrocytic stages of the life cycle that may co-exist in the same patient. Complete elimination of the parasite infection, therefore, may require more than one drug.

Artemether and lumefantrine is the recommended first line drug for treatment of uncomplicated *P. falciparum* malaria, while artesunate is the drug of choice for complicated *P. falciparum*. Chloroquine is the recommended treatment for *P. vivax*, artemether and lumefantrine used when chloroquine is unavailable. Blood Schizontocides such as 4- aminoquinolines (chloroquine), are the mainstay of the treatment of acute malaria, and some are used for prophylaxis.

Artemether and lumefantrine is the recommended first line drug for treatment of uncomplicated *P. falciparum* malaria, while artesunate is the drug of choice for complicated *P. falciparum*. Chloroquine is the recommended treatment for *P. vivax*, artemether and lumefantrine used when chloroquine is unavailable.

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| **Artemether** | |
| Pharmacological class | Artemisinin derivative |
| Dosage form | Injection: 20mg/ml, 40mg/ml, 80mg/ml |
| Indications | Treatment of malaria caused by *Plasmodium vivax* and *P. falciparum* |
| Dose and Administration | **Malaria**; IM:  **Adult and Child over 6 months:** 3.2 mg/kg once daily on first day, 1.6 mg/kg once daily until patient can tolerate oral medication (maximum 7 days) |
| Contraindications | Hypersensitivity to artemether or peanut oil. |
| Drug interactions | Carbamazepine, phenytoin, rifampin, St. John's wort. |
| Side effects | Transient increase in serum transaminase, headache, nausea, vomiting, abdominal pain, diarrhea, dizziness, tinnitus, neutropenia, reduction in nucleoside and reticulocyte count. |
| Cautions | Pregnancy, breast feeding, geriatric 65 years of age, hepatic impairment, renal impairment. |
| Storage condition | Store below 30℃ and protected from light. |
| **Artemether + lumefantrine (AL)** | |
| Pharmacological class | Combination of antimalarials |
| Dosage form | Tablet (dispersible): 20mg + 120mg |
| Indications | Treatment of uncomplicated malaria due to *P. falciparum*, *P. vivax* and mixed infections |
| Dose and administration | **Adult** **and child\*; oral:**  Body weight 5- 14 kg: 1 tablet  Body weight 15 – 24 kg: 2 tablets  Body weight 25 – 34 kg: 3 tablets  Body weight > 35 kg: 4 tablets  **Note:** On day one, the initial dose will be repeated after 8 hours  On day 2 and 3**:** two times daily (3-day course of 6 doses) \* Child <2 years or <5 kg: safety and efficacy not established. |
| Contraindications | Family history of congenital QT interval prolongation, family history of sudden death, history of arrhythmias, history of clinically relevant, bradycardia, history of congestive heart failure accompanied by reduced left ventricular ejection fraction |
| Drug interactions | Drugs known to prolong QT: class IA or III antiarrhythmics, tricyclic antidepressants, macrolides, fluoroquinolones, quinine, quinidine  Strong CYP 3A4 inducers: rifampin, carbamazepine, phenytoin |
| Side effects | Abdominal pain, anorexia, diarrhea, nausea and vomiting, headache, dizziness, sleep disorders, palpitations, arthralgia, myalgia, cough, asthenia, fatigue, pruritus, rash. |
| Cautions | Electrolyte disturbances (hypokalemia), concomitant administration of drugs that prolong QT interval, renal or hepatic impairment, pregnancy, breastfeeding. |
| Storage condition | Store below 30℃. |
| **Artesunate** | |
| Pharmacological class | Artemisinin derivates, antimalarial |
| Dosage form | Injection: 60mg/ml  Rectal (capsule): 50 mg; 200 mg; 100 mg |
| Indications | Treatment of severe malaria caused by *P. falciparum* |
| Dose and administration | **Severe malaria**  **IV:**  **Adults and children weighing > 20 kg**: Initially 2.4 mg/kg, then repeat at 12-hour intervals for 2 further doses, then once daily  **Children weighing < 20 kg**: Initially 3 mg/kg, then repeat at 12-hour intervals for 2 further doses, then once daily  **Rectal:**10mg/kg body weight |
| Contraindications | Hypersensitivity to artesunate or other artemisinins. |
| Drug interactions | Dapsone, nevirapine, phenobarbital, carbamazepine, phenytoin, imatinib, rifampin. |
| Side effects | Headache, nausea, vomiting, convulsions, abdominal pain, diarrhea, dizziness, tinnitus, neutropenia, elevated liver enzyme values, ECG abnormalities, including prolongation of QT interval, temporary suppression of reticulocyte response and induction of blackwater fever reported, neurotoxicity in animal studies. |
| Cautions | Pregnancy, performing tasks such as riding a bike or operating machinery within 24 hours. |
| Storage condition | Store below 30oC. |
| **Atovaquone + proguanil** | |
| Pharmacological class | Combination of antimalarials |
| Dosage form | Tablet:250mg+100mg |
| Indications | Prophylaxis of *falciparum* malaria |
| Dose and administration | **Prophylaxis of *falciparum* malaria:**  **Adult and child body weight 40 kg and above:** 1 tablet once daily, to be started 1–2 days before entering endemic area and continued for 1 week after leaving  **Child:**  Body weight 11-20: 62.5mg/25mg daily  Body weight 21-30: 125mg/50mg as a single dose daily  Body weight 31-40: 187.5mg/75mg as a single dose daily  **Treatment of acute uncomplicated falciparum malaria**  **Adult:** 4 tablets once daily for 3 days |
| Contraindications | Hypersensitivity to the drugs, severe renal impairment (creatinine clearance < 30 mL/min). |
| Drug interactions | Rifampicin, rifabutin, efavirenz, dapsone (topical). |
| Side effects | Abdominal pain, appetite Decreased, cough, depression, diarrhea, dizziness, fever, headache, nausea, skin reactions, sleep disorders, vomiting, anxiety, blood disorder, hyponatraemia, oral disorders, palpitations. photosensitivity reaction, seizure, Stevens-Johnson syndrome, tachycardia, vasculitis. |
| Cautions | Pregnancy, breastfeeding, renal impairment, diarrhea or vomiting, elderly. |
| Storage condition | Store below 30oC. |
| **Chloroquine phosphate** | |
| Pharmacological class | 4-aminoquinoline, anti-malarial |
| Dosage form | Tablets: 250mg, 500mg (equivalent to 150mg, 300mg chloroquine base)  Syrup: 50mg/5ml |
| Indications | Treatment and prevention of *P. vivax* malaria, inflammatory diseases, amebiasis (extraintestinal). |
| Dose and administration | **Treatment of malaria;** Oral treatment of cases with chloroquine dose tablet for 150mg base/tablet or 50mg base/5ml syrup:  **Under 1 year:** (75mg [½ tablet], stat) then 40 mg [¼ tablet] (6 hours); 75 mg [1/2 tablet] (2nd day); and 75 mg [1/2 tablet] (3nd day)  **1-5 year:** (150 mg [1 tab], stat), then 75 mg [1/2 tab] (6 hours later); 75 mg [1/2 tab] (2nd day); and 75 mg [1/2 tab] (3rd day)  **6-9 years:** (300 mg [2 tablets], stat), then 150 mg [1 tablet] (6 hours later); 150 mg, [1 tablet] (2nd day); and 150 mg; [1 tablet] (3rd day)  **10-15 years:** (450 mg [3 tablets], stat), then 225 mg [1 and 1/2 tablets] (6 hours later); 225 mg, [1 and 1/2 tablets] (2nd day); and 225 mg [1 and 1/2 tablets] (3rd day)  **Adults (16 years and above):** (600 mg [4 tablets], stat), then 300 mg, [2 tablets] (6 hours later); 300 mg [2 tablets] (2nd day); and 300 mg [2 tablets] (3rd day)  **For prophylaxis of chloroquine sensitive malaria:**  **Adult** :500 mg (300mg base) two weeks before, during, and up to 8 weeks after exposure to an endemic area, taken as a weekly dose. |
| Contraindications | Hypersensitivity to chloroquine or any 4-aminoquinoline compound, retinal or visual field changes of any etiology, poryphyria |
| Drug interactions | Aspirin, epinephrine, clarithromycin, artemether, azithromycin, ciprofloxacin, saquinavir, metoprolol, paracetamol, cimetidine, alprazolam. Antacids and kaolin may reduce chloroquine absorption |
| Side effects | Gastrointestinal disturbances (nausea, vomiting, diarrhea, abdominal pain), headache, visual disturbances (blurred vision, difficulty focusing), skin reactions (rashes, pruritus), convulsions, depigmentation or loss of hair, bone-marrow suppression, hearing loss, tinnitus, retinal damage, cardiomyopathy, myopathy |
| Cautions | Metabolic and blood disorders, G6PD deficiency, risk of retinopathy and cardiomyopathy, history of epilepsy, severe gastrointestinal disorders, risk of hypoglycemia, psoriasis. |
| Storage condition | Store below 30oC |
| **Dihydroartemisinin + piperaquine phosphate (DP)** | |
| Pharmacological class | Combination of antimalarials |
| Dosage form | Tablet: 40 mg + 320 mg, 20 mg + 160 mg |
| Indications | Treatment of uncomplicated falciparum malaria |
| Dose and administration | **Child and adults > 11 kg body weight (**40 mg + 320 mg tablet); Oral:  Body weight 11 - 17 kg: 1 tablet  Body weight 17 - 25 kg: 1 tablets  Body weight 25 -36 kg: 2 tablets  Body weight 36 - 60 kg: 3 tablets  Body weight 60 - 80 kg: 4 tablets  Body weight 80 kg: 5 tablets  **Child 5 to < 11 kg body weight** (20 mg + 160 mg tablet)  Body weight 5 - 8 kg: 1 tablet  Body weight 8 - 11 kg: 1 tablets |
| Contraindications | Acute myocardial infarction, bradycardia, congenital long QT syndrome, electrolyte disturbances, family history of sudden death, heart failure with reduced left ventricular ejection fraction, history of symptomatic arrhythmias, left ventricular hypertrophy, risk factors for QT interval prolongation, severe hypertension. |
| Drug interactions | Drugs known to prolong QT: Class IA or III antiarrhythmics, tricyclic antidepressants, antipsychotics, ondansetron, macrolides, fluoroquinolones, quinine, quinidine.  Strong CYP 3A4 inducers: rifampin, carbamazepine, phenytoin. |
| Side effects | Cardiac disorders, rarely, gastrointestinal disturbances, pruritus, hepatic disorders, joint and muscle pain. |
| Cautions | Concomitant administration of drugs that prolong QT interval, cardiac disorders, severe renal or hepatic impairment, pregnancy and breast-feeding, age > 60 years. |
| Storage condition | Store below 30 °C. |
| **Doxycycline** | |
| Pharmacological class | Tetracycline, antibacterial **(**Antiprotozoal) |
| Dosage form | Tablet: 100mg |
| Indications | Malaria prophylaxis |
| Dose and administration | **Adult; Oral:** 100mg daily, start one to two days prior to travel to the endemic area, take daily during the stay, and continue it daily for four weeks following return |
| Contraindications | Refer to doxycycline (antibacterials). |
| Drug interactions | Refer to doxycycline(antibacterials). |
| Side effects | Refer to doxycycline(antibacterials). |
| Cautions | Refer to doxycycline. (antibacterials). |
| Storage condition | Store below 30oC. |
| **Mefloquine hydrochloride** | |
| Pharmacological class | Arylaminoalcohols, antimalarial |
| Dosage form | Tablet: 250mg |
| Indications | Prophylaxis of malaria for travellers to areas where high risk of malaria |
| Dose and administration | Prophylaxis should start 1-3 weeks departure and continue for 4 weeks after last exposure, 5 mg /kg mefloquine salt once weekly.  **Adults and children of more than 45 kg bodyweight**: number of tablets per week, 1 tablet  **Children and adults weighing less than 45 kg;** number of tablets per week  5-19 kg (Age: < 3-23 months): 1/2 tablet  20-30 kg (Age: 2-7 years): 1/2 tablet  31-45 kg (Age: 8-10 years): 3/4 tablet  **Note:** *not recommended for children below 9 kg and < 3 months* |
| Contraindications | Hypersensitivity to quinine, neuropsychiatric disorders including depression or convulsions. |
| Drug interactions | Artemether + lumefantrine, atenolol, carbamazepine, chloroquine, digoxin, ethosuximide, nifedipine, phenytoin, propranolol, quinidine, quinine, timolol, valproic acid, verapamil, live typhoid vaccines, clarithromycin, ciprofloxacin, amitriptyline, fluoxetine. |
| Side effects | Nausea, vomiting, diarrhea, abdominal pain, anorexia, headache, dizziness, loss of balance, insomnia and abnormal dreams, neurological and psychiatric disturbances, convulsions, anxiety, depression, confusion, hallucinations, panic attacks, emotional instability, aggression, agitation and psychoses, cardiac conduction disorders, myalgia, arthralgia, rash, urticaria, pruritus, alopecia, disturbances in liver function tests, leukopenia, leucocytosis, thrombocytopenia, Stevens-Johnson syndrome, atrioventricular block and encephalopathy. |
| Cautions | Pregnancy, cardiac conduction disorders, hepatic impairment, epilepsy; breastfeeding, infants under 3 months. |
| Storage condition | Store below 30oC. |
| **Primaquine phosphate** | |
| Pharmacological class | 8-aminoquinolone, antimalarial |
| Dosage form | Tablet: 7.5 mg, 15mg |
| Indications | For the prevention of relapses (radical cure) of malaria caused by *P. vivax* and *P. ovale.,* to decrease transmission of *P. falciparum* |
| Dose and administration | **Radical cure of P. *vivax* and *P. ovale.* (14 days)**; **Oral:**  Body weight 8 – 18 kg: tablet of 7.5 mg  Body weight 19 – 24 kg: tablet of 7.5 mg  Body weight 25 – 35: tablet of 15 mg  Body weight 36 – 50: 1 tablet of 15 mg  Body weight 50: 1 tablet of 15 mg  **Transmission of *P. falciparum* (single dose); Oral:**  Body weight 8 – 18 kg: tablet of 15 mg  Body weight 19 – 24 kg: tablet of 15 mg  Body weight 25 – 35: 1 tablet of 15 mg  Body weight 36 – 50: 1 tablet of 15 mg  Body weight 50: 2 tablets of 15 mg |
| Contraindications | Hypersensitivity to the drug, severe G6PD deficiency, pregnancy, breastfeeding, infants under six months, moderate to severe anemia. |
| Drug interactions | Class IA or III antiarrhythmics, tricyclic antidepressants, macrolides, fluoroquinolones, quinine, quinidine, thioridazine, bone marrow suppressants and drugs that cause haemolysis (e.g. dapsone) |
| Side effects | Hemolytic anemia especially in G6PD deficiency, leucopoenia, abdominal pain or cramps, nausea, vomiting, methemoglobinemia (cyanosis - bluish fingernails, lips, or skin), dizziness or light-headedness, difficult breathing, unusual tiredness or weakness). |
| Cautions | Mild to moderate G6PD deficiency, history of acute hemolytic anemia, systemic disease associated with agranulocytopenia (e.g. rheumatoid arthritis), ventricular arrhythmias, hypokalemia, hypomagnesemia. |
| Storage condition | Store below 30°C. |
| **Quinine hydrochloride** | |
| Pharmacological class | Arylaminoalcohol, antimalarial |
| Dosage form | Injection: 300mg/ml in 2ml ampoule  Tablet (Dihydrochloride or sulphate): 300mg |
| Indications | An alternate drug for the treatment of severe and complicated malaria and treatment of uncomplicated p. falciparum malaria for pregnant women during the first trimester and for children of less than 5 kg. |
| Dose and administration | ***Falciparum* malaria; Oral:**  **Adult**: 10mg quinine sulphate salt/Kg 3 times daily for seven days (the max adult dose is 600 mg TID)  **Child**: 10 mg/kg (quinine sulfate) every 8 hours  **Treatment of severe and complicated Plasmodium falciparum malaria:**  **Slow IV infusion (over 4 hours):**  **Adult**: 20 mg/kg (quinine dihydrochloride) loading dose followed by 10 mg/kg (quinine dihydrochloride) every 8 hours.  **Child**: 20 mg/kg (quinine dihydrochloride) followed by 10 mg/kg (quinine dihydrochloride) every 12 hours. |
| Contraindications | Hypersensitivity to quinine or quinidine, glucose-6-phosphate dehydrogenase deficiency (G-6-PD), myasthenia gravis, optic neuritis, haemoglobinuria, tinnitus. |
| Drug interactions | Mefloquine, quinidine, cimetidine, halofantrine, digoxin, antacids, other hemolytic drugs such as dapsone, amiodarone, fexinidazole, erythromycin, thioridazine, artemether, lopinvir, mifeprestone |
| Side effects | Cinchonism, GIT disturbances (abdominal or stomach cramps or pain, nausea, vomiting, diarrhea), confusion, hypersensitivity reaction (fever, angioedema, blood disorder including thrombocytopenia and intravascular coagulation), acute renal failure, hypoglycemia |
| Cautions | Atrial fibrillation, conduction defects, heart block, hepatic impairment, renal impairment. |
| Storage condition | Store below 30oC. |

**Medicines used for amoebiasis**

Treatment of amoebiasis involves a strategic combination of medications that target different forms and locations of the *Entamoeba histolytica* parasite. This comprehensive approach is essential to ensure the complete eradication of the parasite from the body, addressing both the active infections and the dormant cyst forms. Effective management typically requires the use of both tissue and luminal amebicides to target the parasite in various stages and locations within the host.

Tissue amoebicides are crucial for eliminating the invasive forms of the parasite that have spread beyond the intestines, such as in cases of hepatic amoebiasis. Examples of tissue amoebicides include metronidazole and tinidazole. These medications penetrate tissues where the parasite has invaded, helping to clear the infection from organs and preventing systemic complications.

Luminal amoebicides, on the other hand, are designed to target the parasites residing in the intestinal lumen. These drugs are essential for treating amoebic dysentery, where the parasites are localized in the gut. Examples of luminal amoebicides include diloxanide furoate and paromomycin. Paromomycin, an aminoglycoside antibiotic, is particularly effective in clearing the intestinal lumen of parasites and is often used when there is a need to ensure thorough eradication of luminal cysts.

By combining tissue and luminal amoebicides, treatment regimens can effectively address the full spectrum of amoebiasis manifestations. The selection of appropriate medications and their combinations depends on the severity and location of the infection, the patient’s overall health, and any potential contraindications. This targeted approach not only enhances treatment efficacy but also minimizes the risk of recurrence, ensuring a higher likelihood of complete recovery and preventing further transmission of the disease.

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| **Diloxanide furoate** | |
| Pharmacologic class | Dichloroacetamide derivative, luminal amebicide |
| Dosage form | Tablet: 500mg |
| Indications | Treatment of asymptomatic cyst carriers of *E. histolytica, a*djunct treatment for amoebic dysentery and extra-intestinal amoebiasis |
| Dose and administration | **Oral:**  **Adult:** 500 mg orally three times daily for 10 days.  **Child over 25kg**: 20 mg/kg body weight daily in 3 divided doses for 5-10 days. |
| Contraindications | Hypersensitivity to diloxanide furoate. |
| Drug interactions | No clinically significant drug interactions known in amoebiasis treatment. |
| Side effects | Flatulence, abdominal cramps. Nausea, vomiting, pruritus, urticaria. |
| Cautions | Pregnancy, breastfeeding, gastrointestinal problems. |
| Storage condition | Store below 30°C. |
| **Metronidazole** | |
| Pharmacologic class | Nitroimidazole, antibacterial (antiprotozoal) |
| Dosage form | Oral suspension: 125mg/5ml, 200mg/5ml (as benzoate)  Capsule/Tablet: 250mg, 500mg  Injection: 500mg in 100ml vial |
| Indications | Treatment of amoebic dysentery, extra-intestinal amoebiasis including hepatic amoebiasis. |
| Dose and administration | **Invasive amoebiasis; Oral:**  **Adult and Child**: 30mg/kg daily in 3 divided doses for 8-10 days, followed by a course of a luminal amoebicide.  **Invasive amoebiasis** (IV infusion if oral administration not possible):  **Adult and Child:** 30 mg/kg daily in 3 divided doses (until patient can complete course with oral drugs), followed by a course of a luminal amoebicide.  **Patient Advice:** Tablets should be swallowed whole with water during or after a meal; suspension should be taken one hour before a meal |
| Contraindications | Refer to metronidazole (antibacterials). |
| Drug interactions | Refer to metronidazole (antibacterials). |
| Side effects | Refer to metronidazole (antibacterials). |
| Cautions | Refer to metronidazole (antibacterials). |
| Storage condition | Store below 30oC, in light-resistant container. |
| **Paromomycin** | |
| Pharmacologic class | Aminoglycoside |
| Dosage form | Tablet/capsule: 500mg |
| Indications | Treatment of intestinal amoebiasis, adjunct treatment for amoebic dysentery |
| Dose and Administration | **Adults:** 25-35 mg/kg/day orally in4 divided doses  **Children:** 25-35 mg/kg/day orally in 3divided doses |
| Contraindications | Hypersensitivity to paromomycin or other aminoglycosides. |
| Drug interactions | Concurrent use with other nephrotoxic or ototoxic drugs (increased risk of toxicity), quinidine, muscle relaxants. |
| Side effects | Nausea, vomiting, abdominal cramps, ototoxicity, nephrotoxicity (rare with oral administration). |
| Cautions | Renal impairment, intestinal obstruction, prolonged treatment may cause superinfection. |
| Storage condition | Store below 30oC. |
| **Tinidazole** | |
| Pharmacologic class | Nitroimidazole |
| Dosage form | Tablet: 500mg |
| Indications | Treatment of amoebic dysentery, extra-intestinal amoebiasis, including hepatic amoebiasis. |
| Dose and administration | **Intestinal amoebiasis:**  Adult: 2g daily for 2-3 days  Child>3 years: 50-60 mg/kg daily for 3 days.  **Amoebic liver abscess:**  Adult: 1.5-2g daily for 3-6 days  Child> years: 50-60 mg/kg daily for 5 days  **Note**: *for child below 3 years safety data is not well established*. |
| Contraindications | Hypersensitivity to tinidazole or other nitroimidazole derivatives. |
| Drug interactions | Alcohol (disulfiram-like reaction), warfarin (increased anticoagulant effect), phenytoin and phenobarbital (increased metabolism of tinidazole), fluorouracil, lopinavir, ritonavir. |
| Side effects | Abdominal pain, decreased appetite, diarrhea, headache, nausea, skin reactions, vertigo, vomiting. angioedema, ataxia, dizziness, fatigue, flushing, leukopenia, oral disorders, peripheral neuropathy. |
| Cautions | Pregnancy, breastfeeding, severe hepatic impairment. |
| Storage condition | Store below 30oC. |

**Medicines used for giardiasis**

Treatment of giardiasis involves the use of specific antiparasitic medications aimed at eradicating Giardia lamblia, the causative protozoan parasite. The goal of treatment is to eliminate the parasite from the intestines and resolve the symptoms associated with the infection, such as diarrhea, abdominal cramps, and nausea.

Metronidazole and Tinidazole are nitroimidazole derivatives commonly used for the treatment of giardiasis. These medications are highly effective in eliminating the parasite from the intestines. Metronidazole is typically administered in multiple doses over several days, while Tinidazole offers the advantage of a single-dose regimen, providing convenient and effective treatment options.

These medications target the *Giardia lamblia* parasite, helping to clear the infection from the intestines and alleviate symptoms. The selection of the appropriate medication and regimen depends on various factors, including the patient's age, tolerance, and any potential contraindications.

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| **Metronidazole** | |
| Pharmacologic class | Nitroimidazole, antibacterial |
| Dosage form | Oral suspension: 125mg/5ml, 200mg per 5 mL  Capsule/Tablet: 250mg, 500mg |
| Indications | Invasive giardiasis |
| Dose and Administration | **Adults**: 250-500 mg orally three times daily for 5-7 days or 2g once daily for 3 days  **Children:** 15 mg/kg/day in divided doses for 5-7 days. |
| Contraindications | Refer to metronidazole (antibacterials). |
| Drug interactions | Refer to metronidazole (antibacterials). |
| Side effects | Refer to metronidazole (antibacterials). |
| Cautions | Refer to metronidazole (antibacterials). |
| Storage condition | Store below 30oC. |
| **Tinidazole** | |
| Pharmacologic class | Nitroimidazole, antimicrobial |
| Dosage form | Tablet: 500mg, 2g |
| Indications | Treatment of giardiasis caused by *Giardia lamblia* |
| Dose and Administration | **Oral:**  **Adults:** 2 g orally as a single dose (repeat once if necessary)  **Children:** 50 mg/kg (up to 2 g) as a single dose  **Note**: for child below 3 years safety data is not well established |
| Contraindications | Refer to tinidazole (medicine for amoebiasis). |
| Drug interactions | Refer to tinidazole (medicine for amoebiasis). |
| Side effects | Refer to tinidazole (medicine for amoebiasis). |
| Cautions | Refer to tinidazole (medicine for amoebiasis). |
| Storage condition | Store below 30oC. |

**Antileishmanials**

Leishmaniasis is a complex tropical/sub-tropical disease caused by more than 50 species of protozoa parasites of the genus Leishmania, 20 of which being pathogenic for humans. The parasites are transmitted between mammalian hosts by more than 90 female phlebotomine sandfly species. There are several different forms of the disease: Visceral leishmaniasis (VL), also known as kala-azar, is the most serious form of the disease and it is fatal if untreated, Post-kala-azar dermal leishmaniasis (PKDL), which usually appears six months to one year after apparent cure of VL, Cutaneous leishmaniasis (CL), the most common, causes skin lesions, mainly ulcers on exposed parts of the body, leaving lifelong scars, and Mucocutaneous leishmaniasis (MCL), which leads to partial or total destruction of mucous membranes of the nose, oral, and throat.

Currently, the drugs used for leishmaniasis include older drugs such as pentavalent antimony, pentamidine, amphotericin B, and newer drugs such as the imidazoles, miltefosine, paromomycin, and liposomal amphotericin B. Sodium Stibogluconate, an organic pentavalent antimony compound, is the primary treatment for visceral leishmaniasis. Miltefosine has been employed in antimony-resistant visceral leishmaniasis.

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| **Amphotericin B** | |
| Pharmacological Class | Polyene antifungal |
| Dosage Form | Powder for Injection (Liposomal Complex): 50 mg/vial |
| Indications | Treatment of visceral leishmaniasis. |
| Dose and Administration | IV Infusion:  **Adult:** 2-3mg/kg/day (for a total of 20-40mg/ kg)  **Immunocompromised patients**: 4 mg/kg/day |
| Contraindications | Refer to amphotericin (antifungals). |
| Drug Interactions | Refer to amphotericin (antifungals). |
| Side Effects | Refer to amphotericin (antifungals). |
| Cautions | Refer to amphotericin (antifungals). |
| Storage Condition | Store below 30oC. |
| **Miltefosine** | |
| Pharmacological Class | Phosphocholines antiprotozoal |
| Dosage Form | Solid oral dosage form: 10 mg, 50 mg |
| Indications | Treatment of visceral and cutaneous leishmaniasis |
| Dose and administration | **Oral:**  **Adult:** 50 mg 2-3 times daily for 28 days.  **Pediatric:** 2.5 mg/kg/day orally, divided into two doses (maximum dose 50 mg twice daily). |
| Contraindications | Hypersensitivity to miltefosine, pregnancy. |
| Drug interactions | Concomitant use with nephrotoxic drugs (e.g., aminoglycosides, amphotericin B), antiretroviral drugs, hepatotoxic medications. |
| Side effects | Nausea, vomiting, diarrhea, abdominal pain, headache, dizziness. elevated liver enzymes, renal impairment, thrombocytopenia, neutropenia, rash. |
| Cautions | Renal or hepatic impairment, breastfeeding.  **Note**: *effective contraception should be used during and for at least 5 months after treatment.* |
| Storage condition | Store below 30oC. |
| **Paromomycin** | |
| Pharmacological class | Aminoglycoside |
| Dosage form | Capsule: 250 mg,  Injection: 375 mg/ml (Sulfate) 2 ml/ampoule, 750 mg base (as sulfate) |
| Indications | Treatment of visceral leishmaniasis, amebiasis |
| Dose and administration | **Visceral leishmaniasis;** Oral:  **Adult and Pediatric:** 15 mg/kg/day orally in three divided doses  Injection (IM):  **Adult:** 15 mg/kg/day intramuscularly for 21 days.  **Child over 5 kg:** 11 mg/kg daily for 17 days (in combination with pentavalent antimonial)  **Amebiasis (eradication cyst); Oral:**  **Adult:** 25–35mg/kg/day, divided in 3 daily doses |
| Contraindications | Refer to paromomycin (Medicines for amoebiasis). |
| Drug interactions | Refer to paromomycin (Medicines for amoebiasis). |
| Side effects | Refer to paromomycin (Medicines for amoebiasis). |
| Cautions | Refer to paromomycin (Medicines for amoebiasis). |
| Storage condition | Store below 30oC. |
| **Sodium stibogluconate** | |
| Pharmacological class | Pentavalent antimonial, antiprotozoal |
| Dosage form | Injection: 100 mg/ml in 30 mL vial |
| Indications | Treatment of cutaneous, mucocutaneous, and visceral leishmaniasis. |
| Dose and administration | **IM/IV:**  **Adult and child**: 20 mg/kg/day (maximum 850 mg) |
| Contraindications | Hypersensitivity to sodium stibogluconate, pre-existing severe cardiac, liver, renal, pancreas or hematological morbidities |
| Drug interactions | Nephrotoxic drugs, hepatotoxic drugs, drugs prolonging QT interval (e.g., certain antiarrhythmics, macrolides), antiretroviral drugs, |
| Side effects | Anorexia, nausea, vomiting, abdominal pain, headache, fatigue, myalgia, arthralgia, cardiotoxicity (QT prolongation, arrhythmias), hepatotoxicity, nephrotoxicity, pancreatitis |
| Cautions | Renal impairment, hepatic impairment, altered cardiac conduction, pregnancy, breastfeeding |
| Storage condition | Store below 30oC |

**Trypanocides**

African trypanosomiasis, or sleeping sickness, is a protozoan infection transmitted by *Glossina* Spp. (tsetse flies). Two subspecies of *Trypanosoma brucei*, *T. brucei gambiense* and *T. brucei rhodesiense,* produce distinctive clinical forms of the diseases. The early stage of African Trypanosomiasis resulted from infection of the blood stream and lymph nodes. The late meningoencephalitis stage is associated with infection of the central nervous system.

The drugs used for treatment of trypanosomiasis are pentamidine, suramin and melarsoprol. Treatment of early- stage infections of *T. b. rhodesiense* with suramin sodium and *T. b. gambiense* with pentamidine isethionate can be curative if started before the central nervous system has become involved. In areas where pentamidine resistance occurs, suramin sodium may be used for *T. b. gambiense* infection. Melarsoprol is used for confirmed cases of *T. b. rhodesiense* and *T.b. gambiense* with meningo-encephalitic involvement.

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| **Fexinidazole** | |
| Pharmacological class | Nitroimidazole, antiprotozoal (Trypanocide) |
| Dosage form | Tablet: 600 mg |
| Indications | Indicated for the treatment of both first-stage (hemolymphatic) and second-stage (meningoencephalitis) Human African trypanosomiasis (HAT) due to *T. brucei gambiense* in patients 6 years of age and older and weighing at least 20 kg weighing at least 20 kg |
| Dose and administration | **For patients 6 years of age and older and weighing at least 20 kg;** 10 days regimen:  **20-35kg**Days 1-4: 1200 mg (2tablets) daily, THEN  Days 5-10: 600 mg (1 tablet) daily  **35kg**  Days 1-4: 1800 mg (3 tablets) daily, THEN  Days 5-10: 1200 mg (2 tablets) daily |
| Contraindications | Hypersensitivity to fexinidazole, and/or nitroimidazole drugs, patients with hepatic impairment |
| Drug interactions | Rifampin, phenytoin, St. John’s wort, carbamazepine, clarithromycin, itraconazole, voriconazole, erythromycin, fluconazole, albuterol, alfuzosin, amiodarone, atazanavir, atenolol, bisoprolol, bupropion, carbamazepine, ciprofloxacin, chloroquine, clofazimine, chloramphenicol. |
| Side effects | Headache, vomiting, insomnia, nausea, asthenia, tremor, decreased appetite, dizziness, hypocalcaemia, dyspepsia, back pain, upper abdominal pain, hyperkalemia, QT interval prolongation, neuropsychiatric adverse reactions, neutropenia, hepatotoxicity. |
| Cautions | Patients at risk of QT interval prolongation, uncorrected electrolyte abnormalities, history of blood dyscrasia, elderly patient, pediatrics, renal impairment. |
| Storage condition | Store below 30oC, away from heat, moisture, and direct light. |
| **Melarsoprol** | |
| Pharmacological class | Trivalent arsenical, antiprotozoal (trypanocide) |
| Dosage form | Injection: 180 mg/5mL in 5mL ampoule (3.6% solution) |
| Indications | Treatment of meningo-encephalitic stage of *T. b. gambiense* or *T. b. rhodesiense* infections. |
| Dose and administration | *T. brucei rhodesiense* and *T. brucei gambiense* with meningo-encephalitic involvement, slow IV injection:  **Adul and child**: 2.2 mg/kg per day (maximum: 5 mL) once daily for 10 days  *Note: Corticosteroid pretreatment should be considered as it can reduce the risk of encephalopathic reaction to melarsoprol.* |
| Contraindications | Hypersensitivity to the drug, pregnancy, glucose-6-phosphoate dehydrogenase deficiency (G6PD), ingestion of alcohol during treatment, influenza epidemics. |
| Drug interactions | Alcohol. |
| Side effects | Fatal reactive encephalopathy characterized by headache, tremor, slurred speech, convulsions and ultimately coma, myocardial damage, albuminuria, hypertension, hypersensitivity reactions, agranulocytosis, dose-related renal and hepatic impairment, hyperthermia, urticaria, headache, diarrhea and vomiting - in late stage of treatment. |
| Cautions | Malnutrition, leprosy  *Note: treat intercurrent infections such as pneumonia and malaria before melarsoprol administration.* |
| Storage condition | Store below 30oC. Protect from sunlight. |
| **Pentamidine** | |
| Pharmacological class | Aromatic diamidine, antiprotozoal (Trypanocide) |
| Dosage form | Powder for injection (Isethionate): 300mg in vial |
| Indications | Haemolymphatic first-stage of rhodesiense and gambiense HAT, meningoencephalitic stage of *T. brucei gambiense* |
| Dose and administration | **Adult**; IM:  **Haemolymphatic first-stage of rhodesiense and gambiense HAT**: 4 mg/kg daily for 7 days or on alternate days for a total of 7–10 doses  **Meningoencephalitic stage of *T. brucei gambiense*** (prior to melarsoprol): 4 mg/kg daily on days one and two  **Pediatric;** IM:  **Treatment of first-stage trypanosomiasis**, Infant or child: 4 mg/kg daily |
| Contraindications | Hypersensitivity to pentamidine, severe renal impairment, T. brucei rhodesiense infection. |
| Drug interactions | Amphotericin B, artemether, quinine, typhoid vaccine, bone marrow depressants, radiation therapy, foscarnet, nephrotoxic medications. |
| Side effects | Dizziness, hypoglycemia, hypotension, local reaction, nausea, rash, taste altered, QT interval prolongation, pancreatitis acute, nephrotoxicity, leucopoenia, anemia, thrombocytopenia, raised liver enzyme, hypotension, altered taste. |
| Cautions | Anemia, bradycardia, history of ventricular arrhythmias, hyperglycemia or hypoglycemia, hypokalemia, hypomagnesaemia, hypotension, leukopenia, risk of severe hypotension following administration, thrombocytopenia, renal impairment, hepatic impairment. |
| Storage condition | Store below 30oC. Protect from light. |
| **Suramin sodium** | |
| Pharmacological class | Sulfated naphthylamine, trypanocide |
| Dosage form | Powder for injection: 1gm in vial |
| Indications | Treatment of the early stages of African trypanosomiasis |
| Dose and administration | **Adult**:  **Initial phase of *T. brucei rhodesiense* infection**, by slow IV injection: 5 mg/kg on day 1, then 20 mg/kg on days 5, 11, 17, 23, and 30.5 mg/kg on day 31, OR 20 mg/kg every week for five weeks. Maximum dose per injection is 1 g.  **Pediatric**:  **Initial phase of *T. brucei rhodesiense* infection**, slow IV injection:  **Child of all ages**: 5 mg/kg on day 1 (as a test dose) followed by 20 mg/kg on day 3, 10, 17, 24, and 31  **First (test) dose**: Administer first dose with caution, wait at least 1 minute after injecting the first few microlitres, inject next 0.5 mL over 30 seconds and wait 1 minute, inject the remainder over several minutes |
| Contraindications | Hypersensitivity to suramin, severe liver or renal function impairment. |
| Drug interactions | There are no known significant interactions. |
| Side effects | Nausea, vomiting, nausea, anorexia and metallic taste, reaction such as urticaria and pruritis, rash, loss of consciousness (first dose), paresthesia, hyperesthesia of the palms and soles, skin eruptions, fever, photophobia, hematuria., fever, thrombocytopenia, peripheral neuropathy, transient hyperbilirubinemias, mild proteinuria, polyuria, polydipsia. |
| Cautions | Debilitated or malnourished patients, albuminuria, onchocerciasis, pregnancy, renal and hepatic impairment. |
| Storage condition | Store below 30oC. |

**Medicines used for toxoplasmosis and pneumocystosis**

Toxoplasmosis is caused by infection with the protozoan parasite *Toxoplasma gondii.* Toxoplasmosis in immunocompetent individuals is usually asymptomatic and self-limiting. Patients with impaired immunity may develop serious complications such as encephalitis, myocarditis, and pneumonitis. Congenital toxoplasmosis is not a problem in women who have toxoplasma antibody before conception but primary toxoplasmosis during early pregnancy is serious because of the risk of transplacental transmission, which may result in fetal death or congenital toxoplasmosis.

The treatment of choice for toxoplasmosis is a combination of pyrimethamine and sulfadiazine. In immunocompromised patient, trimethoprim and sulfamethoxazole used for treatment of toxoplasmosis instead of the more usual treatment with pyrimethamine plus sulfadiazine. Folinic acid should be given during treatment to counteract megaloblastic anemia secondary to pyrimethamine. Besides, drugs such as Clindamycin and atovaquone are employed against toxoplasmosis. Treatment is ideally continued for several weeks after clinical cure. Prolonged, even life long, maintenance therapy should be considered for AIDS patients since the tissue cyst forms of *T. gondii* may not be eliminated by the initial treatment.

Pneumocystis pneumonia is caused by *Pneumocystis jiroveci* formerly known as pneumocystis carnii pneumonia (PCP), a ubiquitous organism that is classified as a fungus but also shares biologic characteristics with protozoa. It commonly occurs when patients have significant immune suppression (CD4<200cells/mm3 or CD4 % <14%). The incidence of PCP has declined substantially with widespread use of prophylaxis and ART. A combination of trimethoprim and sulfamethoxazole is the treatment of choice. Alternatively, PCP is treated by a combination of clindamycin with primaquine or dapsone.

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| **Atovaquone** | |
| Pharmacological class | Antimalarial |
| Dosage forms | Tablet: 750 mg |
| Indications | Treatment for malaria and for toxoplasmosis in combination with sulfadiazine (alternative to pyrimethamine), treatment of mild to moderate *Pneumocystis* *Jiroveci* Pneumonia (also known as PCP). |
| Dose and administration | **Treatment of Toxoplasmosis in HIV-infected adolescents and adults*;*** Oral: 1.5 g twice daily, and Oral sulfadiazine 1 g (body weight <60 kg) or 1.5 g (body weight ≥60 kg)  **Treatment of mild to moderate PCP in adults*;*** Oral:  **Child> 13 years and adult** 750 mg twice daily for 21 days  **Prophylaxis of PCP in adults; oral:**  **Child> 13 years and adult: 1500mg/day or in 2 divided doses**  **Note: for children <13 years: not established** |
| Contraindications | Refer to atovaquone (antimalarials). |
| Drug interactions | Refer to atovaquone (antimalarials). |
| Side effects | Refer to atovaquone (antimalarials). |
| Cautions | Refer to atovaquone (antimalarials). |
| Storage condition | Store below 30oC |
| **Clindamycin** | |
| Pharmacological class | Lincosamide, antibacterial |
| Dosage forms | Capsule: 75mg, 150mg  Injection: 150mg/ml in ampoule  Oral Solution: 15mg/ml |
| Indications | Treatment for toxoplasmosis, pneumocystosis |
| Dose and administration | **Patients with AIDS and toxoplasmic encephalitis;** Oral:  **Adult:** 600mg every 6 hours for at least 3 weeks, maintenance, 1200mg daily  **Mild to moderate PCP, in combination with dapsone or primaquine;** Oral:  **Adult:** 600 mg every 6 hours |
| Contraindications | Refer to clindamycin (antibacterials). |
| Drug interactions | Refer to clindamycin (antibacterials). |
| Side effects | Refer to clindamycin (antibacterials). |
| Cautions | Refer to clindamycin (antibacterials). |
| Storage condition | Store below 30oC. |
| **Pentamidine** | |
| Pharmacological class | Antiprotozoal |
| Dosage form | Powder for injection: 200 mg, 300 mg |
| Indications | Treatment of early leishmaniasis, African Trypanosomiasis and pneumocystosis |
| Dose and administration | ***Pneumocystis* *jirovecii* Pneumonia (PCP) treatment; IV infusion:**  **Child>4 months and Adult:** 4 mg/kg once daily for at least 14 days  ***Pneumocystis* *jirovecii* Pneumonia (PCP) prophylaxis;**  **Child>4 months and Adult:** 4 mg/kg every 2-3 weeks  **Note**: child<4 months: safety and efficacy not established |
| Contraindications | Refer to pentamidine (trypanocides). |
| Drug interactions | Refer to pentamidine (trypanocides). |
| Side effects | Refer to pentamidine (trypanocides). |
| Cautions | Refer to pentamidine (trypanocides). |
| Storage condition | Store below 30°C. Protect from light. |
| **Pyrimethamine** | |
| Pharmacological class | Benzylpyrimidine anti-protozoal |
| Dosage form | Tablet: 25mg |
| Indications | Treatment of toxoplasmosis in combination with sulfadiazine and folinic acid, prevention of congenital transmission oftoxoplasmosis, primary prophylaxis of toxoplasmosis in combination with dapsone and folinic acid, secondary prophylaxis of toxoplasmosis and PCP in combination with sulfasalazine and folinic acid. |
| Dose and administration | **Prevention of congenital transmission of****toxoplasmosis;** Oral:  **Adult:** 25mg-50mg daily  **Toxoplasmosis in immunodeficiency;** Oral:  **Adult:** 200mg in divided doses on first day, then 50 – 75 daily for at least 6 weeks, followed by a suppressive dose of 25-50mg daily  **Child over 1 month:** 1 mg/kg (maximum 25 mg/dose) twice daily for 3 days, then 1 mg/kg (maximum 25 mg) once daily for at least 6 weeks  **Chorioretinitis;** Oral:  **Adult:** 75mg daily for 3 days then 25mg daily for 4 weeks; in unresponsive patients, 50 mg daily for a further 4 weeks.  **Congenital toxoplasmosis;** Oral:  **Neonate:** 1 mg/kg twice daily for 2 days, then 1 mg/ kg once daily for 6 months, then 1 mg/kg three times weekly for a further 6 months. Duration of treatment depends on whether the neonate has overt disease. If without overt disease but born to mother infected during pregnancy, treat for 4 weeks, followed by further courses if infection confirmed.  **Primary prophylaxis of toxoplasmosis**  **Child over 1 month:** 1 mg/kg once daily; maximum 25 mg daily  **Secondary prophylaxis of toxoplasmosis and PCP**  **Infant or child**: 1 mg/kg once daily; maximum 50 mg daily  **Note***:* child < 2 months old: Safety and efficacy not established |
| Contraindications | Hypersensitivity to the drug, megaloblastic anemia, pregnancy, history of seizures disorders, anemia, bone marrow depression. |
| Drug interactions | Bone marrow depressants and folate antagonists like Artemether + lumefantrine, methotrexate, phenytoin, proguanil, silver sulfadiazine, sulfadiazine, sulfamethoxazole + trimethoprim, trimethoprim, zidovudine. |
| Side effects | Megaloblastic anemia, diarrhea, dizziness, headache, leucopenia, nausea, skin reactions, thrombocytopenia, vomiting, fever, abdominal pain, oral ulceration, pancytopenia, pneumonia eosinophilic, seizure, GI disturbance |
| Cautions | Folate deficiency, history of seizures, renal impairment, hepatic impairment, pregnancy, breastfeeding.  **Note:** *supplement folate throughout treatment to prevent hematological toxicity.* |
| Storage condition | Store below 30oC, in a tight, light-resistant container. |
| **Sulfadiazine + folinic Acid** | |
| Pharmacological class | Combination of sulfonamide and folate agonist |
| Dosage form | Tablet: 500mg +15mg |
| Indications | Toxoplasmosis in combination with pyrimethamine |
| Dose and administration | **Treatment of Toxoplasmosis in HIV-infected adolescents and adults:**  Oral sulfadiazine 1 g (body weight <60 kg) or 1.5 g (body weight ≥60 kg) and oral leucovorin (10–25 mg once daily) in combination with pyrimethamine or atovaquone  Treatment duration at least 6 weeks; longer duration may be appropriate if clinical response incomplete at 6 weeks).  **Treatment of congenital toxoplasmosis**  **Neonate:** 50 mg/kg twice daily for 12 months in conjunction with oral pyrimethamine (1 mg/kg once daily for 2 days, then 1 mg/kg once daily for 2–6 months, then 1 mg/kg 3 times weekly) and oral or IM leucovorin (10 mg with each pyrimethamine dose) (recommended duration in HIV-infected infants is 12 months).  **Treatment of Toxoplasmosis in HIV-infected Infants and Children**  Oral: 25–50 mg/kg (up to 1–1.5 g) 4 times daily in conjunction with oral pyrimethamine (1 mg/kg [up to 50 mg] twice daily for 3 days, then 1 mg/kg [up to 25 mg] once daily) and oral folinic acid (10–25 mg once daily).  Treatment duration at least 6 weeks; longer duration may be appropriate if disease is extensive or response incomplete at 6 weeks). |
| Contraindications | Hypersensitivity to the drug or any sulfa drug, porphyria, infants <2 months except as adjunctive therapy with pyrimethamine treating congenital toxoplasmosis. |
| Drug interactions | Ciclosporin, methotrexate, phenytoin, pyrimethamine, sulfadoxine + pyrimethamine, thiopental, warfarin |
| Side effects | Nausea. vomiting, rash, abdominal pain. rare: hepatitis, pancreatitis, SJS, crystalluria, blood dyscrasias, agranulocytosis, aplastic anemia, appetite decreased, ataxia, back pain, blood disorders, cough, crystalluria, cyanosis, depression, diarrhea, dizziness, drowsiness, dyspnea, fatigue, fever, hematuria, hallucination, headache, hepatic disorders, hypoglycemia, hypoprothrombinemia, hypothyroidism |
| Cautions | Renal impairment, hepatic impairment, G6PD deficiency, urinary obstruction, blood dyscrasia, asthma, maintain adequate fluid intake, predisposition to folate deficiency, impaired renal or hepatic function and to those with severe allergy or bronchial asthma. |
| Storage condition | Store below 30oC. |
| **Sulfamethoxazole + Trimethoprim** | |
| Pharmacological class | Sulfonamide, antibacterial (antiprotozoal) |
| Dosage form | Suspension: 240mg/5ml  Dispersible tablet:100mg + 20mg  Tablet: 400mg + 80mg; 800mg +160mg  Injection: 80mg + 16mg/ml (5ml, 10ml, 30ml) |
| Indications | Prophylaxis and treatment of *Pneumocystis* *jiroveci* pneumonia, toxoplasmosis in immunocompromised patients |
| Dose and administration | **Treatment of toxoplasmosis**  **Adult***:* 80/400, oral, 4 tablets 12 hourly for 28 days, followed by 2 tablets 12 hourly for 3 months in adults  **Infant** or **child over 1 month**: 10mg of trimethoprim + 50mg of sulfamethoxazole per kg per dose every 12 hours for 28 days followed by maintenance therapy at 50% reduced dosage for three months.  **Pneumocystis jiroveci pneumonia treatment**  **Adult and Child:** sulfamethoxazole up to 100mg/kg daily with trimethoprim up to 20mg/kg daily in 2-4 divided doses for 14-21 days.  **Prophylaxis of toxoplasmosis** **and PCP**  **Adult:** Sulfamethoxazole800 mg + trimethoprim 160 mg, or sulfamethoxazole400 mg + trimethoprim 80 mg if higherdose not tolerated  **Child (oral: 2.5–5 mg/kg) \*:**  Infant or child under 6 months: 20 mg once daily,  Child 6 months–5 years: 40 mg once daily  Child 6–12 years: 80 mg once daily  *Note: \*Doses are expressed in terms of trimethoprim component*   * *Child < 2 months: safety is not established* |
| Contraindications | Refer to Sulfamethoxazole + Trimethoprim (antibacterials). |
| Drug interactions | Refer to Sulfamethoxazole + Trimethoprim (antibacterials). |
| Side effects | Refer to Sulfamethoxazole + Trimethoprim (antibacterials). |
| Cautions | Refer to Sulfamethoxazole + Trimethoprim (antibacterials). |
| Storage condition | Store below 30oC. |

## Anthelmintics

Helminths (worms) are multicellular parasites that infect a significant portion of the human population, causing a diverse array of diseases. Over a billion individuals are afflicted with intestinal nematodes, while millions more are infected with filarial nematodes, flukes, and tapeworms. A variety of medications targeting different biological targets are available to combat these parasitic infections. While the goal in many cases, particularly in developing nations, is to control infection, reducing the parasite load often mitigates disease symptoms and minimizes further transmission. In other circumstances, the ultimate objective of treatment is complete eradication of the parasitic organisms.

**Filaricides**

Filarial nematode infections (filariasis) are endemic in large areas of the tropics and cause considerable morbidity. These are loiasis (arises from infections with loa loa), lymphatic filariasis (by *Wuchereria bancorofti*, *Brugia malayi*, or *B. timori*), onchocerciasis (river blindness, is caused by infection with the filarial nematode *Onchocerca volculus*), and Mansonellosis (by *Mansonella perstans*) infections. *W. bancrofti* is the most common cause of lymphatic filariasis in the Tropics including Ethiopia. Administering anti-filarial medications to entire populations, particularly in endemic areas, helps eliminate microfilariae and interrupt the transmission cycle. Diethylcarbamazine is effective against microfilariae and adults of loa loa, *W. bancrofti*, and *B. malayi*. Ivermectin is very effective in onchocerciasis, and it is now the drug of choice.

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| **Albendazole** | |
| Pharmacological class | Benzimidazole, anthelminthic |
| Dosage form | Tablet (chewable): 200mg, 400mg  Oral suspension: 100mg/5ml |
| Indications | Lymphatic filariasis, chronic strongyloidiasis infection, hydatid disease, hookworm infections, capillariasis. |
| Dose and administration | **Chronic Strongyloidiasis infection,** Oral:  **Adult**: 400 mg twice daily for 3 days, dose may be repeated after 3 weeks if necessary.  **Child > 2 years**: 400 mg once or twice daily for 3–7 days; dose may be repeated after 3 weeks if necessary.  **Hydatid disease (cystic echinococcosis, dog tapeworm),** oral:  **Adult < 60 kg**: 15 mg/kg daily in 2 divided doses (maximum daily dose, 800 mg) for 28 days followed by 14 tablet-free days, up to 3 courses may be given.  **Adult ≥ 60 kg**: 800 mg daily in 2 divided doses for 28 days followed by 14 tablet-free days \* 3 cycles  **Child 2–17 years:** 7.5 mg/kg twice daily (max. per dose 400 mg twice daily) for 28 days followed by 14-day break, repeated for up to 2–3 cycles.  **Capillariasis**, Oral:  **Adult**: 400 mg daily for 10 days  **Child** **> 2 years**: 400 mg daily for 10 days.  **Lymphatic filariasis:**  **Adult**: 400 mg alone twice per year for areas co-endemic with loiasis. |
| Contraindications | Hypersensitivity to albendazole or other benzimidazoles. |
| Drug interactions | Dexamethasone, praziquantel, fosphenytoin, phenytoin, cimetidine, praziquantel, ropeginterferon, carbamazepine, ritonavir, phenobarbital, and grapefruit |
| Side effects | GI disturbances, headache, dizziness, increases in liver enzymes, reversible alopecia, rash, fever, bone marrow suppression (leukopenia and rarely, pancytopenia), allergic shock if cyst leakage, convulsions and meningism in cerebral disease, blurred vision, rhabdomyolysis, acute renal failure, erythema multiforme, Steven-Johnson syndrome. |
| Cautions | Breastfeeding, pregnancy, in patients with neurocysticercosis, retinal lesions, liver disease. |
| Storage condition | Store below 30oC. |
| **Diethylcarbamazine citrate** | |
| Pharmacological class | Piperazine derivative anthelmintic |
| Dosage form | Tablet ( dihydrogen citrate): 50mg, 100mg |
| Indications | Treatment of lymphatic filariasis due to *W. bancrofti* (bancroftian filariasis), *B. malayi*, or *B. timori*, Loa loa infections. |
| Dose and administration | **Lymphatic filariasis (bancroftian)**, Oral:  **Adult and Child ≥10 years**: 6mg/kg daily, preferably in divided doses after meals, for 21 days.  **Child < 10 years**: half the adult dose  **Mass treatment program:**  **Adult and child ≥10 years**: 6mg/kg in divided doses over 24 hours, once a year  **Child < 10 years**: half the adult dose  **Lymphatic filariasis (brugian)**, Oral:  **Adult and Child ≥10 years**: 3- 6mg/kg, preferably in divided doses after meals, for 6-12 days  **Child < 10 years**: half the adult dose.  **Mass treatment program:** Adult and Child ≥10 years**:** 3-6mg/kg in divided doses over 24 hours, 6 times at weekly or monthly intervals; child < 10 years: half the adult dose.  **Occult filariasis**, Oral:  Adult: 8mg/kg daily for 14 days, repeated as necessary if symptoms return.  **Loiasis treatment**, Oral:  Adult: 1mg/kg as a single dose on the first day, doubled on two successive days, then adjusted to 2-3mg/kg 3 times daily for a further 18 days.  **Loiasis prophylaxis,** Oral:  Adult: 300mg weekly for as long as exposure occurs.  *Note:* *Diethylcarbamazine should be taken immediately after meals.* |
| Contraindications | Hypersensitivity to the drug, pregnancy, breastfeeding, infants, elderly, debilitated patients, impaired renal function, cardiac disease. |
| Drug interactions | There are no known significant interactions. |
| Side effects | Itching and sweating of face (especially eyes), fever, lymphadenopathy, skin rash and visual disturbances, nausea, vomiting, headache dizziness, drowsiness. |
| Cautions | risk of hypersensitivity reactions (especially in patients with onchocerciasis or loiasis), risk of loss of vision, night blindness, or tunnel vision. |
| Storage condition | Store below 30oC. |
| **Ivermectin** | |
| Pharmacological class | Macrocyclic lactone (avermectin), anthelmintic |
| Dosage form | Tablet: 3mg, 6mg |
| Indications | Suppressive treatment of onchocerciasis; as a secondary agent in the treatment of bancroftian filariasis caused by *W. bancrofti.* |
| Dose and administration | **Bancroftian filariasis**, Oral:  **Adult:** 200mcg (0.2mg) per kg of body weight as a single dose.  **Suppression of microfilariae**, Oral:  **Adult and child > 5 years (and weighing over 15kg):** 150-200mcg/kg as a single dose once a year.  *Note: avoid food or alcohol for at least 2 hours before and after a dose* |
| Contraindications | Hypersensitivity to ivermectin, pregnancy. |
| Drug interactions | P-glycoprotein inhibitors and inducers, oral anticoagulants |
| Side effects | Mazzoti reaction, arthralgia, myalgia, dizziness, fever, headache, abdominal pain, lymphadenopathy, skin rash or itching (due to death of microflaria in skin), transient eosinophilia, liver dysfunction (hepatitis), liver enzymes abnormality, hyperbilirubinemia, hematuria, Stevens-Johnson syndrome. |
| Cautions | Breastfeeding, children below 15kg |
| Storage condition | Store below 30oC. |

**Medicines used for schistosomiasis and fasciolosis**

Schistosomiasis is a major neglected tropical disease. It is caused by various *Schistosoma* species. *Schistosoma haematobium* causes urogenital schistosomiasis while intestinal schistosomiasis is caused by *S. guineensis, S. intercalatum, S. mansoni, S. japonicum*, or *S. mekongi*. Currently, the main forms of treatment used for schistosomiasis are praziquantel (PZQ) and oxamniquine (OXA). PZQ is the drug of choice because it presents as a high-spectrum anthelmintic, used in the treatment of all known species of schistosomiasis and some species of cestodes and trematodes. OXA, however, is not active against the three *Schistosome* species. The timing of treatment is important since praziquantel is most effective against the adult worm and requires the presence of a mature antibody response to the parasite.

Fascioliasis is an emerging neglected zoonotic infection affecting the health and wellbeing of human populations. Two accepted species, *Fasciola hepatica* and *F. gigantica*, infect a wide range of mammals including livestock and humans. The infection can be asymptomatic or present in acute or chronic forms. Regardless of the presentation, fascioliasis can be associated with long-term complications such as anemia and malnutrition. Triclabendazole is the only drug recommended for the treatment of acute and chronic human fascioliasis. This is a benzimidazole drug that interferes with the parasite’s β-tubulin polymerization balance like other drugs in the same class. The WHO recommends treatment with one or two doses at 10 mg/kg per dose separated for 12 to 24 hours.

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| **Praziquantel** | |
| Pharmacological class | Quinoline derivative, anthelminthic |
| Dosage form | Tablet: 150 mg, 500 mg 600mg (scored) |
| Indications | Treatment of schistosomiasis, intestinal tapeworm infections caused by *Taenia saginata, T. solium,* *Diphyllobothrium latum* and *Hymenolepis nana*, cysticercosiscaused by *T. solium.* |
| Dose and administration | **Adult:**  **Schistosomiasis:**  20 mg/kg 4–6 hourly for 3 doses or 40–60 mg/kg as a single dose.  ***T. saginata and T. solium* infections**: 600 mg or 5–10 mg/ kg as a single dose  ***H. nana infection*:** 15-25mg/kg or 1800mg single dose, followed by repeat dose 10 days later.  ***D. latum infection***:5–25 mg/kg as a single dose.  **Neurocysticercosis**: Praziquantel,40 mg/kg single dose, after few days of steroid therapy  **Dermal cysticercosis**: 60 mg/kg daily in 3 divided doses for 6 days.  **Pediatrics (Child over 4 years):**  **Schistosomiasis:** 20 mg/kg 4–6 hourly for 3 doses or 40–60 mg/kg as a single dose.  ***T. saginata* and *T. solium*****infections**: 5–10 mg/kg as a single dose.  ***H. nana* infection:** 15–25 mg/kg as a single dose.  ***D. latum* infection:** 5–10 mg/kg as a single dose.  **Neurocysticercosis**: 50 mg/kg daily in 3 divided doses for 15 days with prednisolone (or similar corticosteroid) given 2–3 days before and throughout treatment period.  **Dermal cysticercosis, oral:** 60 mg/kg daily in 3 divided doses for 6 days. |
| Contraindications | Hypersensitivity to praziquantel, ocular cysticercosis, concomitant administration of strong CYP inducers (e.g., rifampicin). |
| Drug interactions | Carbamazepine, dexamethasone, phenobarbital, phenytoin, chloroquine, efavirenz, nevirapine, cimetidine, erythromycin, itraconazole, ketoconazole, rifampin. |
| Side effects | Abdominal discomfort, nausea, vomiting, diarrhea, malaise, headache, dizziness, drowsiness, rarely hypersensitivity reactions including fever, urticaria, pruritus, and eosinophilia, headache, hyperthermia, seizures, intracranial hypertension. |
| Cautions | Neurocysticercosis (requires corticosteroid cover with monitoring in a hospital setting), patient with cardiac abnormalities, history of epilepsy and/or other signs of potential CNS involvement (e.g., SC nodules suggestive of cysticercosis), moderate to severe hepatic impairment, pregnancy and breast-feeding. The drug causes drowsiness that patients are to be advised not to drive vehicles or operate machineries. |
| Storage condition | Store below 30oC. |
| **Triclabendazole** | |
| Pharmacological class | Benzimidazole, anthelmintic |
| Dosage form | Tablets: 250 mg |
| Indications | To treat fascioliasis |
| Dose and administration | **Adults and children 6 years of age and older:**  **Oral**: one or two doses at 10 mg/kg, given 12 to 24 hours apart. |
| Contraindications | Patients with known hypersensitivity to triclabendazole and/or to other benzimidazole derivatives |
| Drug interactions | There are no known significant interactions. |
| Side effects | Abdominal pain, hyperhidrosis, nausea, decreased appetite, headache, urticaria, diarrhea, vomiting, musculoskeletal chest pain, and pruritus, constipation, biliary colic, arthralgia, back pain, spinal pain, and chromaturia. |
| Cautions | QT prolongation, pregnancy, hepatic impairment, breastfeeding, pediatric below 6 years, electrolyte imbalance. |
| Storage condition | Store below 300C. |

**Intestinal anthelminthics**

Anthelmintics or anthelminthics are a group of antiparasitic drugs that expel parasitic worms (helminths) and other internal parasites from the body by either stunning or killing them and without causing significant damage to the host. They may also be called vermifuges (those that stun) or vermicides (those that kill). They include several classes, i.e., benzimidazoles and avermectins, and are classified according to their chemical structure and mode of action.

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| **Albendazole** | |
| Pharmacological class | Benzimidazole anthelminthic |
| Dosage form | Tablet: 200mg, 400mg  Oral suspension: 100mg/5ml |
| Indications | Treatment of single or mixed infestations of intestinal parasites and strongyloides infection |
| Dose and administration | **Oral:**  **Thread worm infections, whip worm infections, round worm infections**:  **Child 12-24 months:** 200mg as a single dose  **Adult & Child above 2 years:** 400mg once daily for 3 consecutive days  **Hook worm infections, ascariasis**:  **Adult:** 400 mg for 1dose  **Treatment of neurocysticercosis**:  **Adult:** 15mg/kg per day for 8- 28 days  **Chronic strongyloidiasis infection**:  **Adult**: 400 mg twice daily for 3 days, dose may be repeated after 3 weeks if necessary |
| Contraindications | Refer to albendazole (Filaricides). |
| Drug interactions | Refer to albendazole (Filaricides). |
| Side effects | Refer to albendazole (Filaricides). |
| Cautions | Refer to albendazole (Filaricides). |
| Storage condition | Store below 300C. |
| **Mebendazole** | |
| Pharmacological class | Benzimidazole, anthelminthic |
| Dosage form | Tablet: 200mg, 400mg  Oral suspension: 100mg/5ml |
| Indications | Thread worm infections, whip worm infections, hookworm infections, round worm infections. |
| Dose and administration | **Thread worm infections; oral:**  **Adult and child over 2 years**: 100mg for 1dose, if reinfection occurs, second dose may be needed after 2weeks  **Whip worm infections, hookworm infections, oral**:  **Adult and child over 2 years**:100mg twice daily for 3days  **Round worm infections, oral**:  **Child 2 year:** 100mg twice daily for 3days  **Adult and child 2 years and over**: 100mg twice daily for 3days, alternatively 500mg for1dose  **Ascariasis; oral:**  **Adult:** 100mg twice daily for 3 days or 500mg,  **Trichuriasis; oral:**  **Adult:** 500mg single dose  **Note:** *<2 years: Safety and efficacy not established* |
| Contraindications | Hypersensitivity to the drug, pregnancy. |
| Drug interactions | Carbamazepine, phenobarbital, phenytoin, cimetidine, metronidazole. |
| Side effects | Transient abdominal pain or upset, nausea, vomiting, diarrhea, dizziness, headache, skin rash and itching, neutropenia and agranulocytosis reported with high doses. |
| Cautions | Breastfeeding, blood counts and liver function tests recommended with high dose regimens, children < 2 years. |
| Storage condition | Store below 300C. |
| **Ivermectin** | |
| Pharmacological class | Macrocyclic lactone (avermectin) anthelmintic |
| Dosage form | Tablet: 3mg, 6mg |
| Indications | Strongyloidiasis of the intestinal tract, onchocerciasis. |
| Dose and administration | **Onchocerciasis**, Oral:  **Adult:** 150 micrograms/kg as single dose, repeat treatment every 3–12 months until symptoms resolved.  **Child >15 kg:** 150 micrograms /kg as single dose, repeat treatment every 3–12 months until symptoms resolved.  **Strongyloidiasis (uncomplicated)**, Oral:  **Adult (Immunocompetent):** 200 mcg/kg daily for 1–2 days  **Adult** (Immunocompromised): 200mcg/kg daily for 1-2 days  **Child >15 kg and adolescent:** 200mcg/kg daily for 2 days; immunocompromised patients or patients with disseminated infection may need to repeat therapy  **Strongyloidiasis (severe, disseminated infection)**, Oral:  **Adult:** 200 mcg/kg daily till symptoms are resolved or stool/sputum results are negative for >=2weeks  ***Note****: avoid food or alcohol for at least 2 hours before and after a dose* |
| Contraindications | Refer to ivermectin (filaricides). |
| Drug interactions | Refer to ivermectin (filaricides). |
| Side effects | Refer to ivermectin (filaricides). |
| Cautions | Refer to ivermectin (filaricides). |
| Storage condition | Store below 30oC. |

# Medicines Used for Pain and Palliative Care

Palliative care focuses on improving the quality of life for patients and their families facing serious illness by preventing and relieving suffering. It addresses pain and other physical, emotional, psychosocial, and spiritual problems. Effective pain management in palliative care involves selecting the right medication, dose, route, and timing. Analgesics are a group of drugs that can be divided into three main categories: non-opioids (e.g., paracetamol, NSAIDs), opioids (e.g., codeine for moderate pain, morphine for severe pain), and adjuvants (e.g., antidepressants, anticonvulsants). Non-opioids are typically sufficient for mild pain, while opioids may be added when pain is moderate or severe. If standard opioids like morphine are ineffective, palliative care specialists may consider alternatives such as fentanyl or methadone. Pain like neuropathic pain, often challenging to treat, may respond to tricyclic antidepressants like amitriptyline or anticonvulsants like carbamazepine. Opioids may help when other treatments fail, though they are less effective for this type of pain. Corticosteroids are sometimes used, especially for pain related to nerve compression. Early and regular administration of analgesics is crucial for effective pain relief.

## Non-opioid and Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

Paracetamol, aspirin, and other NSAIDs are the first choice for treating mild or moderate pain and are used in moderate or severe pain to potentiate the effects of opioids. They are suitable for use in acute or chronic pain. NSAIDs should be usedwith caution in patients with renal disease, peptic ulcer disease, and cardiovascular conditions.

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| **Acetylsalicylic acid (Aspirin)** | |
| Pharmacological class | Non-steroidal anti-inflammatory drug (NSAID) |
| Dosage form | Tablet: 300mg  Suppository: 60mg, 120mg |
| **Indications** | Mild to moderate pain, fever, inflammatory arthritis, and other musculoskeletal disorders including juvenile arthritis, pyrexia, acute migraine attack, kawasaki disease |
| Dose and Administration | **Mild to moderate pain, pyrexia**, **oral**:  **Adult:** 300–900 mg every 4–6 hours as required; maximum 4 g per day.  **Mild to moderate pain, pyrexia**, rectal:  **Adult**: 450–900 mg every 4 hours; maximum 3.6 g per day.  **Inflammatory arthritis, oral:**  **Adult:** 4 to 8 g daily in divided doses in acute conditions, up to 5.4 g daily may be sufficient in chronic conditions.  **Acute migraine, oral:**  **Adult:** 900 mg for 1 dose, to be taken as soon asmigraine symptoms develop  PJ**uvenile arthritis, rheumatic fever**, **oral**:  **Infant or child**: Up to 130 mg/kg daily in 5–6 divided doses in acute conditions; 80–100 mg/kg daily in divided doses for maintenance  **Kawasaki disease, oral:**  **Neonate**: Initially 8 mg/kg four times daily until afebrile, followed by 5 mg/kg once daily for 6–8 weeks; if no evidence of coronary lesions after 8 weeks, discontinue treatment or seek expert advice.  **Infant or child**: Initially 7.5–12.5 mg/kg four times daily until afebrile, followed by 2–5 mg/kg once daily for 6–8 weeks; if no evidence of coronary lesions after 8 weeks, discontinue treatment or seekexpert advice. |
| Contraindications | Hypersensitivity tothe drug, active/previous peptic ulceration, bleeding disorders, children under 16 years (risk of Reye’s syndrome), haemophilia, severe cardiac failure (analgesic dose). |
| Drug interactions | Acetazolamide and other antidiabetics, heparin, warfarin, antacids, bismuth subsalicylate, bisphosphonates, corticosteroids, daptomycin, methotrexate, NRTIs (zidovudine), thiazide diuretics, enalapril, fluoxetine, metoclopramide, phenytoin, spironolactone, valproic acid, ibuprofen, methotrexate, calcium channel blockers, mifepristol. |
| Side effects | Dyspepsia, haemorrhage, asthmatic attack, bronchospasm, fluid retention |
| Cautions | Allergic disease, anaemia, asthma, dehydration, elderly, G6PD deficiency, hypertension, thyrotoxicosis, renal and hepatic impairment, pregnancy, breastfeeding. |
| Storage condition | Store below 300C in a tight container. |
| **Diclofenac potassium** | |
| Pharmacological class | Non-steroidal anti-inflammatory drug (NSAID) |
| Dosage form | Injection : 25mg/ml in 3ml ampoule  Suppository: 12.5 mg, 25 mg, 50 mg, 100 mg  Tablet: 50mg, 75mg  Gel: 1% w/w |
| **Indications** | Pain and inflammation in rheumatic disease and othermusculoskeletal disorders, acute gout, postoperative pain, migraine, fever in ear, nose, or throat infection, seasonal allergic conjunctivitis |
| Dose and administration | **Pain and inflammation in rheumatic disease and othermusculoskeletal disorders, oral:**  **Adult:** 75–150 mg daily in 2–3 divided doses  **Acute gout, oral:**  **Adult:**75–150 mg daily in 2–3 divided doses  **Postoperative pain**, **oral**:  **Adult:** 75–150 mg daily in 2–3 divided doses  **Migraine**, **oral**:  **Adult**: 50 mg, to be given at onset of migraine, then  50 mg after 2 hours if required, then 50 mg after4–6 hours; maximum 200 mg per day  **Pain and inflammation in rheumatic disease and othermusculoskeletal disorders, oral:**  **Child 14–17 years**: 75–100 mg daily in 2–3 divided doses  **Postoperative pain, oral:**  **Child 9–13 years (body-weight 35 kg and above):** Up to 2 mg/kg daily in 3 divided doses; maximum 100 mg per day  **Fever in ear, nose, or throat infection, oral:**  **Child 9–17 years (body-weight 35 kg and above):** Up to 2 mg/kg daily in 3 divided doses; maximum 100 mg per day. |
| Contraindications | Hypersensitivity to the drug or aspirin/other NSAIDs, peptic or intestinal ulcer, history of asthma, urticaria or acute rhinitis precipitated by aspirin or other NSAIDs, recent rectal bleeding. |
| Drug interactions | Coumarin derivative anticoagulants, or heparin or thrombolytic agents, antihypertensives, diuretics, aspirin and other anti-inflammatory drugs, radiation therapy, colchicine, lithium, methotrexate, probenecid, digoxin, ciclosporin, quinolones, calcium channel blockers |
| Side effects | Decreasedappetite, diarrhea, dizziness, gastrointestinal disorders, headache, nausea, skin reactions, vertigo, vomiting, acute kidney injury, agranulocytosis, angioedema, anxiety, anaemia, asthma, confusion, constipation, depression, drowsiness, dyspnea, erectile dysfunction, fatigue, haemorrhage, hearing impairment, hepatic disorders |
| Cautions | Allergic disorders, cardiac impairment, coagulation defects, connective-tissue disorders, dehydration, elderly, history of history of gastro-intestinal disorders, hypertension, oedema, pregnancy (third trimester), breastfeeding. |
| Storage condition | Store below 30 oC in a tight container. Protect from moisture. |
| **Ibuprofen** | |
| Pharmacological class | Non-steroidal anti-inflammatory drug (NSAID) |
| Dosage form | Suspension:100mg/5ml  Capsule/Tablet: 400mg |
| Indications | Mild to moderate pain including dysmenorrhoea, postoperative analgesia, and dental pain, pain and inflammation in rheumatic disease and other musculoskeletal disorders. |
| Dose and administration | **Mild to moderate pain, pyrexia, inflammatory musculoskeletal disorders,oral:**  **Adult:** Initially 400 mg 3–4 times a day; increased, if necessary, up to 600 mg 4 times a day; maintenance 200–400 mg 3 times a day, may be adequate.  **Acute migraine**, **oral**:  **Adult**: 400–600 mg for 1 dose, to be taken as soon as migraine symptoms develop.  **Mild to moderate pain, pain and inflammation of soft tissue injuries, pyrexia with discomfort, oral:**  **Child 3–5 months:** 50 mg 3 times a day, maximum daily dose to be given in 3–4 divided doses; maximum30 mg/kg per day  **Child 6–11 month**s: 50 mg 3–4 times a day, maximumdaily dose to be given in 3–4 divided doses; maximum30 mg/kg per day  **Child 1–3 years**: 100 mg 3 times a day, maximum dailydose to be given in 3–4 divided doses; maximum 30 mg/kg per day  **Child 4–6 years**: 150 mg 3 times a day, maximum dailydose to be given in 3–4 divided doses; maximum30 mg/kg per day  **Child 7–9 years**: 200 mg 3 times a day, maximum daily dose to be given in 3–4 divided doses; maximum 30 mg/kg per day; maximum 2.4 g per day  **Child 10–11 years**: 300 mg 3 times a day, maximum dailydose to be given in 3–4 divided doses; maximum 30 mg/kg per day; maximum 2.4 g per day  **Pain and inflammation in rheumatic disease including juvenile idiopathic arthritis,oral:**  **Child 3 months–12 years**: 30–40 mg/kg daily in3–4 divided doses; maximum 2.4 g per day  **Post-immunization pyrexia in infants (on health professional’s advice only)**, **oral**:  **Child 2–3 months**: 50 mg for 1 dose, followed by 50 mg after 6 hours if required.  *Note: The dose for pain can be increased to 40mg/kg/day (max. 2.4g/day).* |
| Contraindications | Hypersensitivity to the drug or acetylsalicylic acid or any other NSAID, active gastrointestinal bleeding/ulceration, history of gastrointestinal bleeding/perforation related to previous NSAID therapy, severe heart failure, varicella infection, severe renal failure, hepatic failure, congenital patent ductus arteriosus. |
| Drug interactions | Acetylsalicylic acid, ciclosporin, dexamethasone, digoxin, enalapril, fuoxetine, furosemide, heparin, hydrocortisone, levofoxacin, lithium, epinephrine, methotrexate, ofoxacin, penicillamine, phenytoin, prednisolone, chlorpromazine, propranolol, ritonavir, spironolactone, lidocaine, warfarin, zidovudine, nifedipine, procainamide, pyridostigmine, quinidine, verapamil. |
| Side effects | GI disturbances including nausea, diarrhea, dyspepsia, ulceration, and hemorrhage, hypersensitivity reactions including rash, angioedema and bronchospasm, fluid retention, impairment of renal function |
| Cautions | Allergic disorders, cardiac impairment, cerebrovascular disease, coagulation defects, connective-tissue disorders, dehydration, elderly, history of gastro-intestinal disorders, contact with eyes and mucous membranes, contact with inflamed or broken skin. |
| Storage condition | Store below 30 °C. Protect from moisture. |
| **Paracetamol (Acetaminophen)** | |
| Pharmacological class | Non-opioid analgesic |
| Dosage form | Drops: 100mg/ml  Injection: 1gm in 100ml  Syrup: 125mg/5ml, 250mg/5ml  Suppository: 125 mg, 250 mg  Tablet:100 mg, 500mg |
| **Indications** | Mild to moderate pain, including dysmenorrhea and headache, pain relief in osteoarthritis and soft tissue lesions, pyrexia, including post-immunization pyrexia, acute migraine attack. |
| Dose and administration | **Mild to moderate pain, pyrexia, oral:**  **Adult:** 0.5–1 g every 4–6 hours, maximum 4 g daily  **By IV infusion:**  **Body weight up to 50 kg:** 15 mg/kg every 4–6 hours;dose to be administered over 15 minutes; maximum 60 mg/kg per day  **Body weight 50 kg and above**: 1 g every4–6 hours, dose to be administered over 15 minutes;maximum 4 g per day  **By rectum**:  **Adult:** 0.5–1 g every 4–6 hours; maximum 4 g per day  **Mild to moderate pain or pyrexia in patients with riskfactors for hepatotoxicity, by IV infusion:**  **Body weight up to 50 kg:** 15 mg/kg every 4–6 hours, dose to be administered over 15 minutes, maximum 60 mg/kg per day  **Body weight 50 kg and above**: 1 g every 4–6 hours; dose to be administered over 15 minutes; maximum 3 g per day  **Acute migraine**, **oral**:  **Adult:** 1 g for 1 dose, to be taken as soon as migraine symptoms develop  **Mild to moderate pain**, **fever**, **oral:**  **Child 3–5 month**s: 60 mg every 4–6 hours, maximum 4 doses per day  **Child 6–23 months:** 120 mg every 4–6 hours, maximum4 doses per day  **Child 2–3 years**: 180 mg every 4–6 hours, maximum4 doses per day  **Child 4–5 years**: 240 mg every 4–6 hours, maximum 4 doses per day  **Child 6–7 years**: 240–250 mg every 4–6 hours, maximum 4 doses per day  **Child 8–9 year**s: 360–375 mg every 4–6 hours, maximum 4 doses per day  **Child 10–11 year**s: 480–500 mg every 4–6 hours, maximum 4 doses per day  **Child 12–15 years**: 480–750 mg every 4–6 hours, maximum 4 doses per day  **Child 16–17 years:** 0.5–1 g every 4–6 hours, maximum 4 doses per day  **Mild to moderate pain, fever, by rectum**:  **Child 3–11 month**s: 60–125 mg every 4–6 hours as required, maximum 4 doses per day  **Child 1–4 years**: 125–250 mg every 4–6 hours as required, maximum 4 doses per day  **Child 5–11 year**s: 250–500 mg every 4–6 hours as required, maximum 4 doses per day Child 12–17 years: 500 mg every 4–6 hours post-immunization fever in infants, **oral**  **Child 2–3 month**s: 60 mg for 1 dose, then 60 mg after 4–6 hours if required  **Child 4 month**s: 60 mg for 1 dose, then 60 mg after 4–6 hours, maximum 4 doses per day. |
| Contraindications | Hypersensitivity to the drug, severe hepatic or renal disease. |
| Drug interactions | Metoclopramide, warfarin, isoniazid, tinidazole |
| Side effects | Hepatotoxicity, leucopenia, rash, Stevens Johnson syndrome (SJS)  Children in the following situations may be at an increased risk of liver damage from paracetamol overdosage, |
| Cautions | Alcohol dependence, over dosage, malnutrition, hepatic impairment, infants under 3 months, G6PD deficiency. obese, febrile illness |
| Storage condition | Store below 30 oC. |

## Opioid Analgesics

Opioid analgesics are a class of drugs that act on opioid receptors in the central nervous system to relieve pain. They may also be called opioids, opiates, or narcotic analgesics. They are used for various conditions, including acute or chronic pain, surgery, and opioid use disorder. They have a high risk for addiction and habit-forming. Opioid analgesics can be divided into those used for moderate pain (such as codeine phosphate), those used for moderate-to-severe pain (such as morphine or oxycodone hydrochloride) and those used for intra-operative analgesia (such as alfentanil, fentanyl and remifentanil). Combination of weak opioids with strong opioids is not recommended because of increased adverse drug reactions.

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| **Fentanyl** | |
| Pharmacological class | Opioid analgesic |
| Dosage form | Injection (as citrate): 50 mcg/ml  Transdermal patch: 12 mcg/hr., 25 mcg/hr., 50 mcg/hr., 75 mcg/hr., 100 mcg/hr. |
| **Indications** | Chronic intractable pain, breakthrough pain in patients receiving opioid therapy for chronic cancer pain, analgesia and enhancement of anesthesia during operation, induction of analgesia and respiratory depression in intensive care. |
| Dose and Administration | **Chronic intractable pain not currently treated with a strong opioid analgesic by transdermal application**:  **Adult:** Initially 12 mcg/hour every 72 hours. Dose should be adjusted at 48–72hour intervals in steps of 12–25 mcg/hour; if necessary, more than one patch may be used at a time (but applied at the same time to avoid confusion)—consider additional or alternative analgesic therapy if dose required exceeds 300 mcg/hour (Important: It takes 17 hours or more for the plasma-fentanyl concentration to decrease by 50% replacement opioid therapy should be initiated at a low dose and increased gradually)  **Chronic intractable pain currently treated with a strong opioid analgesic by transdermal application**:  **Adult:** Initial dose based on previous 24-hour opioid requirement (consult product literature), for evaluating analgesic efficacy and dose increments  **Chronic intractable pain not currently treated with a strong opioid analgesic by transdermal application**:  **Child 2–17 years**: Initial dose based on previous 24-hour opioid requirement |
| Contraindications | Hypersensitivity to the drug or other opioids, respiratory depression, obstructive airways disease. |
| Drug interactions | Azole antifungals, benzodiazepine or other CNS depressants, calcium channel blockers (CCBs), protease inhibitors, cimetidine, macrolide antibiotics, mifepristone, rifamycins, carbamazepine, phenytoin, monoamine oxidase inhibitors (MAOIs), linezolid, CYP3A4 inhibitors. |
| Side effects | Anxiety, decreased appetite, asthenia, depression, diarrhea, dyspnea, hypertension, insomnia, malaise, muscle complaints, peripheral oedema, sensation abnormal, tremor, cyanosis, fever, GI disorders, memory loss, respiratory disorders, seizures, sexual dysfunction, vision blurred, apnoea, muscle rigidity, post procedural complications, , vascular pain, urinary retention. |
| Cautions | Bradyarrhythmia, cerebral tumor, diabetes mellitus, impaired consciousness, hypovolemia,renal impairment. |
| Storage condition | Store below 30 °C. |
| **Methadone hydrochloride** | |
| Pharmacological class | Opioid analgesic |
| Dosage form | Tablet: 5 mg; 10 mg  Syrup: 5 mg/5 ml; 10 mg/5 ml |
| **Indications** | Adjunct in treatment of opioid dependence, severe pain and cough in palliative care |
| Dose and Administration | **Severe pain**; **by oral, or SC injection, or IM injection:**  **Adult:**5–10 mg every 6–8 hours, adjusted according to response, on prolonged use not to be given more frequently than every 12 hours  **Adjunct in treatment of opioid dependence**; **oral**:  **Adult:** Initially 10–30 mg daily, increased in steps of 5–10 mg daily if required until no signs of withdrawal nor evidence of intoxication, dose to be increased in the first week, then increased every few days as necessary up to usual dose, maximum weekly dose increase of 30 mg; usual dose 60–120 mg daily  **Cough in palliative care**, **oral:**  **Adult:** 1–2 mg every 4–6 hours, reduced to 1–2 mg twice daily, use twice daily frequency if prolonged use |
| Contraindications | Acute respiratory depression, acute alcoholism, risk of paralytic ileus, raised intracranial pressure or head injury |
| Drug interactions | Azole antifungals, abacavir, alcohol, amitriptyline, artemeter, carbamazepine, chlorpromazine, clomipramine, cimetidine, chloroquine, diazepam, efavirenz, fentanyl, fluphenazine, haloperidol, macrolides, metoclopramide, nelfinavir, nevirapine, phenytoin, rifampicin, ritonavir, zidovudine, CYP3A4 inducers/inhibitors. |
| Side effects | Nausea, vomiting, constipation, drowsiness, dry mouth, anorexia, difficulty with micturition, spasm of urinary and biliary tract, bradycardia, tachycardia, dysphoria, mood changes, decreased libido or potency, rash, urticaria, pruritus, sweating, headache, facial flushing, vertigo, postural hypotension, hypothermia, hallucinations, confusion, and miosis, respiratory depression, hypotension, muscle rigidity. |
| Cautions | Hepatic impairment, hypothyroidism, convulsive disorders, decreased respiratory reserve and acute asthma, hypotension, prostatic hypertrophy, pregnancy, breastfeeding, renal impairment. |
| Storage condition | Store below 30°C. |
| **Morphine** | |
| Pharmacological class | Opioid analgesics |
| Dosage form | Injection (as HCl or sulphate): 10mg/ml  Syrup: 20mg/5ml  Tablet: 10mg, 30mg |
| **Indications** | Moderate to severe pain, including post-operative pain and renal colic, obstetric analgesia: |
| Dose and administration | **Moderate to severe pain, including post-operative pain and renal colic**, oral**:**  **Adult:** 200 mg every 3–6 hours as required  IM injection: 75–100 mg every 2–4 hours if required  Slow IV injection: 50–100 mg every 2–4 hours if required  **Obstetric analgesia**, by IM injection:  **Adult:** 2 mg/kg, usual dose 100–150 mg  Acute pulmonary edema by slow IV injection (2 mg/min): 5–10 mg  **Pain, SC, or IM:**  **Neonate**: Initially 50 mcg/kg every 6 hours, adjusted according to response  **Infant 1–6 months**: Initially 100 mcg/kg every 6 hours, adjusted according to response  **Infant or child 6 months–12 years**: Initially 100 mcg/kg every 4 hours, adjusted according to response; maximum dose is 15 mg  **Pain, IV injection and infusion:**  **Neonate**: Initially by IV injection (over at least 5 minutes) 25–100 mcg/kg then by continuous IV infusion 5–40 mcg/kg/hour adjusted according to response  **Child 1–6 months**: Initially by IV injection (over at least 5 minutes) 100–200 mcg/kg then by continuous infusion 10–30 mcg/kg/hour adjusted to response  **Child 6 months–12 year**s: Initially by IV injection (over at least 5 minutes) 100–200 mcg/kg then by continuous IV infusion 20–30 mcg/kg/hour adjusted according to response.  **Pain,** oral**:**  **Child 1–12 months**: Initially 80–200 mcg/kg every 4 hours, adjusted according to response  **Child 1–2 years**: Initially 200–400 mcg/kg every 4 hours, adjusted according to response  **Child 2–12 years**: Initially 200–500 mcg/kg (maximum 20 mg) every 4 hours, adjusted according to response |
| Contraindications | Patients known to be hypersensitivity to the drug, respiratory depression, acute hepatic disease, acute alcoholism, head injuries, coma, convulsive disorders, increased intracranial pressure, acute abdomen, delayed gastric emptying, heart failure secondary to chronic lung disease, phaeochromocytoma. |
| Drug interactions | MAOIs, gabapentin, ritonavir, rifampicin, cimetidine, CNS depressants, esmolol, domperidone/ metoclopramide, mexiletine, phenothiazine antiemetics, sedative medicines such as benzodiazepines, linezolid, fentanyl, tramadol,quinidine, fluoxetine. |
| Side effects | Appetite decreased, asthenia, gastrointestinal discomfort, insomnia, malaise, neuromuscular dysfunction, amenorrhoea, biliary pain, hyperalgesia, hypertension, pancreatitis exacerbated, sexual dysfunction, sleep apnoea, ureteral spasm, withdrawal syndrome with unknown frequency. |
| Cautions | Renal impairment, hepatic impairment, dependence, cardiac arrhythmias, pancreatitis, hypothyroidism, convulsive disorders, acute asthma, hypotension, prostatic hypertrophy. |
| Storage condition | Store below 30°C. Protect from light. |
| **Pethidine hydrochloride (Meperidine)** | |
| Pharmacological class | Opioid analgesics |
| Dosage form | Injection: 50mg/ml in 1ml and 2ml ampoule |
| Indications | Acute pain, obstetric analgesia, premedication, postoperative pain |
| Dose and administration | **Acute pain, By SC injection, or by IM injection**:  **Adult:** 25–100 mg, then 25–100 mg after 4 hours, for debilitated patients use dose described for elderly patients  **Elderly:** Initially 25 mg, then 25–100 mg after 4 hours  **By slow IV injection**: 25–50 mg, then 25–50 mg after 4 hours, for debilitated patients use dose described for elderly patients  **Elderly**: Initially 25 mg, then 25–50 mg after 4 hours  **Obstetric analgesia, by SC injection, or by IM injection:**  **Adult:** 50–100 mg, then 50–100 mg after 1–3 hours if required; maximum 400 mg per day  **Premedication, by IM injection:**  **Adult:** 25–100 mg, dose to be given 1 hour before operation, for debilitated patients use dose described for elderly patients  **Elderly**: 25 mg, dose to be given 1 hour before operation  **Postoperative pain, by SC injection, or by IM injection**:  **Adult:** 25–100 mg every 2–3 hours if required, for debilitated patients use dose described for elderly patients  **Elderly**: Initially 25 mg every 2–3 hours if required |
| Contraindications | Hypersensitivity to the drug, phaeochromocytoma, severe or acute bronchial asthma, respiratory depression, GI obstruction. |
| Drug interactions | Alcohol, antidepressants, SSRIs and Tricyclic antidepressants, anxiolytics and hypnotics, antipsychotics, carbamazepine, coumarins, MAOIs, digoxin, duloxetine, fentanyl, tramadol, sertraline, selegiline, ciprofloxacin, cimetidine, domperidone, metoclopramide, linezolid, mexiletine, ritonavir, and sedative medicines such as benzodiazepines, CYP3A4 inhibitors/inducers. |
| Side effects | Biliary spasm, dysuria, hypotension, hypothermia, anxiety, appetite decreased, asthenia, concentration impaired, depressed mood, diarrhea, dyspnea, feeling of body temperature change, gastrointestinal discomfort, mucosal dryness, muscle contractions involuntary, muscle spasms, oedema, sleep disorders, tremor |
| Cautions | Cardiac arrhythmias, renal impairment, hypotension, seizure, anxiety |
| Storage condition | Store below 30°C. |
| **Tramadol hydrochloride** | |
| Pharmacological class | Opioid analgesics |
| Dosage form | Injection: 50mg/ml  Tablet/Capsule: 50mg, 100mg |
| Indications | Moderate to severe pain where alternative therapies are inadequate, mixed pain- neuropathic and nociceptive. |
| Dose and administration | **Acute pain**, **oral:**  **Adult:** 50-100 mg every 4-6 hours when required, do not exceed 400 mg in 24 hours.  **Chronic pain**, **oral:**  **Adult:** Initially 25 mg, titrate upwards by 25-50 mg every 3 days up to 50-100 mg every 4-6 hours when required, do not exceed 400 mg in 24 hours.  **Moderate to severe pain,** by IM, bolus, slow IV or SC:  **Adult:** 50-100 mg every 4-6 hours, for slow IV give over 2-3 minutes.  **Moderate to severe acute pain,** by IM, bolus, slow IV or SC: **Adult:** 100 mg initially, then 50–100 mg every 4–6 hours; do not exceed 400 mg in 24 hours.  **Moderate to severe chronic pain,** by IM, bolus, slow IV or SC**: Adult:** Initially 50 mg then adjust the dose according to the patient’s response. Do not exceed 400 mg in 24 hours.  **Postoperative pain,** by IM, bolus, slow IV orSC:  **Adult:** Initially 100 mg (in the first hour), then 50 mg every 10-20 minutes if required up to 250 mg (including the initial dose). Maintenance dose: 50-100 mg every 4-6 hours. For IV give over 2-3 minutes. Do not exceed 400 mg in 24 hours.  **Children 1 month to 11 year**s: Safety and efficacy is not established with life-threatening respiratory depression and death have occurred on receiving tramadol.  **Moderate to severe acute pain,** oral:  **Child 12–17 years:** Initially 100 mg, then 50–100 mg every 4–6 hours; do not exceed 400 mg in 24 hours.  **Moderate to severe chronic pain**, oral:  **Child 12–17 years**: Initially 50 mg, then, adjusted according to response; maximum 400 mg in 24 hours.  By IM, slow IV (over 2-3 mins), IV infusion, or SC:  **Moderate to severe acute pain,** by IM, IV, IV infusion, or SC:  **Child 12–17 years**: 50–100 mg every 4-6 hours; do not exceed 400 mg in 24 hours. IV injection to be given over 2-3 minutes.  **Postoperative pain**, by slow IV (over 2-3 mins), IM, IV infusion or SC:  **Child 12–17 years:** Initially 100 mg, then 50 mg every 10–20 minutes if required up to total maximum 250 mg (including initial dose) in first hour, then 50–100 mg every 4–6 hours; Maximum 400 mg in 24 hours. |
| Contraindications | Hypersensitivity to the drug, uncontrolled epilepsy, known or suspected gastrointestinal obstruction, including paralytic ileus, concurrent, children<12 years, postoperative management in children <18 yearsfollowing tonsillectomy and/or adenoidectomy, severe/acute bronchial asthma, significantrespiratory depression. |
| Drug interactions | Selegiline, alfentanil, acetaminophen, buprenorphine, clonidine, codeine, MAOIs, fentanyl, linezolid, methadone, metoclopramide, morphine, oxycodone, cimetidine, diazepam, erythromycin, aminoglutethimide, carbamazepine, nafcillin, nevirapine, phenobarbital, phenytoin rifampicin, diphenoxylate HCl and duloxetine |
| Side effects | Allergic reaction, anaphylaxis, suicidal tendency, weight loss, serotonin syndrome, orthostatic hypotension, syncope, tachycardia, amnesia, cognitive dysfunction, depression, difficulty in concentration, hallucinations, paresthesia, seizure, tremor, dyspnea, Stevens Johnson syndrome, toxic epidermal necrolysis, urticaria, vesicles, dysgeusia, dysuria, menstrual disorder, sweating, dizziness, vomiting, dry mouth, gastrointestinal disturbances, cerebral convulsions, physical dependence, circulatory collapse, headaches, constipation, opioid-induced hyperalgesia. |
| Cautions | Renal impairment, hepatic impairment, pregnancy. |
| Storage condition | Store below 30 °C. |

## Medicines used for other common symptoms in palliative care

In palliative care, symptoms like p**ain,** nausea and vomiting, dyspnea (breathlessness), anxiety constipation, depression, several drugs manage agitation or delirium and cxcessive secretions. Neuropathic pain is treated with adjuvants like gabapentin while n**ausea and vomiting** are controlled with antiemetics like metoclopramide and antihistamines such as cyclizine. For **breathlessness**, opioids and anxiolytics help reduce discomfort and anxiety. **Anxiety** is often treated with benzodiazepines, while **constipation** is managed using laxatives. **Depression** is addressed with antidepressants like sertraline, and **agitation** is calmed with antipsychotics such as haloperidol. Anticholinergics like hyoscine reduce excessive **secretions**, and corticosteroids like dexamethasone are used to relieve **fatigue**. These medications help control common symptoms and improve comfort for palliative care patients.

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| --- | --- |
| **Amitriptyline** | |
| Pharmacological class | Tricyclic antidepressant |
| Dosage form | Tablet: 10 mg, 25 mg |
| Indications | Neuropathic pain in palliative care, depression |
| Dose and Administration | **Depression**, oral:  **Adult:** Initially 50 mg daily in 2 divided doses, then increased in steps of 25 mg once daily on alternate days if required, maximum 150mg daily in 2 divided doses.  **Elderly:** Initially 10–25 mg daily, increased, if necessary, up to 100–150 mg daily in 2 divided doses, dose increases dependent on individual patient response and tolerability—doses above 100 mg should be used with caution  **Neuropathic pain**: **Migraine prophylaxis, chronic tension type headache prophylaxis,** oral:  **Adult:** Initially 10–25 mg daily, taken in the evening, then increased, if tolerated, in steps of 10–25 mg every 3–7 days in 1–2 divided doses; usual dose 25–75 mg daily, taken in the evening; doses above 100 mg should be used with caution (doses above 75 mg should be used with caution in the elderly and in patients with cardiovascular disease), maximum per dose 75 mg.  N**europathic pain,** oral:  **Child 2–12 years:** Initially 200–500 mcg/kg (maximum 25 mg) once daily at night, increased if necessary to a maximum of 1 mg/kg twice daily |
| Contraindications | Recent MI, arrhythmias (especially heart block), manic phase in bipolar disorders, severe liver disease, porphyria, |
| Drug interactions | Alcohol, artemether + lumefantrine, atropine, carbamazepine, chlorpheniramine, chlorpromazine, codeine, contraceptives (oral), MAOIs, diazepam, dextromethorphan, epinephrine, erythromycin, ethosuximide, fluconazole, fluoxetine, fluphenazine, furosemide, haloperidol, halothane, hydrochlorothiazide, isoniazid, ketamine, levothyroxine, morphine, nitrous oxide, ondansetron, phenobarbital, phenytoin, rifampicin, ritonavir, sympathomimetic drugs, spironolactone, thiopental, valproic acid, warfarin |
| Side effects | Anticholinergic syndrome, drowsiness, QT interval prolongation, myelosuppression, photosensitivity, hypotension, tachycardia, weight gain, sexual dysfunction, sedation. |
| Cautions | History of epilepsy, hepatic impairment, thyroid disease, phaeochromocytoma, history of bipolar depression, psychoses, depression, angle closure glaucoma, history of urinary retention, concurrent electroconvulsive therapy, abrupt withdrawal, anaesthesia. |
| Storage condition | Store below 30 oC. |
| **Carbamazepine** | |
| Pharmacological class | Sodium channel blocker anti-epileptic drugs |
| Dosage form | Tablet: 100mg, 200mg |
| Indications | Trigeminal neuralgia, focal and secondary generalized tonic-clonic seizures, prophylaxis of bipolar disorder unresponsive to lithium, adjunct in acute alcohol withdrawal, diabetic neuropathy |
| Dose and administration | **Trigeminal neuralgia,** oral:  **Adult:** Initially 100 mg 1–2 times a day, increased gradually according to response; usual dose 200 mg 3–4 times daily (up to 1.6 g daily may be needed in some patients)  **Focal and secondary generalised tonic-clonic seizures, prophylaxis of bipolar disorder unresponsive to lithium, adjunct in acute alcohol withdrawal, diabetic neuropathy (***Refer uner medicines for neurological disorders)* |
| Contraindications | Hypersensitivity to the drug, atrioventricular conduction abnormalities, history of bone marrow depression, porphyria, jaundice, pregnancy, hepatitis |
| Drug interactions | MAOIs, itraconazole, voriconazole, CYP3A4 inducers (NNRTIs), Amitriptyline, chloroquine, chlorpromazine, ciclosporin, dexamethasone, doxycycline, erythromycin, ethosuximide, fluoxetine, haloperidol, hydrochlorothiazide, hydrocortisone, isoniazid, levothyroxine, lopinavir, mebendazole, mefloquine, phenobarbital, phenytoin, praziquantel, ritonavir, saquinavir, valproic acid, vecuronium, warfarin. |
| Side effects | Drowsiness, ataxia, dizziness, blurred vision, diplopia, headache (all dose related), rash, dry mouth, abdominal pain, nausea, vomiting, anorexia, diarrhea, constipation, asymptomatic hyponatremia, leukopenia, thrombocytopenia, increased liver enzymes. |
| Cautions | Hepatic impairment, renal impairment, cardiac disease, skin reactions. history of blood disorders, glaucoma, sudden withdrawal, blood and skin disorders, pregnancy, breastfeeding. |
| Storage condition | Store below 30˚C. Protect from moisture and light |
| **Dexamethasone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection: 4 mg/ml in 1 ml, 4mg/ml in 2ml  Oral liquid: 2 mg/5 ml  Tablet: 2 mg, 4 mg. |
| Indications | Adjunct in the emergency treatment of anaphylaxis, short-term suppression of inflammation in allergic disorders. |
| Dose and administration | **Allergy (short-term use)**, oral:  **Adult:** Usual range 0.5–10 mg daily as a single dose in the morning  **Anaphylaxis (adjunct),** by slow IV injection or infusion(as dexamethasone phosphate):  **Adult:**  0.5–24 mg  I**nflammatory and allergic disorders**, IM or slow IV injection or infusion**:**  **Infant or Child:** 100–400 mcg/kg in 1–2 divided doses (maximum 24 mg daily). |
| Contraindications | Hypersensitivity to the drug, intra-articular injection, bacterial arthritis, risk of bleeding, periarticular calcification, avascular bone necrosis, tendon rupture infiltration, glaucoma, Cushing syndrome, cerebral malaria, systemic fungal infection. |
| Drug interactions | Acetylsalicylic acid, albendazole, amphotericin B, antacids, carbamazepine, cimetidine, contraceptives (oral), digoxin, enalapril, erythromycin, furosemide, hydrochlorothiazide, ibuprofen, insulins, lopinavir, ketoconazole, metformin, methotrexate, phenobarbital, phenytoin, praziquantel, propranolol, rifampicin, ritonavir, salbutamol, saquinavir, spironolactone, influenza vaccine, live vaccines, warfarin, artemether/lumefantrine. |
| Side effects | Nausea, hiccups, increased susceptibility to infection, sodium and water retention, oedema, hypertension, hypokalemia, hyperglycemia, increased appetite, dyspepsia, delayed wound healing, bruising, acne, psychiatric effects, perineal irritation. |
| Cautions | Adrenal suppression (iatrogenic), anaphylactic reaction, Kaposi sarcoma, activation or exacerbation of TB, amoebiasis, strongyloidiasis, chickenpox measles, diabetes mellitus, peptic ulcer, hypertension, corneal perforation, osteoporosis, myasthenia gravis. |
| Storage condition | Store below 30°C. Protect from light. |
| **Diazepam** | |
| Pharmacological class | Benzodiazepine |
| Dosage form | Injection: 5 mg/ml  Syrup: 2 mg/5 ml  Rectal gel: 5 mg/ml in 0.5 ml, 2 ml, 4 ml  Rectal solution: 2 mg/ml in 1.25 ml, 2.5 ml, 4 mg/ml in 2.5 ml in rectal tube  Tablet: 5 mg; 10 mg |
| Indications | Status epilepticus, drug or alcohol withdrawal, seizures associated with poisoning, muscle spasm, tetanus, anxiety, insomnia associated with anxiety |
| Dose and administration | **Status epilepticus, emergency management of recurrent epileptic seizures**, by slow IV injection (at a rate of 5 mg/min):  **Adult:** 10–20 mg, repeated, if necessary, after 30–60 minutes, may be followed by IV infusion up to a maximum of 3 mg/kg over 24 hours  **Status epilepticus, emergency management of recurrent epileptic seizures,** by rectum as solution**:**  **Adult:** 500 mcg/kg, if convulsions not controlled, other measures should be instituted.  **Drug or alcohol withdrawal,** by slow IV injection (at a rate of 5 mg/min):  **Adult:** 10 mg, higher doses may be required, depending on severity of symptoms  **Seizures associated with poisoning**, by slow IV injection (at a rate of 5 mg/min): 10–20 mg  **Muscle spasm of varied etiology**, oral:  **Adult:** 5–15 mg daily in divided doses, then increased if necessary to 60 mg daily, adjusted according to response, dose only increased in spastic conditions  **Acute muscle spasm**, by IM injection, or by slow IV injection:  **Adult:** 10 mg, then 10 mg after 4 hours if required, IV injection to be administered into a large vein at a rate of no more than 5 mg/min  **Tetanus**, by IV injection:  **Adult:** 100–300 mcg/kg every 1–4 hours  **Anxiety**, oral:  **Adult:** 5 mg a day, then increased if necessary to 15–30 mg daily in divided doses  **Insomnia associated with anxiety**, oral:  **Adult:** 5–15 mg daily, to be taken at bedtime  **Status epilepticus, emergency management of recurrent seizures**, rectal.  **Neonate**: 1.25–2.5 mg repeated once after 10 minutes if necessary  **Infant or child <2 years**: 5 mg repeated once after 10 minutes if necessary Older than 2 years: 10 mg repeated once after 10 minutes if necessary.  **Tetanus**, by IV injection: 100–300 mcg/kg every 1–4 hours  **Muscle spasm in cerebral spasticity or in postoperative, skeletal muscle spasm,** oral:  **Child 1–11 months**: Initially 250 mcg/kg twice daily  **Child 1–4 years**: Initially 2.5 mg twice daily  **Child 5–11 years**: Initially 5 mg twice daily  **Child 12–17 years**: Initially 10 mg twice daily, maximum 40 mg per day. |
| Contraindications | Hypersensitivity to the drug, CNS depression or coma, shock, respiratory depression, acute pulmonary insufficiency, sleep apnea, severe hepatic impairment, marked neuromuscular respiratory weakness including unstable myasthenia gravis, untreated open-angle glaucoma, infants less than 3 months |
| Drug interactions | Amitriptyline, chlorpheniramine, chlorpromazine, codeine, enalapril, furosemide, haloperidol, halothane, isoniazid, ketamine, morphine, nitrous oxide, phenytoin, rifampicin, ritonavir, spironolactone, thiopental, mifepristone, ketoconazole, cimetidine, fentanyl, erythromycin, carbamazepine, metronidazole. |
| Side effects | Drowsiness, sedation, confusion, amnesia, muscle weakness, ataxia, slurred speech, respiratory depression, hypotension, dizziness, vertigo, hallucinations, paradoxical insomnia, excitability, aggression, injection site pain, thrombophlebitis, hepatotoxicity, withdrawal syndrome, blood dyscrasias. |
| Cautions | Respiratory disease, muscle weakness, myasthenia gravis, marked personality disorder, hepatic impairment, renal impairment, porphyria, neonates, infants. |
| Storage condition | Store below 30 0C. |
| **Fluoxetine hydrochloride** | |
| Pharmacological class | Selective serotonin re-uptake inhibitor |
| Dosage form | Tablet: 20 mg |
| **Indications** | Major depression, generalized anxiety disorder, bulimia nervosa, obsessive-compulsive disorder |
| Dose and administration | **Major depression,** oral:  **Adult:** Initially 20 mg once daily, increased as necessary after 3 weeks to a maximum of 80 mg daily, usual maintenance dose range, 20–60 mg once daily.  **Elderly**: Initially 20 mg once daily, increased as necessary after 3 weeks to a maximum of 60 mg daily, maintenance dose range, 20–40 mg once daily.  **Generalized anxiety disorder,** oral**:**  **Adult:** 10-20mg once daily; gradually increase dose based on response and tolerability in 10-20 mg increments at intervals of ≥ 1 week up to 60 mg/day.  **Major Depression**, oral:  **Child 8–12 years:** 10 mg once daily increased after 1–2 weeks if necessary to a maximum of 20 mg once daily  **Anxiety disorder**, oral:  **Child 6-12 years:** 5 mg once daily, slowly titrate to 10-20 mg once daily up to 40 mg/day.  **Child ≥ 12 years:** initial 10mg daily. Titrate upto 20-40mg/day (max. dose 60 mg/day). |
| Contraindications | Hpersensitivity to the drug |
| Drug interactions | MAOIs, thioridazine, TCAs, meperidine, fentanyl, metoclopramide, propranolol, quinidine |
| Side effects | Nausea, agitation, insomnia, drowsiness, tremor, dry mouth, diarrhea, dizziness, headache, sweating, weakness, anxiety, weight gain or loss, sexual dysfunction, rhinitis, myalgia, rash, chills, euphoria, yawning, extrapyramidal reactions, sedation, confusion, palpitations, tachycardia, hypotension, hyponatremia, , alopecia, changes in blood sugar, serotonin syndrome, hepatic failure, galactorrhea, blood dyscrasias, seizures, akathisia, paraesthesia, taste disturbance, toxic epidermal necrolysis and neuroleptic malignant syndrome. |
| Cautions | Epilepsy, cardiac disease, bleeding disorders, diabetes mellitus, closed-angle glaucoma, history of mania, concurrent electroconvulsive therapy, hepatic impairment, abrupt withdrawal, suicidal atempt, QT prolongation, pregnancy, breastfeeding |
| Storage condition | Store below 30 oC. |
| **Gabapentin** | |
| Pharmacological class | Anticonvulsant |
| Dosage form | Tablet: 150 mg, 300 mg |
| Indications | Focal seizures with or without secondary generalization, peripheral neuropathic pain, painful diabetic neuropathy and post-herpetic neuralgia, menopausal symptoms, particularly hot flushes, oscillopsia in multiple sclerosis, spasticity in multiple sclerosis |
| Dose and administration | **Adjunctive treatment of focal seizures with or without secondary generalization**, oral:  **Adult:** Initially 300 mg once daily on day 1, then 300 mg twice daily on day 2, then 300 mg 3 times a day on day 3; alternatively, initially 300 mg 3 times a day on day 1, then increased in steps of 300 mg every 2–3 days in 3 divided doses, adjusted according to response; usual dose 0.9–3.6 g daily in 3 divided doses (max. per dose 1.6 g 3 times a day)  **Monotherapy for focal seizures with or without secondary generalization**, oral:  **Adult:** Initially 300 mg once daily on day 1, then 300 mg twice daily on day 2, then 300 mg 3 times a day on day 3, alternatively initially 300 mg 3 times a day on day 1, then increased in steps of 300 mg every 2–3 days in 3 divided doses, adjusted according to response, usual dose 0.9–3.6 g daily in 3 divided doses (max. per dose 1.6 g 3 times a day)  **Peripheral neuropathic pain**, oral:  **Adult:** Initially 300 mg once daily on day 1, then 300 mg twice daily on day 2, then 300 mg 3 times a day on day 3, alternatively initially 300 mg 3 times a day on day 1, then increased in steps of 300 mg every 2–3 days in 3 divided doses, adjusted according to response, maximum 3.6 g per day continued  **Menopausal symptoms, particularly hot flushes**, **in womenwith breast cancer,** oral**:**  **Adult:** 300 mg 3 times a day, initial dose should be lower and titrated up over 3 days  **Oscillopsia in multiple sclerosis**, oral:  **Adult:** Initially 300 mg once daily, then increased in steps of 300 mg, every 4–7 days, adjusted according to response, usual maximum 900 mg 3 times a day  **Spasticity in multiple sclerosis**, oral:  **Adult:** Initially 300 mg once daily for 1–2 weeks, then 300 mg twice daily for 1–2 weeks, then 300 mg 3 times a day for 1–2 weeks, alternatively initially 100 mg 3 times a day, thenincreased in steps of 100 mg 3 times a day, every 1–2 weeks, adjusted according to response, usual maximum 900 mg 3 times a day  **Adjunctive treatment of focal seizures with or without secondary generalization**, oral:  **Child 6–11 years**: 10 mg/kg once daily (max. per dose 300 mg) on day 1, then 10 mg/kg twice daily (max. per dose 300 mg) on day 2, then 10 mg/kg 3 times a day (max. per dose 300 mg) on day 3, usual dose 25–35 mg/kg daily in 3 divided doses, some children may not tolerate daily increments, longer intervals (up to weekly) may be more appropriate, daily dose maximum to be given in 3 divided doses, maximum 70 mg/kg per day. |
| Contraindications | Hypersensitivity to the drug, acute pancreatitis. |
| Drug interactions | Antacids containing aluminium with magnesium, morphine, amitriptyline, fentanyl, codeine, diazepam, ethanol, fluoxetine, antisesure medicines |
| Side effects | Anxiety, appetite abnormal, arthralgia, asthenia, behavior abnormal, confusion, constipation, cough, depression, diarrhea, dizziness, drowsiness, dry mouth, dysarthria, dyspnea, emotional lability, flatulence, gait abnormal, GI discomfort, headache, hypertension, increased risk of infection, insomnia, leucopenia, malaise, movement disorders, muscle complaints, nausea, nystagmus, edema, pain, reflexes abnormal, seizure (in children), sensation abnormal, sexual dysfunction, skin reactions, tooth disorder, tremor, vasodilation, vertigo, visual impairment, vomiting, cognitive impairment, palpitations. |
| Cautions | Diabetes mellitus, elderly, low body weight, history of psychotic illness, history of substance abuse, mixed seizures (including absences), renal impairment, abrupt discontinuation, pregnancy, breast feeding |
| Storage condition | Store below 30 ºC. |
| **Haloperidol** | |
| Pharmacological class | First-generation (typical) antipsychotics |
| Dosage form | Injection: 5 mg in 1 ml ampoule  Syrup: 2 mg/ml  Tablet: 0.5 mg; 2mg; 5 mg. |
| Indications | Schizophrenia and other psychotic disorders, short-term adjunctive management of psychomotor agitation, excitement, violent, dangerous or impulsive behavior and severe anxiety, motor tics (including Tourette syndrome) |
| Dose and administration | **Schizophrenia and other psychoses, mania, short-term adjunctive management of psychomotor agitation, violent behavior, and severe anxiety**, oral:  **Adult:** 2.5–5 mg 2–3 times daily  For elderly or debilitated patients, use half of the adult dose; 3–5 mg 2–3 times daily in severely affected or resistant patients, up to 30 mg daily in resistant schizophrenia  **Acute psychotic conditions,** by IM injection:  **Adult:** Initially 2–10mg (half of the adult dose in elderly or debilitated patients, up to 18 mg in severely affected patients), subsequent doses every 4–8 hours according to response (up to every hour if necessary) up to a maximum of 18 mg daily  **Schizophrenia and other psychoses, short-term adjunctive management of psychomotor agitation, excitement and violent or dangerous impulsivebehavior, severe anxiety,** oral:  **Child 3–12 years**: Initially 0.125–0.25 mg twice daily, increase by 0.25–0.5 mg/day every 5–7 days; maximum 0.15 mg/kg daily; usual maintenance 0.025–0.05 mg/kg three times daily  IM (when rapid effect required)  **Child 6–12 years**: 1–3 mg per dose every 4–8 hoursto a maximum of 0.15 mg/kg daily; change to oral therapy as soon as possible  **Motor tics (including Tourette syndrome)**, oral:  **Child 5–12 years**: 0.0125–0.025 mg/kg twice daily, adjusted according to response up to 10 mg daily |
| Contraindications | Impaired consciousness due to CNS depression, bone marrow suppression, phaeochromocytoma, porphyria, basal ganglia disease, severe liver or cardiac disease, comatose states, congenital long QT syndrome, dementia with Lewy bodies, history of torsade de pointes, history of ventricular arrhythmia, Parkinson’s disease, progressive supranuclear palsy, recent acute MI, uncompensated heart failure, hypokalaemia, dopamine use |
| Drug interactions | Amitriptyline, artemether + lumefantrine, atropine, carbamazepine, clomipramine, codeine, diazepam, enalapril, epinephrine, erythromycin, ethanol, ethosuximide, fluoxetine, fentanyl, fluconazole, halothane, ketamine, metoclopramide, morphine, nifedipine, nitrous oxide, phenobarbital, phenytoin, procainamide, quinidine, rifampicin, ritonavir, thiopental, thioridazile, valproic acid. |
| Side effects | Depression, eye disorders, headache, hypersalivation, nausea, neuromuscular dysfunction, psychotic disorder, vision disorders, weight decreased, anxiety, agitation, extrapyramidal adverse effects, orthostatic hypotension, tachycardia, mydriasis, constipation, nausea, dry oral, urinary retention, hyperprolactinemia, erectile dysfunction, weight gain, sedation. |
| Cautions | Bradycardia, electrolyte disturbances, family history of QTc-interval prolongation, history of heavy alcohol exposure, hyperthyroidism, hypotension, prolactin-dependent tumors, prolactinaemia, risk factors for stroke, hepatic impairment, renal impairment, patients with dementia-related psychosis, neutropenia. |
| Storage condition | Store below 30° C. Protect from light. |
| **Hyoscine butylbromide** | |
| Pharmacological class | Antispasmodic, Anticholinergic |
| Dosage form | Injection: 20 mg/ml  Tablet: 10mg, 20mg |
| Indications | Smooth muscle spasm, irritable bowel syndrome, pre-anaestheticmedication. |
| Dose and administration | **Smooth muscle spasm,** oral:  **Adult:** 20 mg four times daily  IM or IV, acute spasm and spasm in diagnostic procedures:20 mg repeated after 30 minutes if necessary; may be repeated more frequently in endoscopy; maximum 100 mg daily.  **Irritable bowel syndrome,** oral:  **Adult:** 10 mg 3 times daily, increase ifrequired up to 20 mg 4 times daily  **Premedication**, IM or SC:  **Adult:** 200-600 mcg to be administered 30-60 minutes before induction of anesthesia.  **Acute spasm**, **spasm in diagnostic procedures:** initially by IM injection or by slow IV injection**:**  **Child 2–5 years**: 5 mg, then (by IM injection or by slow IV injection) 5 mg after 30 minutes if required, dose may be repeated more frequently in endoscopy, maximum 15 mg per day  **Child 6–11 years**: 5–10 mg, then (by IM injection or by IV injection) 5–10 mg after 30 minutes if required, dose may be repeated more frequently in endoscopy, maximum 30 mg per day  **Bowel colic in palliative care,** oral**:**  **Child 1 month–1 year**: 300–500 mcg/kg 3–4 times a day (max. per dose 5 mg)  **Child 2–4 years**: 5 mg 3–4 times a day  **Child 5–11 years**: 10 mg 3–4 times a day  **Child 12–17 years**: 10–20 mg 3–4 times a day  **Bowel colic in palliative care**, by IM injection or IV injection:  **Child 1 month–4 years**: 300–500 mcg/kg 3–4 times a day (max. per dose 5 mg)  **Child 5–11 years**: 5–10 mg 3–4 times a day  **Child 12–17 years**: 10–20 mg 3–4 times a day |
| Contraindications | Hypersensitivity to the drug or belladonna alkaloids, tachycardia, geriatric patient, hyperthyroidism, dysrhythmias, ulcerative colitis, renal disease, hepatic disease, galactosaemia, GI obstruction, GI perforation, closed-angle glaucoma |
| Drug interactions | CNS depressants, fentanyl |
| Side effects | Headache, confusion, dizziness, hallucination, palpitation, tachycardia, blurred vision, photophobia, cycloplegia, dry mouth, drowsiness, constipation, paralytic ileus, dyspnoea, feeling hot, hypotension, mydriasis, sweat changes |
| Cautions | Heart failure, coronary insufficiency, cardiac rhythm disorders, hypertension, pregnancy |
| Storage condition | Store below 30 oC. |
| **Lactulose** | |
| Pharmacological class | Osmotic laxative |
| Dosage form | **Oral** solution: 10g/15ml |
| **Indications** | Constipation, hepatic encephalopathy |
| Dose and administration | **Constipation** oral**:**  **Adult:** Initially 15 ml twice daily, adjusted according to response.  **Hepatic encephalopathy**, oral**:**  **Adult:**30–50 ml 3 times a day, subsequently adjusted to produce 2–3 soft stools per day.  **Constipation**, oral:  **Child 1–11 months:** 2.5 ml twice daily, adjusted according to response  **Child 1–4 years**: 2.5–10 ml twice daily, adjusted according to response  **Child 5–17 years**: 5–20 ml twice daily, adjusted according to response  **Hepatic encephalopathy**, oral:  **Child 12–17 years**: 30–50 ml 3 times a day, subsequently a djusted to produce 2–3 soft stools per day |
| Contraindications | Hypersensitivity to the drug, galactosaemia, gastrointestinal obstruction, digestive perforation or risk of digestive perforation (e.g. acute inflammatory bowel disease such as ulcerative colitis, Crohn’s disease) |
| Drug interactions | Other laxatives, nifedipine, warfarin, antacids, sodium bicarbonate. |
| Side effects | Dehydration, abdominal pain/cramps, diarrhea, flatulence, nausea, vomiting, belching, hypernatremia, hypokalemia. |
| Cautions | Lactose intolerance, diabetes mellitus |
| Storage condition | Store below 30 oC. |
| **Loperamide** |  |
| Pharmacological class | Opioid receptor agonist |
| Dosage form | Tablet: 2 mg |
| Indications | Acute nonspecific diarrhea, chronic diarrhea, faecal incontinence, pain of intestinal colic |
| Dose and administration | **Acute diarrhea**, oral:  **Adult:** Initially 4 mg, followed by 2 mg for up to 5 days, usual dose 6 to 8 mg daily, maximum 16 mg per day  **Chronic diarrhea**, oral:  **Adult:** Initially 4 to 8 mg daily in divided doses, subsequently adjusted accordance to response, maintenance up to 16 mg daily in 2 divided doses  **Chronic diarrhea,** oral:  **Child over 2 years:** Initially 1 mg/12.5 kg body mass, followed by 0.5 mg/12.5 kg after each loose stool; alternatively, 0.08–0.24 mg/kg/day in 2–3 divided doses  **Symptomatic treatment of acute diarrhea**, oral:  **Child 4–7 years**: 1 mg 3–4 times a day for up to 3 days only  **Child 8–11 years**: 2 mg 4 times a day for up to 5 days  *Note: Not recommended for children under 12 years* |
| Contraindications | Hypersensitivity to the drug, active ulcerative colitis, antibiotic associated colitis, abdominal distention, risk of inhibition of peristalsis, bloody diarrhea, high fever, infectious diarrhea, pseudomembranous colitis, age <2 years. |
| Drug interactions | Artemether+lumefantrine, bedaquiline, fentanyl, opioid analgesics, CNS depressants (e.g., alcohol), drugs with QTc prolongation (quinine, clozapine, clarithromycin), toxic megacolon. |
| Side effects | Dizziness, drowsiness, fatigue, flatulence, headache, nausea, angioedema. |
| Cautions | Dehydration, hepatic impairment |
| Storage condition | Store below 30°C. |
| **Meclizine hydrochloride** | |
| Pharmacological class | Anti-histamine |
| Dosage form | Tablet: 12.5 mg, 25 mg |
| **Indications** | Prevention and relief of nauseaand vomiting associated with motion sickness, radiation sickness, Meniere’s disease triad (episodic vertigo, tinnitus, and hearing loss), labyrinthitis and other vestibular disturbances. |
| Dose and administration | **Motion sickness**:  **Ault:**25 to 50 mg. The initial dose should be taken at least one hour prior to travelling. Thereafter, the dose may be repeatedevery 24 hours as indicated for the duration of the journey.  **Labyrinthine and vestibular disturbances**:  **Ault:** optimal dosage is usually 25 to 100 mg daily in divided doses, depending on the clinical response.  **Meniere’s disease triad:**  **Ault:**25 to 100 mg daily or in divided doses.  **Radiation sickness**:  **Ault:**50 mg administered 2 to 12 hours prior to radiation treatment. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | CNS depressants, including barbiturates, alcohol, tranquilizers, and sedatives |
| Side effects | Drowsiness, dry mouth, fatigue, vomiting and on rare occasions, blurred vision. |
| Cautions | Driving or operating heavymachinery, asthma, narrow-angle glaucoma, obstructive GI disease, prostatic enlargement |
| Storage condition | Store below 30 oC. Protect from moisture and heat |
| **Midazolam** | |
| Pharmacological class | Benzodiazepine |
| Dosage form | Injection: 1 mg/ml; 5 mg/ml  Syrup: 2 mg/ml  Tablet: 7.5 mg; 15 mg |
| **Indications** | Delirium and terminal restlessness in palliative care |
| Dose and administration | **Delirium and terminal restlessness in palliative care,** oral:  **Adul**t: Initially 10-20 mg in 24 hours, adjusted according to response; usual dose 20-60 mg in 24 hours |
| Contraindications | Refer under anesthetics, pre- and intra-operative medicines, and medical gases |
| Drug interactions | Refer under anesthetics, pre- and intra-operative medicines, and medical gases |
| Side effects | Refer under anesthetics, pre- and intra-operative medicines, and medical gases |
| Cautions | Refer under anesthetics, pre- and intra-operative medicines, and medical gases |
| Storage condition | Store below 30 oC. |
| **Ondansetron** | |
| Pharmacological class | 5-TH3 antagonist |
| Dosage form | Injection: 4 mg/ml in 1 ml  Syrup: 2 mg/5 ml  Tablet: 2 mg; 4 mg |
| Indications | For the prevention of chemotherapy/radiotherapy inducednausea and vomiting, for the treatment of postoperative nausea and vomiting |
| Dose and administration | **Moderately emetogenic chemotherapy or radiotherapy**, oral:  **Adult:**8 mg 1–2 hours before treatment or by IM injection or slow IV injection, 8 mg immediately before treatment then oral, 8 mg every 12 hours for up to 5 days.  **Severely emetogenic chemotherapy**, by IM injection or slow IV injection:  **Adult:** 8 mg immediately before treatment, where necessary, followed by 2 further doses of 8 mg at intervals of 2–4 hours (or followed by 1 mg/hour bycontinuous IV infusion for up to 24 hours), then oral, 8 mg every 12 hours for up to 5 days; alternatively, by IV infusion, over at least 15 minutes, 32 mg immediately before treatment then oral, 8 mg every 12 hours for up to 5 days  **Prevention/treatment of postoperative nausea and vomiting**, oral:  **Adult:**16 mg 1 hour before anaesthesia or 8 mg 1 hour before anaesthesia, followed by 8 mg at intervals of 8 hours for 2 further doses; alternatively, by IM or slow IV injection, 4 mg at induction of anaesthesia  **Chemotherapy-induced nausea and vomiting:**  **Child 6 months–18 years:** By IV infusion over 15 minutes, 5 mg/m2 (max. 8 mg) immediately before chemotherapy, then for body-surface area <0.6 m2, 2 mg oral every 12 hours for up to 5 days; for body-surface area 0.6 m2 or greater, 4 mg oral every 12 hours for up to 5 days, max. total daily dose 32 mg; alternatively, by IV infusion over 15 minutes, 150 mcg/kg (max. 8 mg) immediately before chemotherapy repeated at intervals of 4 hours for 2 further doses, then for body weight 10 kg or less 2 mg oral every 12 hours for up to 5 days; for body weight over 10 kg, 4 mg oral every 12 hours for up to 5 days, maximum total daily dose 32 mg  **Prevention of postoperative nausea and vomiting**  **Child 6 month–18 years:** By slow IV injection over at least 30 seconds21, 100 mcg/kg (max. 4 mg) before, during, or after induction of anaesthesia  **Treatment of postoperative nausea and vomiting,** by IMor slow IV injection  **Child 6 month–18 year**s: By slow IV injection over atleast 30 seconds, 100 mcg/kg (max. 4 mg)  *Note: Use only in children aged >6 months* |
| Contraindications | Hypersensitivity to the drug and other5-HT3 antagonists |
| Drug interactions | Apomorphine, CYP3A4-inducers (such as aminoglutethimide, carbamazepine, nafcillin, nevirapine, phenobarbital, phenytoin, and rifampicin), tramadol, amiodarone, artemether + lumefantrine, azole antifungals, macrolides. |
| Side effects | Constipation, headache, transient rise in hepatic aminotransferases, hypersensitivity reactions (including anaphylaxis), fatigue, fever, anxiety. |
| Cautions | Sub-acute intestinal obstruction, adenotonsillar surgery, cardiac rhythm or conduction disturbances, in patients treated with anti-arrhythmic agents or beta-adrenergic blocking agents, in patients with significant electrolyte disturbance, hepatic impairment, pregnancy, breastfeeding |
| Storage condition | Store below 30 oC. |
| **Prednisolone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Tablet: 5 mg |
| Indications | Suppression of inflammatory and allergic disorders, inflammatory bowel disease, asthma, rheumatic disease, for the treatment of adrenocortical insufficiency and as immune suppression. |
| Dose and administration | **Suppression of inflammatory and allergic disorders**, oral:  **Adult:** Initially up to 10–20 mg daily (severe disease, up to 60 mg daily), preferably taken in the morning after breakfast; dose can often be reduced within a few days, but may need to be continued for several weeks or months; maintenance, 2.5–15 mg daily or higher, cushingoid features are increasingly likely with doses above 7.5 mg daily  **Ulcerative colitis and Crohn’s disease**, oral:  **Adult:** Initially 20–40 mg daily until remission occurs, followed by reducing doses, up to 60 mg daily, may be used in some cases, doses preferably taken in the morning after breakfast  **Mild to moderate acute asthma, severe or life-threatening**  **acute asthma,** oral:  **Adult:** 40–50 mg daily for at least 5 days  **Suppression of inflammatory and allergic disorders, oral:**  **Infant or child**: 1–2 mg/kg once daily (usual maximum 60 mg), reducing after a few days if appropriate; increased frequency may be required in certain clinical indications  **Mild to moderate acute asthma, Severe or life-threatening**  **acute asthma,** oral:  **Child 1 month–11 years**: 1–2 mg/kg once daily (max. Per dose 40 mg) for up to 3 days, longer if necessary  **Child 12–17 years**: 40–50 mg daily for at least 5 days |
| Contraindications | Hypersensitivity to the drug, untreated systemic infection, live vaccines, herpes simplex keratitis, uncontrolled psychosis |
| Drug interactions | Acetylsalicylic acid, amphotericin B, carbamazepine, ciclosporin, oral contraceptives, digoxin, enalapril, erythromycin, furosemide, hydrochlorothiazide, insulins, phenobarbital, phenytoin, propranolol, rifampicin, ritonavir, spironolactone, infuenza vaccine, live vaccines, warfarin. |
| Side effects | Nausea, increased susceptibility to infection, diarrhoea, sodium and water retention, oedema, hypertension, hypokalemia, hyperglycemia, increased appetite, dizziness, dyslipidaemia, lipomatosis, protein catabolism, scleroderma renal crisis, dyspepsia, delayed wound healing, bruising, acne, psychiatric effects, hypersensitivity reactions including anaphylaxis. |
| Cautions | Viral infections, recent myocardial infarction (MI), congestive heart failure, renal impairment, hepatic impairment, diabetes mellitus, osteoporosis, glaucoma, corneal perforation, epilepsy, psoriasis, peptic ulcer, hypothyroidism, history of steroid associated myopathy. |
| Storage condition | Store below 30 0C. |

# Medicines for Neurological Disorders

[Drugs for neurological disorders are **medications that affect the brain and nervous system**](https://www.bing.com/ck/a?!&&p=14fa5b0251b7a07bJmltdHM9MTcxNzYzMjAwMCZpZ3VpZD0zMjk0MTEyYy03MzAzLTY0Y2EtMDBmZS0wNWJhNzJiNzY1NjkmaW5zaWQ9NTc5Ng&ptn=3&ver=2&hsh=3&fclid=3294112c-7303-64ca-00fe-05ba72b76569&psq=Medicines+for+Neurological+Disorders&u=a1aHR0cHM6Ly93d3cucHN5Y2hndWlkZXMuY29tL25ldXJvbG9naWNhbC1kaXNvcmRlcnMvdHJlYXRtZW50Lw&ntb=1). [They may be used to treat various conditions, such as schizophrenia, epilepsy, multiple sclerosis, Parkinson's disease, Alzheimer’s disease, depression, migraine, and insomnia](https://www.bing.com/ck/a?!&&p=22965ce308953e4eJmltdHM9MTcxNzYzMjAwMCZpZ3VpZD0zMjk0MTEyYy03MzAzLTY0Y2EtMDBmZS0wNWJhNzJiNzY1NjkmaW5zaWQ9NTgwMQ&ptn=3&ver=2&hsh=3&fclid=3294112c-7303-64ca-00fe-05ba72b76569&psq=Medicines+for+Neurological+Disorders&u=a1aHR0cHM6Ly93d3cucHN5Y2hndWlkZXMuY29tL25ldXJvbG9naWNhbC1kaXNvcmRlcnMvdHJlYXRtZW50Lw&ntb=1). [Some examples of neurological drugs are neuroleptics, corticosteroids, dopamine-affecting drugs, antidepressants, beta blockers, antimigraine and antiseizure medicines.](https://www.bing.com/ck/a?!&&p=75111b6a620defdaJmltdHM9MTcxNzYzMjAwMCZpZ3VpZD0zMjk0MTEyYy03MzAzLTY0Y2EtMDBmZS0wNWJhNzJiNzY1NjkmaW5zaWQ9NTgwNg&ptn=3&ver=2&hsh=3&fclid=3294112c-7303-64ca-00fe-05ba72b76569&psq=Medicines+for+Neurological+Disorders&u=a1aHR0cHM6Ly93d3cucHN5Y2hndWlkZXMuY29tL25ldXJvbG9naWNhbC1kaXNvcmRlcnMvdHJlYXRtZW50Lw&ntb=1)

## Antiseizure medicines

Antiseizure medicines (antiepileptic drugs) are medicine used to prevent the occurrence of seizure. Anti-epileptic drugs (AEDs) are numerous. There are a variety of mechanisms of action, and some AEDs possess multiple mechanisms of action. Some AEDs act on the sodium channels by either blocking their repetitive activation (phenytoin, carbamazepine) or by enhancing their slow inactivation (lacosamide). Others work on calcium channels by blocking either T-type calcium channels (ethosuximide, valproic acid) or the N- and L-type calcium channels (zonisamide). Lamotrigine works by blocking sodium channels, blocking N- and L-type calcium channel, and modulating H-current. Topiramate works by blocking sodium channels, alpha-amino-3-hydroxy-5-methyl-4-isoxazole propionic acid (AMPA) receptors, and by inhibiting carbonic anhydrase. Other mechanisms through which AEDs act are by enhancing gamma-aminobutyric acid (GABA)-A receptors (phenobarbital, benzodiazepines), blocking N-methyl-D-aspartic acid (NMDA) receptors (felbamate), and opening neuronal potassium channels (ezogabine).

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| **Carbamazepine** | |
| Pharmacological class | Anticonvulsant |
| Dosage form | Tablet(chewable): 100mg, 200mg  Tablet(scored):100mg, 200mg, 400mg  **Oral** liquid:100mg/5ml |
| Indications | Partial and secondary generalized tonic-clonic seizures, primary generalized seizures, trigeminal neuralgia, prophylaxis of bipolar disorder unresponsive to lithium, diabetic neuropathy. |
| Dose and Administration | **Partial and secondary generalized tonic-clonic seizures, and primary generalized seizures,** oral:  **Adult:** Initially, 100–200 mg 1–2 times a day, increased in steps of 100–200 mg every 2 weeks; usual dose 800mg–1200g daily in divided doses; increased, if necessary, up to 1.6–2 g daily in divided doses.  **Elderly:** Reduce initial dose  **Trigeminal neuralgia,** oral:  **Adult:** Initially 100 mg 1–2 times a day, some patients may require higher initial dose, increase gradually according to response; usual dose 200 mg 3–4 times a day, increased, if necessary, up to 1.6 g daily.  **Prophylaxis of bipolar disorder unresponsive to lithium, oral:**  **Adult:** Initially 400mg daily in divided doses increased until symptoms controlled; usual range 400 - 600mg daily; max. 1.6 g daily.  **Diabetic neuropathy,** oral:  **Adult:** Initially 100 mg 1–2 times a day, increased gradually according to response; usual dose 200 mg 3–4 times a day, increased, if necessary, up to 1.6 g daily.  **Focal and generalized tonic-clonic seizures,** oral:  **Child 1 month–11 years:** Initially 5 mg/kg once daily, dose to be taken at night, alternatively initially 2.5 mg/kg twice daily, then increased in steps of 2.5–5 mg/kg every 3–7 days as required; maintenance dose of 5 mg/kg 2–3 times a day, increased, if necessary, up to 20 mg/kg daily. |
| Contraindications | Hypersensitivity to the drug or tricyclic compounds, atrioventricular conduction abnormalities, bone marrow suppression, porphyria, MAOIs use within the last 14 days and concomitant use, pregnancy (first trimester), co-administration with nefazodone, co-administration with NNRTIs, jaundice (hepatitis). |
| Drug interactions | Amiodarone, cyclosporine, clomipramine, estrogens, progestogens, dexamethasone, doxycycline, erythromycin, ethosuximide, fluoxetine, furosemide, haloperidol, hydrochlorothiazide, hydrocortisone, protease inhibitors, isoniazid, levonorgestrel, levothyroxine, lithium, lopinavir, ketoconazole, mebendazole, medroxyprogesterone, mefloquine, miconazole, nelfinavir, nifedipine, norethisterone, phenobarbital, praziquantel, prednisolone, spironolactone, valproic acid, vecuronium, warfarin. |
| Side effects | Dizziness, drowsiness, dry oral, eosinophilia, fatigue, fluid imbalance, gastrointestinal discomfort, headache, hyponatremia, leucopenia, movement disorders, nausea, oedema, skin reactions, thrombocytopenia, vision disorders, vomiting, weight increased. |
| Cautions | Dermatologic reactions (toxic epidermal necrolysis and Stevens-Johnson syndrome), breastfeeding, pregnancy, liver or kidney dysfunction, increased intraocular pressure, history of cardiac damage, elderly patients, glaucoma, idiopathic epilepsy, history of aplastic anemia, agranulocytosis, abrupt discontinuation, risk of suicidal thoughts or behaviors. |
| Storage condition | Store below 300C. Protect from light. |
| **Clonazepam** | |
| Pharmacological class | Benzodiazepine |
| Dosage form | Tablet: 0.5mg, 1mg, 2mg  Syrup: 2mg/5ml |
| Indications | All forms of epilepsy |
| Dose and administration | **Adult:** Initially 1 mg once daily for 4 nights, dose to be increased over 2–4 weeks, usual dose 4–8 mg daily, adjusted according to response, dose usually taken at night; may be given in 3–4 divided doses if necessary.  **Elderly**: Initially 500 mcg once daily for 4 nights, dose to be increased over 2–4 weeks, usual dose 4–8 mg daily, adjusted according to response, dose usually taken at night; may be given in 3–4 divided doses if necessary.  **Child 1–11 months:** Initially 250 mcg once daily for 4 nights, dose to be increased over 2–4 weeks, usual dose 0.5–1 mg daily, dose to be taken at night; may be given in 3 divided doses if necessary.  **Child 1–4 years:** Initially 250 mcg once daily for 4 nights, dose to be increased over 2–4 weeks, usual dose 1–3 mg daily, and dose to be taken at night; may be given in 3 divided doses if necessary.  **Child 5–11 years:** Initially 500 mcg once daily for 4 nights, dose to be increased over 2–4 weeks, usual dose 3–6 mg daily, and dose to be taken at night; may be given in 3 divided doses if necessary.  *Note: The effectiveness of clonazepam may decrease significantly after weeks or months of continuous therapy.* |
| Contraindications | Hypersensitivity to to the drug and other benzodiazepines, severe liver disease, acute narrow angle glaucoma, respiratory depression, acute pulmonary insufficiency, current drug and alcohol abuse. |
| Drug interactions | Acetazolamide, alcohol, carbamazepine, phenobarbital, phenytoin, ritonavir. |
| Side effects | Somnolence, alopecia, bronchial secretion increased (in children), depression, dizziness, fatigue, concentration impaired, coordination abnormal, drooling (in children), gastrointestinal disorder, hypersalivation (in children), incomplete precocious puberty (in children), increased risk of fall (in adults), increased risk of fracture (in adults), muscle tone decreased, nystagmus, psychotic disorder, seizures, sexual dysfunction, skin reactions, speech impairment, suicidal behaviors, upper respiratory infection, urinary incontinence. |
| Cautions | Acute porphyria, airways obstruction, brain damage, cerebellar ataxia, depression, sleep apnea, open-angle glaucoma, renal/hepatic disease, spinal ataxia, suicidal ideation, breast feeding. |
| Storage condition | Store below 30oC. |
| **Diazepam** | |
| Pharmacological class | Benzodiazepine |
| Dosage form | Rectal gel: 5 mg/ml in 0.5 ml, 2 ml, 4 ml rectal delivery system.  Rectal solution: 2 mg/ml in 1.25 ml, 2.5 ml rectal tube; 4 mg/ml in 2.5 ml rectal tube.  Injection: 5mg/1ml |
| Indications | Status epilepticus, febrile convulsions |
| Dose and administration | **Status epilepticus**and**febrile convulsions,** by IV injection**:**  **Adult:** 10 mg, then 10 mg after 10 minutes if required, administered at a rate of 1ml (5 mg) per minute.  **Neonate:** 300–400 mcg/kg, then 300–400 mcg/kg after 10 minutes if required, to be given over 3–5 minutes.  **Child 1 month–11 years:** 300–400 mcg/kg (max. per dose 10 mg), then 300–400 mcg/kg after 10 minutes if required, to be given over 3–5 minutes  **By rectum:**  **Adult**: 10–20 mg, then 10–20 mg after 5–10 minutes if required  **Elderly:** 10 mg, then 10 mg after 5–10 minutes if required  **Neonate**: 1.25–2.5 mg, then 1.25–2.5 mg after 5–10 minutes if required.  **Child 1 month–1 year:** 5 mg, then 5 mg after 5–10 minutes if required  **Child 2–11 years:** 5–10 mg, then 5–10 mg after 5–10 minutes if required |
| Contraindications | Hypersensitivity to the drug, acute narrow-angle glaucoma and open-angle glaucoma, chronic psychosis (in adults), CNS depression, compromised airway, hyperkinesis, respiratory depression, injections containing benzyl alcohol (neonates) |
| Drug interactions | Amitriptyline, chlorpheniramine, chlorpromazine, cimetidine, clarithromycin, codeine, enalapril, erythromycin, furosemide, fentanyl, haloperidol, halothane, isoniazid, ketamine, ketoconazole, mifepristone, morphine, nitrous oxide, phenytoin, rifampicin, ritonavir, spironolactone, thiopental, CYP3A4 inhibitors/inducers, CNS depressants. |
| Side effects | Appetite abnormal, concentration impaired, gastrointestinal disorder, movement disorders, muscle spasms, palpitations, sensory disorder, vomiting, constipation, diarrhoea, hypersalivation, speech slurred |
| Cautions | Concomitant use with opioids, muscle weakness, organic brain changes, parenteral administration |
| Storage condition | Store below 300C. Protect from light. |
| **Ethosuximide** | |
| Pharmacological class | Anticonvultant |
| Dosage form | Capsule: 250 mg.  **Oral** liquid: 250 mg/5 ml |
| Indications | Absence seizure, myoclonic seizure |
| Dose and administration | **Adult:** Initially 500 mg daily in 2 divided doses, then increased in steps of 250 mg every 5–7 days; usual dose 1–1.5 g daily in 2 divided doses, increased, if necessary, up to 2 g daily  **Child**: **1 month–5 years**: Initially 5 mg/kg twice daily (max. per dose 125 mg), dose to be increased every 5–7 days; maintenance 10–20 mg/kg twice daily (max. per dose 500 mg), total daily dose may rarely be given in 3 divided doses  **Child: 6–12 years**: Initially 250 mg twice daily, then increased in steps of 250 mg every 5–7 days; usual dose 500–750 mg twice daily, increased, if necessary, up to1 g twice daily*)*  **Oral Liquid:**  **Adults, elderly patients and children over 6 years of age:** start at a daily dose of 500 mg. Depending on the patient's tolerance, the dose is increased every five to seven days in increments of max. 250 mg until the seizures are controlled by a daily dose of 1000-1500 mg. In an individual case, a daily dose of 2000 mg, taken in several single doses, may be required.  Child under 2 years: start at a daily dose of 125 mg (2.5 ml). The dose is increased gradually in small increments every few days until the fits are controlled.  **Child between 2 and 6 years**: start at a daily dose of 250 mg (5 ml). The dose is increased gradually in small increments every few days until the fits are controlled. The optimum daily dose for most children is 20 mg/kg. The maximum daily dose is 1000 mg. |
| Contraindications | Hypersensitivity to the drug or other succinimides. |
| Drug interactions | Other antiepileptics, CNS depressants, alcohol, mifepristone. |
| Side effects | Gastrointestinal disturbances, aggression, agranulocytosis, blood disorder, bone marrow disorders, concentration impaired, depression, dizziness, drowsiness, erythema nodosum, fatigue, generalized tonic-clonic seizure, headache, hiccups, leucopenia, libido increased, lupus-like syndrome, mood altered, movement disorders, nephrotic syndrome, psychosis, rash, sleep disorders, Stevens-Johnson syndrome, vaginal hemorrhage, vision disorders. |
| Cautions | Hepatic or renal impairment, thrombocytopenia, acute porphyria, abrupt discontinuation, risk of suicidal behaviors, breastfeeding |
| Storage condition | Store below 300C. |
| **Lamotrigine** | |
| Pharmacological class | Anticonvulsant |
| Dosage form | Tablet: 25 mg, 50 mg, 100 mg, 200 mg.  Tablet (chewable, dispersible): 2 mg, 5 mg, 25 mg, 50 mg, 100 mg, 200mg |
| Indications | Focal seizure, primary or secondary generalized tonic-clonic seizure, seizures associated with Lennox Gastaut syndrome |
| Dose and administration | **Generalized tonic-clonic seizure, focal seizure**, **seizures associated with Lennox Gastaut syndrome:**  **Adult**: Initially 25 mg once daily for 14 days, then increased to 50 mg once daily for further 14 days, then increased in steps of up to 100 mg every 7–14 days; maintenance 100–200 mg daily in 1–2 divided doses; increased, if necessary, up to 500 mg daily, dose titration should be repeated if restarting after interval of more than 5 days.  **For use as adjunctive therapy for treatment-resistant partial or generalized seizures, focal seizures with valproate, primary and secondary generalized tonic-clonic seizures with valproate, seizures associated with Lennox Gastaut syndrome with valproate:**  **Child 2–11 years (body-weight up to 13 kg):** Initially 2 mg once daily on alternate days for first 14 days, then 300 mcg/kg once daily for further 14 days, then increased in steps of up to 300 mcg/kg every 7–14 days; maintenance1–5mg/kg daily in 1–2 divided doses, dose titration should be repeated if restarting after interval of more than 5 days; maximum 200 mg per day.  **Child 2–11 years (body-weight 13 kg and above):** Initially 150 mcg/kg once daily for 14 days, then 300 mcg/kg once daily for further 14 days, thenincreased in steps of up to 300 mcg/kg every 7–14 days; maintenance1–5mg/kg daily in 1–2 divided doses; dose titration should be repeated if continued. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Antidepressant, antiepileptics, antimalarials, barbiturates, oral contraceptives, paracetamol, ritonavir, and desmopressin. |
| Side effects | Aggression, agitation, arthralgia, diarrhea, dizziness, drowsiness, dry mouth, fatigue, headache, irritability, nausea, pain, rash, sleep disorders, diplopia, ataxia, blurred vision, rhinitis, somnolence |
| Cautions | Seizure, Parkinson’s disease, blood disorders, renal impairment, hepatic impairment, CNS depression, arrhythmia, abrutwithdrawal, risk of serious rash |
| Storage condition | Store below 30°C |
| **Levetiracetam** | |
| Pharmacological class | Anticonvulsant |
| Dosage form | Oral solution: 100 mg/ml  Tablet: 250 mg, 500 mg, 750 mg, 1000 mg. |
| Indications | Monotherapy of focal seizures with or without secondary generalization, adjunctive therapy of focal seizures with or without secondary generalization |
| Dose and administration | **Monotherapy of focal seizures with or without secondary generalization, by oral route:**  **Adult**: Initially 250 mg once daily for 1–2 weeks, then increased to 250 mg twice daily, then increased in steps of 250 mg twice daily (max. per dose 1.5 g twice daily), adjusted according to response, dose to be increased every 2 weeks.  **Adjunctive therapy of focal seizures with or without secondary generalization:**  **Adult**: Initially 250 mg twice daily, then increased in steps of 500 mg twice daily (max. per dose 1.5 g twice daily), dose to be increased every 2–4 weeks.  **Child1–5 months**: Initially 7 mg/kg once daily, then increased in steps of up to 7 mg/kg twice daily (max. per dose 21 mg/kg twice daily), dose to be increased every 2 weeks.  **Child 6 months–17 years (body-weight up to 50 kg)**: Initially 10 mg/kg once daily, then increased in steps of up to 10 mg/kg twice daily (max. per dose 30 mg/kg twice daily), dose to be increased every 2 weeks. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Methotrexate, codeine |
| Side effects | Anxiety, decreased appetite, asthenia, abnormal behavior, cough,depression, diarrhea, dizziness, drowsiness, GI discomfort, headache, increased risk of infection, insomnia, mood altered, movement disorders, nausea, skin reactions, vertigo, vomiting, alopecia, impaired concentration, confusion, hallucination, leukopenia, muscle weakness, myalgia, paraesthesia, psychotic disorder, suicidal tendencies, thrombocytopenia, vision disorders, weight changes, acute kidney injury, agranulocytosis, hepatic disorders, hyponatremia, neutropenia, pancreatitis,pancytopenia, personality disorder, rhabdomyolysis, abnormal thinking |
| Cautions | Abrupt discontinuation, renal impairment, hepatic impairment, elderly, driving or operating machinery, risk of suicidal thoughts or behaviors, pregnancy, lactation |
| Storage condition | * Store below 30°C. |
| **Lorazepam** | |
| Pharmacological class | Benzodiazepine |
| Dosage form | Tablet (sublingual): 1mg, 2mg  Injection: 1mg, 4mg |
| Indications | Status epilepticus, febrile convulsions |
| Dose and administration | **Adult**: IV, 4 mg for 1 dose, then 4 mg after 5–10 minutes if required for 1 dose, to be administered into a large vein.  **Child 1 month–11 years**: IV,100 mcg/kg (max. per dose 4 mg) for 1 dose, then 100 mcg/kg after 5–10 minutes (max. per dose 4 mg) if required for1 dose, to be administered into a large vein. |
| Contraindications | Hypersensitivity to the drug or other benzodiapenes, respiratory depression, acute pulmonary insufficiency, sleep apnoea syndrome, severe hepatic impairment, myasthenia gravis, phobic or obsessional states, depression or anxiety with depression, acute narrow-angle glaucoma |
| Drug interactions | Alcuronium, vecuronium, nifedipine, IV magnesium sulphate, suxamethonium, metronidazole, theophylline, valproic acid, clozapine, alcohol or central nervous system depressants, oral contraceptives, rifampicin, digoxin |
| Side effects | Fatigue, hypotension, ataxia, respiratory depression, sedation, confusion, depression, headache, nausea, tremor, urinary retention, vertigo, withdrawal syndrome, bradycardia, dependence or abuse, anterograde amnesia, propylene glycol toxicity |
| Cautions | Muscle weakness, organic brain changes, renal impairment, breast feeding, hepatic impairment, primary depressive disorder or psychosis. |
| Storage condition | Store below 30°C. |
| **Magnesium sulphate** | |
| Pharmacological class | Mineral/electrolyte, anticonvulsant |
| Dosage form | Injection: 0.5 g/ml in 2 ml ampoule (equivalent to 1 g in 2 ml; 50% weight/volume); 0.5 g/ml in 10 ml ampoule (equivalent to 5 g in 10 ml; 50% weight/volume |
| Indications | Prevention and treatment of recurrent seizures in eclampsia, as seizure prophylaxis in severe pre-eclampsia |
| Dose and administration | **Adult:** Initially 4 g, to be given over 5–15 minutes, followed by (by IV infusion) 1 g/hour for 24 hours, if seizure occurs, give an additional dose of2-4 g by IV injection over 5–15 minutes.  **Dilution and administration**: For IV injection, the concentration of magnesium sulphate should not exceed 20% (dilute 1 part of magnesium sulphate injection, 50%, with at least 1.5 parts of water for injection), for IM injection, mix magnesium sulphate injection, 50%, with 1 ml lidocaine injection, 2%. |
| Contraindications | Hypersensitivity to the drug, myocardial damage, diabetic coma, heart block, hypermagnesemia, hypercalcemia, severe renal impairment. |
| Drug interactions | Nifedipine, suxamethonium, vecuronium, dolutegravir, alphacalcidole, bisphononates, gapapentin, levothyroxine, phosphate supplements, tetracyclines, quinolones. |
| Side effects | Hypermagnesemia, nausea, vomiting, thirst, flushing of skin, hypotension, arrhythmias, respiratory depression, drowsiness, confusion, less of tendon reflexes, muscle weakness, coma |
| Cautions | Myasthenia gravis, hepatic impairment, renal impairment |
| Storage condition | Store below 30°C. |
| **Midazolam** | |
| Pharmacological class | Benzodiazepines |
| Dosage form | Solution for oromucosal administration: 5 mg/ml in 0.5 ml, 1 ml, 1.5 ml, 2 ml pre-filled syringe; 10 mg/ml in 0.25 ml, 0.5 ml, 0.75 ml, 1 ml pre-filled syringe.  Injection: 1 mg/ml in 5 ml vial; 5 mg/ml in 1 ml or 3 mlvial |
| Indications | Status epilepticus, febrile convulsions, convulsions in palliative care. |
| Dose and administration | **Status epilepticus: by buccal administration**  **Adult**: 10 mg, then 10 mg after 10 minutes if required  **Status epilepticus, febrile convulsions**: by buccal administration  **Child 1–2 months**: 300 mcg/kg (max. per dose 2.5 mg), then 300 mcg/kg after 10 minutes (max. per dose 2.5 mg) if required  **Child 3–11 months**: 2.5 mg, then 2.5 mg after 10 minutes if required  **Child 1–4 years**: 5 mg, then 5 mg after 10 minutes if required  **Child 5–9 years**: 7.5 mg, then 7.5 mg after 10 minutes if required  **Convulsions in palliative care**, SC:  **Adult**: Initially 20–40 mg/24 hours |
| Contraindications | Hypersensitivity to the drug, acute narrow angle glaucoma, acute alcohol intoxication, shock, lactation, concurrent use with protease inhibitors. |
| Drug interactions | * Alcohol, antihistamines, diltiazem, verapamil, clarithromycin, erythromycin, rifampin, CYP3A4 inhibitors (itraconazole, ketoconazole, cimetidine), thalidomide. |
| Side effects | Muscle stiffness, pain, redness, headache, apnoea, nausea, coughing, vomiting, drowsiness, respiratory depression, phlebitis, gastrointestinal disturbances, increased appetite, jaundice, hypotension, bronchospasm, pain at the site of injection. |
| Cautions | Cardiac disease, debilitated patients, hypothermia, hypovolemia, neonates, vasoconstriction, chronic renal failure  *Note: avoid breast feeding for 24hours after administration.* |
| Storage condition | Store below 30°C. |
| **Phenobarbital** | |
| Pharmacological class | Barbiturate |
| Dosage form | Injection: 30 mg/ml or 60 mg/ml, 200 mg/ml  Syrup: 15 mg/5 ml.  Tablet: 15 mg, 30mg, 100 mg. |
| Indications | All forms of epilepsy except absence seizures, pre-operative sedation |
| Dose and administration | **All forms of epilepsyexcept absence seizures, oral**:  **Adult***:* 60–180 mg once daily, dose to be taken at night  **Child:** 5 –8 mg/kg of body weight daily  **Status epilepticus**: **IV (slow):**  **Adult**: 10 mg/kg (max. per dose 1 g).  **Child 1 month–11 years**: Initially 20 mg/kg, then 2.5–5 mg/kg 1–2 times a day.  **Neonate**: Initially 20 mg/kg, then 2.5–5 mg/kg 1–2 times a day.  **Sedation**, **oral**, IV, IM: 30-120 mg per day in 2-3 divided doses (max. 400mg/day)  **Pre-operative sedation**, IM: 100-200 mg 60-90 minutes before surgery. |
| Contraindications | Hypersensitivity to the drug or other barbiturates, hepatic impairment, respiratory depression, porphyria, absence seizures. |
| Drug interactions | Apixaban, artemether + lumefantrine, atazanavir, abacavir, acetazolamide, alcohol, amitriptyline, bortezomib, carbamazepine, cyclosporine, chlarithromycin, clomipramine, oral contraceptives, amlodipine, dasatinib,dexamethasone, dolutegravir, ethosuximide, chlorpromazine, fentanyl, griseofulvin, itraconazole, kanagliflozin,ketoconazole,lamotrigine, lopinavir, metronidazole, pethidine, methodone, methylpredinosolone, praziquantel, verapamil, quinidine, risperidone, rivaroxoban, sofosbuvir, tamoxifen, tenofivir,thyroidpreparations, ticagrelor, tramadol, TCAs, vincristine, warfarin. |
| Side effects | Sedation, mental depression, ataxia, nystagmus, allergic skin reactions including rarely, exfoliative dermatitis, toxic epidermal necrolysis, and SJS (erythema multiforme), paradoxical excitement, restlessness and confusion in the elderly, irritability and hyperactivity in children, megaloblastic anemia, osteomalacia, status epilepticus (on treatment withdrawal), hypotension, shock, laryngospasm and apnoea (with IV injection) and respiratory insufficiency. |
| Cautions | Liver or renal diseases, acute or chronic pain, pregnancy, breast-feeding, driving and operating machines |
| Storage condition | Store below 300C. |
| **Phenytoin** | |
| Pharmacological class | Anticonvulsant |
| Dosage form | Tablet/capsule: 50 mg, 100mg  Suspension:30 mg/5 ml  Powder for injection (sodium): 250 mg in vial  Injection: 50mg/ml in 5ml vial (sodium salt) |
| Indications | Generalized tonic-clonic seizures, partial seizures, status epilepticus |
| Dose and administration | **Generalized tonic-clonic seizures, partial seizures*,*** oral:  **Adult:** Initially 3-4 mg/kg po daily (as a single dose or in 2 divided doses), increased gradually at intervals of 2 weeks as necessary (with plasma- phenytoin concentration monitoring); usual maintenance dose 200 – 500 mg daily.  **Child 1 month to 11 years**: Initially 1.5–2.5 mg/kg twice daily, then adjusted according to response to 2.5–5 mg/kg twice daily (max. per dose 7.5 mg/kg twice daily), dose also adjusted according to plasma phenytoin concentration; maximum 300 mg per day.  **Child 12-17 years**: Initially 75-150 mg twice daily, then adjusted according to response to 150-200mg twice daily (max. per dose 300 mg twice daily), dose also adjusted according to plasma-phenytoin concentration.  **Status epilepticus,** slow IV injection or by IV infusion:  **Adult:** 20mg/kg at rate of not more than 50 mg/minute, as a loading dose; maintenance doses of about 100mg by oral or by slow IV injectionshould be given thereafter at intervals of 6-8 hours, monitored by measurement of plasma concentrations; rates and dose reduced according to weight.  **Child**: 15 mg/kg as loading dose at rate of 1 mg/kg/minute (not exceeding 50 mg/minute).  **Neonate**: 15-20 mg/kg as a loading dose at rate of 1-3 mg/kg/minute. |
| Contraindications | Cardiac function impairment, such as Adams- stokes syndrome, second- and third-degree AV block, sinoatrial block, and sinus bradycardia (parenteral administration), acute porpyrias |
| Drug interactions | Chloramphenicol, antituberculosis agents (isoniazid), amiodarone, corticosteroids, cimetidine, calcium, diazoxide (oral), antacids, anticoagulants (coumarin – or indandione – derivative), diazepam, disulfiram, contraceptives, fluconazole, itraconazole, ketoconazole, miconazole, felbamate, fluoxetine, lidocaine, methadone, sucralfate, valproic acid, theophylline, abacavir, erythromycin, alcohol, acetazolamide, acetylsalicylic acid, alcuronium, amitriptyline amlodipine, azathioprine, bleomycin, carbamazepine, phenobarbital, chlorambucil, chloroquine, valproic acid, CNS depressants. |
| Side effects | Agranulocytosis, gingival hyperplasia, folic acid depletion, rash, bone disorders, gastric intolerance, headache, sleeplessness, agitation (during initial phase), sedation, confusion, blurred vision, ataxia, nystagmus, diplopia, slurred speech, cerebellar-vestibular symptoms, behavioral disorders, dysrhythmia and hypotension (during IV use), hallucinations, hyperglycemia (may be signs of overdose), acne, coarse facies, hirsutism, fever, hepatitis, hypersensitivity reaction, neurological changes including peripheral neuropathy, choreiform movements, impaired cognition. |
| Cautions | Abrupt withdrawal, liver insufficiency, porphyria, diabetes, elderly, pregnancy, breastfeeding, enteral feeding, myocardial insufficiency (heart failure), hypotension, respiratory depression, risk of suicidal thoughts or behaviors.  *Note: discontinue if skin rash occurs.* |
| Storage condition | Store below 30°C. |
| **Valproic acid (sodium valproate)** | |
| Pharmacological class | Anticonvulsant |
| Dosage form | Syrup: 200 mg/5 ml  Tablet (crushable): 100 mg.  Tablet (enteric-coated): 200 mg, 500 mg |
| Indications | All forms of epilepsy, treatment and prevention of mania associated with bipolar disorders, migraine prophylaxis. |
| Dose and administration | **Epilepsyoral:**  **Adult:** Initially 600 mg daily in 2–4divided doses, then increased in steps of 150–300 mg every 3 days; maintenance 1–2 g daily in 2-4 divided doses, alternatively maintenance 20–30 mg/kg daily; maximum 2.5 g per day in 2-4 divided doses  **Child1 month–11 years:** Initially 10–15 mg/kg daily in 1–2 divided doses (max. per dose 600 mg); maintenance 25–30 mg/kg daily in 2 divided doses, doses up to 60 mg/kg daily in 2 divided doses may be used in infantile spasms.  **Treatment and prevention of mania associated with bipolar disorders,** oral:  **Adult**: The recommended initial dose is 750mg/day in 2-3 divided doses. The dose should be increased as rapidly as possible to achieve the lowest therapeutic dose, which produces the desired clinical effects. The recommended maintenance dosage for the treatment of bipolar disorder is between 1g and 2g daily, adjusted according to response, doses greater than 45mg/kg daily require careful monitoring.  **Migraine prophylaxis**, oral:  **Adults**: Initially 250 mg twice daily, then increased if necessary to 1g daily in divided doses. |
| Contraindications | Acute porphyria, personal or family history of severe hepatic dysfunction, urea cycle disorders (risk of hyperammonemia), mitochondrial disorders |
| Drug interactions | Acetazolamine, amitriptyline, carbamazepine, carbapenem antibiotics (imipenem, meropenem), chloroquine, chlorpromazine, cimetidine, clomipramine, ethosuximide, fluphenazine, haloperidol, mefloquine, phenobarbital, phenytoin, zidovudine and acetylsalicylic acid. |
| Side effects | Abdominal pain, agitation, alopecia, anemia, behaviorabnormal, concentration impaired, confusion, deafness, diarrhoea, drowsiness, hemorrhage, hallucination, headache, hepatic disorders, hypersensitivity, hyponatremia, memory loss, menstrual cycle irregularities, movement disorders, nail disorder, nausea, nystagmus, oral disorders, seizures, stupor. thrombocytopenia, tremor, urinary disorders, vomiting, weight increased, hepatic dysfunction, pancreatitis, hperammonemia. |
| Cautions | Systemic lupus erythrethematosus, liver dysufunction, pregnancy  *Note: valproate must not be used in women and girls of childbearing potential unless other treatments are ineffective or not tolerated, as judged by an experienced specialist.* |
| Storage condition | Store below 300C. |

## Antiparkinsonian medicines

Antiparkinsonian medicines are medicines used to treat the symptoms of Parkinson’s disease or other conditions of Parkinsonism. The major anti-Parkinson medicines are levodopa, dopamine-receptor agonists, amantadine, and the so-called catechol-O-methyltransferase (COMT) inhibitors, monoamine oxidase B (MAO-B) inhibitors, and muscarinic receptor antagonists. Before starting antiparkinsonian treatment, the patient’s individual circumstances, including symptoms, comorbidities and preferences, should be discussed together with the potential benefits and harms from the different drugs available. Patients and their care givers should be informed about the risk of adverse reactions from antiparkinsonian medicines including psychotic symptoms, excessive sleepiness and sudden onset of sleep with dopamine-receptor agonists, and impulse control disorders with all dopaminergic therapy.

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| **Benztropine** | |
| Pharmacological class | Antimuscarinic drug |
| Dosage form | Tablet: 1mg, 2mg |
| Indications | Parkinson’s disease, drug induced extrapyramidal symptoms (except tardive dyskinesia) |
| Dose and administration | **Parkinson’s disease, drug induced extrapyramidal symptoms (except tardive dyskinesia),** oral:  **Adult:** 0.5–1 mg daily usually at bedtime, titrate dose in 0.5mg increments every five days, maximum 6 mg daily. |
| Contraindications | Hypersensitivity to the drug, children under three years of age, narrow angle glaucoma, tardive dyskinesia |
| Drug interactions | Antipsychotic drugs such as phenothiazine’s or haloperidol, tricyclic antidepressants, glucagon |
| Side effects | Blurred vision, dilated pupils, urinary retention, dysuria, paralytic ileus, constipation, vomiting, nausea, dry oral, confusion, disorientation, memory impairment, visual hallucinations; exacerbation of preexisting psychotic symptoms, nervousness |
| Cautions | Patients with obstructive gastrointestinal disease, patients with a tendency to tachycardia, patients with prostatic hypertrophy. |
| Storage condition | Store below 300C. |
| **Levodopa + Carbidopa** | |
| Pharmacological class | Anti-Parkinson drugs |
| Dosage form | Tablet: 100mg +10mg, 250mg +25mg |
| Indications | All forms of parkinsonism except drug induced parkinsonism. |
| Dose and administration | **Adult:** Initially 100 - 125 mg (expressed as levodopa) 3 - 4 times daily adjusted according to response. Maintenance: 0.75 - 2 g in divided doses. |
| Contraindications | Hypersensitivity to the drug, narrow-angle glaucoma, compensated endocrine, renal or hepatic function, cardiac disorders, psychiatric diseases, undiagnosed skin lesion, melanoma, history of myocardial infarction, residual arrhythmias, convulsive disorders, pregnancy. |
| Drug interactions | Metoclopramide, MAOIs (isocarboxazid, phenelzine, selegiline), procarbazine, linezolid, clonidine, anticholinergics, tricyclic antidepressant, phenothiazines, phenytoin, droperidol, haloperidol, oral iron, isoniazid. |
| Side effects | Anxiety, confusion, nervousness, mental depression, psychotic symptoms, anorexia, nausea and vomiting, diarrhoea, insomnia, agitation, postural hypotension, dizziness, chest pain, tachycardia, arrhythmias, reddish discoloration of urine and other body fluid, dyskinesia, muscle twitching, blepharospasm, gastrointestinal bleeding, development of duodenal ulcer, dark saliva, leukopenia, hemolytic and non-hemolytic anemia, thrombocytopenia, agranulocytosis, angioedema, urticaria, pruritus, paraesthesia, increased libido, dyspnea, alopecia, rash, dark sweat, dark urine. |
| Cautions | Risk of depression with concomitant suicidal tendencies, cardiovascular disease or pulmonary disease, bronchial asthma, hepatic impairment, renal impairment, endocrine disease (Cushing’s syndrome, diabetes mellitus, hyperthyroidism), chronic wide-angle glaucoma, history of convulsion and peptic ulcer, osteomalacia, pheochromocytoma, women of childbearing age |
| Storage condition | Store below 300C. |
| **Trihexyphenidyl (benzhexol)** | |
| Pharmacological class | Antimuscarinic drug |
| Dosage form | Tablet: 2mg, 5mg |
| Indications | Parkinson’s disease, drug induced extrapyramidal symptoms (but not tardive dyskinesia). |
| Dose and administration | **Parkinson’s disease, drug-induced Parkinsonism,** oral**:**  **Adult**: 1 mg daily, then increased in steps of 2 mg every 3–5 days, adjusted according to response; maintenance 5–15 mg daily in 3–4 divided doses (max. 20 mg per day). |
| Contraindications | Hypersensitivity to the drug, children under 3 years, narrow-angle glaucoma, tardive dyskinesias, prostatic enlargement, paralytic ileus, chronic pulmonary disease, sick sinus syndrome, thyrotoxicosis, cardiac failure with tachycardia, myasthenia gravis. |
| Drug interactions | Phenothiazine, TCAs, amantadine, levodopa, metoclopramide, quinidine, clozapine, |
| Side effects | Severe mental disturbances, euphoria, memory loss, confusion, drowsiness, restlessness, hallucinations, excitement, dysphagia, nausea and vomiting, decreased bronchial secretion, dry mouth, blurring of vision, constipation, urinary retention, glaucoma, flushing, rash, tachycardia. |
| Cautions | Autonomic neuropathy, heart disease, hypertension, hepatic or renal disease, hyperthyroidism, pediatric, elderly, potential for abuse, prostatic hypertrophy, psychosis, angle-closure glaucoma, obstructive disease of gastrointestinal or genitourinary, pregnancy and lactation, patients with ileostomy or colostomy, driving or hazardous activities. |
| Storage condition | Store below 30oC. |

## Antimigraine medicines

Antimigraine medicines are used to treat migraine headaches. Antimigraine medicines are divided into two groups: agents that abort an established migraine attack and agents used prophylactically to reduce the number of migraine attacks. Both groups are used to treat the accompanying headache, vomiting, anxiety, and depression. Acute treatment aims to reverse or at least stop the progression of headache. It is most effective when given within 15 minutes of pain onset and when pain is mild. These medications include selective serotonin receptor agonists (triptans), ergot alkaloids, antiemetics, and combination products. Prophylactic medications include beta-blockers, antiseizure medications, TCA (amitriptyline), calcium channel blockers (CCBs), and non-steroidal anti-inflammatory drugs (NSAIDs).

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| **Amitriptyline** | |
| Pharmacological class | Tricyclic antidepressant (TCA) |
| Dosage form | Tablet: 25 mg |
| Indications | Migraine prophylaxis |
| Dose and Administration | **Adult**: Initially 10–25 mg daily, dose to be taken at bedtime, then increased, if tolerated, in steps of 10–25 mg every 3–7 days in 1–2 divided doses; usual dose 25–75 mg daily, dose to be taken at bed time, doses above 100mg should be used with caution (doses above 75 mg should be used with caution in the elderly and in patients with cardiovascular disease), maximum per dose 75 mg |
| Contraindications | Hypersensitivity, arrhythmias, during manic phase of bipolar disorder, heart block, immediate recovery period after myocardial infarction, concurrent use with cisapride, use with MAOIs within 14 days. |
| Drug interactions | Opioids, alcohol, diphenhydramine and other anti-depressants |
| Side effects | Sedation, dry oral, blurred vision (disturbance of accommodation, increased intraocular pressure), constipation, nausea, difficulty in micturition, QT interval prolongation, hypotension, extrapyramidal side effects, anxiety, headache. |
| Cautions | Cardiovascular disease, history of epilepsy, hepatic impairment, thyroid disease, phaeochromocytoma, history of mania, psychoses, or depression, angle closure glaucoma, history of urinary retention, concurrent electroconvulsive therapy, anesthesia (increased risk of arrhythmias and hypotension), renal impairment, diabetes, paralytic ileus. |
| Storage condition | Store below 30 oC. |
| **Ibuprofen** | |
| Pharmacological class | NSAID |
| Dosage form | Tablet: 200mg, 400mg |
| Indications | Acute attack of migraine. |
| Dose and administration | **Adult**: 400 to 600 mg po for 1 dose, to be taken as soon as migraine symptoms develop, increase if necessary up to 600 mg 4 times a day.  **Infant or child over 3 months**: 5 to 10 mg/kg po three or four times daily, maximum dose is 40 mg/kg/day |
| Contraindications | Hypersensitivity to the drug or any other NSAIDs, gastro-intestinal bleeding, gastro-intestinal ulceration, gastro-intestinal bleeding/perforation due to NSAID therapy, severe heart failure, varicella infection, severe renal failure, and hepatic failure |
| Drug interactions | Acetylsalicylic acid, ciclosporin, dexamethasone, digoxin, enalapril, fluoxetine, furosemide, heparin, hydrocortisone, levofloxacin, lithium, methotrexate, ofloxacin, penicillamine, phenytoin, prednisolone, propranolol, ritonavir, spironolactone, warfarin, zidovudine, |
| Side effects | GI disturbances including nausea, diarrhea, dyspepsia, ulceration, and hemorrhage, hypersensitivity reactions including rash, angioedema and bronchospasm, headache, dizziness, nervousness, depression, drowsiness, insomnia, vertigo, tinnitus, photosensitivity, haematuria, fluid retention raised blood pressure, renal failure, alveolitis, pulmonary eosinophilia, pancreatitis, visual disturbances, erythema multiforme |
| Cautions | Asthma, cardiac disease, volume depletion, such as in gastroenteritis or dehydration (increased risk of renal impairment), concomitant use of drugs that increase risk of bleeding, previous peptic ulceration, coagulation defects, allergic disorders, elderly, pregnancy, avoid in severe liver disease and moderate to severe hepatic impairment |
| Storage condition | Store at below 300C. Protect from light. |
| **Paracetamol (Acetaminophen)** | |
| Pharmacological class | NSAID |
| Dosage form | Tablet: 500mg |
| Indications | Acute migraine attack |
| Dose and administration | **Adult**, oral: 0.5 to 1 g at first sign of attack, repeated every 4 to 6 hours, if necessary, maximum, 4 g daily  **Paediatric**, oral:  **Infant or child**: 15 mg/kg, up to 1 g, every 4 to 6 hours as necessary, maximum 60 mg/kg in 24 hours |
| Contraindications | Severe hepatic or renal disease |
| Drug interactions | Metoclopramide, warfarin, phenobarbital, alcohol |
| Side effects | Refer toparacetamol under medicine for pain and palliative care |
| Cautions | Hepatic impairment, alcohol dependence, over dosage, malnutrition, long term use, chronic dehydration |
| Storage condition | Store below 300C |
| **Propranolol** | |
| Pharmacological class | Beta blocker |
| Dosage form | Tablet: 20 mg, 40 mg |
| Indications | Prophylaxis of migraine |
| Dose and administration | **Adult**: Initially 80mg daily in divided doses; may be increased by 20-40 mg every 3-4 weeks (max. 160-240mg in divided doses).  **Child over 2 years**: 200–500 mcg/kg threetimes daily, maximum 4 mg/kg daily; usual dose 10–20 mg 2–3 times daily |
| Contraindications | Asthma, COPD, history of bronchospasm, uncontrolled heart failure, marked bradycardia, hypotension, sick sinus syndrome, second- or third-degreeatrioventricular block, cardiogenic shock, metabolic acidosis, severe peripheral arterial disease, phaeochromocytoma, concurrent use with chlorpromazine and thioridazine. |
| Drug interactions | Bupivacaine, chlorpromazine, oral contraceptives, dexamethasone, diazepam, digoxin, enalapril, epinephrine, furosemide, halothane, hydrochlorothiazide, hydrocortisone, ibuprofen, insulins, ketamine, lidocaine, mefloquine, neostigmine, nifedipine, nitrous oxide, prednisolone, procainamide, pyridostigmine, quinidine, rifampicin, sodium nitroprusside, spironolactone, suxamethonium, thiopental, vecuronium, verapamil, beta-blockers, artemether + lumefantrine. |
| Side effects | Nausea, diarrhoea, fatigue, insomnia, nightmares, dyspnoea, bronchospasm, peripheral vasoconstriction, exacerbation of Raynaud syndrome, bradycardia, heart failure, hypotension, conduction disorders, rash, exacerbation of psoriasis, muscle cramp, dry eyes, hypersensitivity reaction, thrombocytopenic purpura, liver function abnormality, alopecia, cardiac arrest, aggravation of congestive heart failure. |
| Cautions | Abrupt withdrawal, first-degree atrioventricular block, portal hypertension, diabetes mellitus, history of obstructive airways disease, renal impairment, liver disease, myasthenia gravis, history of hypersensitivity |
| Storage condition | Store below 300C. |
| **Sumatriptan** |  |
| Pharmacological class | 5-HT1-like receptors agonist |
| Dosage form | Tablet: 25mg, 50mg,100mg |
| Indications | Acute migraines headaches |
| Dose and administration | **Adult:** Initially 50–100 mg for 1 dose, followed by 50–100 mg after at least 2 hours if required, to be taken only if migraine recurs (patient not responding to initial dose should not take second dose for same attack) with food; maximum 200 mg per day. |
| Contraindications | Hypersensitivity to the the drug, coronary vasospasm, ischaemic heart disease, mild uncontrolled hypertension, moderate and severe hypertension, peripheral vascular disease, previous cerebrovascular accident, previous myocardial infarction, previous transient ischaemic attack, prinzmetal’s angina, administration of other 5-HT1 agonists (e.g amlotriptan, zolmitriptan, rizatriptan) within 24 hours, hepatic impairment. |
| Drug interactions | Ergotamine, fluoxetine, paroxetine, sertraline, linezolid, azole antifungals, ondansetron, phenelezine |
| Side effects | Asthenia, dizziness, drowsiness, dyspnoea, feeling abnormal, flushing, myalgia, nausea, pain, sensation abnormal, skin reactions, temperature sensation altered, vomiting, paresthesia, somnolence, warm sensation, sore throat, chest, throat, jaw tightness, worsening of head pain. |
| Cautions | Coronary artery disease, elderly, history of seizures, hypertension, risk factors for seizures, hepatic impairment, pregnancy and breast feeding, operating heavy machinery |
| Storage condition | Store below 300C |

# Medicines Used for Mental and Behavioral Disorders

Medicines for mental and behavioral disorders play a crucial role in managing various psychiatric conditions, including mood disorders, anxiety disorders, psychotic disorders, and substance use disorders. These medications aim to alleviate symptoms, improve functioning, and enhance overall quality of life for individuals affected by these conditions. They encompass a diverse range of pharmacological classes and formulations, each with specific mechanisms of action and therapeutic effects tailored to address the complexities of mental health disorders.

The mechanisms of action of medicines for mental and behavioral disorders vary depending on the specific drug and the disorder being treated. However, many of these medications target neurotransmitter systems in the brain, such as serotonin, dopamine, and norepinephrine, which play key roles in regulating mood, cognition, and behavior. For example, selective serotonin reuptake inhibitors (SSRIs) enhance serotonin levels in the brain, alleviating symptoms of depression and anxiety. Antipsychotic medications act on dopamine receptors to manage symptoms of psychosis, while mood stabilizers help stabilize mood fluctuations by modulating neurotransmitter activity.

Medicines for mental and behavioral disorders are used to treat a wide range of conditions, including depression, anxiety disorders, bipolar disorder, psychotic disorders, attention-deficit hyperactivity disorder (ADHD), and substance use disorders. They are prescribed based on the specific diagnosis, severity of symptoms, individual response to treatment, and considerations of potential side effects. These medications are often an integral component of comprehensive treatment plans, which may also include psychotherapy, lifestyle modifications, and other supportive interventions.

While medicines for mental and behavioral disorders can be highly effective in managing symptoms, they are not without risks and side effects. Common side effects may include nausea, dizziness, insomnia, weight changes, and sexual dysfunction. Additionally, some medications may carry a risk of more serious adverse effects, such as metabolic disturbances, cardiovascular effects, neurological complications, and increased risk of suicidal ideation in certain populations.

## Medicines used for anxiety and sleep disorders

Medications commonly prescribed for anxiety and sleep disorders include diazepam, clomipramine, lorazepam, and fluoxetine. Diazepam and lorazepam belong to the benzodiazepine class and act as anxiolytics and hypnotics by enhancing the effects of gamma-aminobutyric acid (GABA) in the brain, resulting in sedative and calming effects. Clomipramine and imipramine, tricyclic antidepressants, increase levels of serotonin and norepinephrine in the brain, effectively reducing anxiety symptoms over time. Fluoxetine, a selective serotonin reuptake inhibitor (SSRI), works by increasing serotonin levels in the brain, which can alleviate symptoms of anxiety.

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| **Clomipramine** | |
| Pharmacological Class | Tricyclic antidepressant |
| Dosage Form | Tablet: 25 mg, 50 mg |
| Indications | Phobic and obsessional states, panic attacks |
| Dose and Administration | **Adult:**  Initially 50 to 75 mg/day, increased gradually to 150 mg/day if necessary. May be given as a single dose at night or in 2 to 3 divided doses.  **Elderly:** Initially 10 mg/day, increasing carefully to 30-50 mg/day.  **Child 5-7 years:** Initially 10 mg/day, increased gradually to 20 mg  **Child 8-14 years:** 20-50 mg |
| Contraindications | Hypersensitivity to the drug, recent myocardial infarction, arrhythmias, heart block, severe liver disease, porphyria |
| Drug Interactions | Alcohol, artemether + lumefantrine, epinephrine, phenobarbital and phenytoin, ritonavir, carbamazepine, chlorpromazine, ethosuximide, fluphenazine, haloperidol, procainamide, quinidine, valproic acid |
| Side Effects | Sedation, dry mouth, blurred vision, increase in intraocular pressure, constipation, nausea, difficulty in micturition, arrhythmias, postural hypotension, tachycardia, syncope, sweating, tremor, rash, behavioral disturbances, hallucination, hypomania or mania, confusion, interference with sexual function, hyperglycaemia, increased appetite and weight gain, testicular enlargement, hyperprolactinemia breast enlargement, convulsions, movement disorders, dyskinesias |
| Cautions | Cardiac disease, history of epilepsy, pregnancy, breastfeeding, elderly, hepatic impairment, thyroid disease, phaeochromocytoma, history of mania, psychoses, angle-closure glaucoma, history of urinary retention, concurrent electroconvulsive therapy, abrupt withdrawal, anesthesia |
| Storage Condition | Store below 300C. Protect from light. |
| **Diazepam** | |
| Pharmacological Class | Benzodiazepine |
| Dosage Form | Injection: 5 mg/ml in 2 ml ampoule, Syrup: 2 mg/5 ml  Tablet: 2 mg, 5 mg, 10 mg |
| Indications | Short-term treatment of anxiety or insomnia, adjunct in acute alcohol withdrawal, status epilepticus, febrile convulsions, muscle spasm, peri-operative use |
| Dose and Administration | **Adults,** oral**:**  **Anxiety:** 2 mg three times daily, increased, if necessary, up to 15–30 mg daily in divided doses.  **Insomnia associated with anxiety:** 5–15 mg at bedtime.  **Acute alcohol withdrawal:** 10 mg three to four times in the first 24 hours, reducing to 5 mg three to four times daily as needed.  **Muscle spasm:** 2–10 mg three times daily, depending on response.  Injection (IV/IM)**:**  **Status epilepticus:** 10–20 mg IV initially, may repeat after 30–60 minutes, if necessary, followed by oral therapy.  **Acute severe anxiety or muscle spasm:** 5–10 mg IV or IM, can be repeated if necessary (adjust based on clinical response).  **Elderly or debilitated patients** (oral and injection**):**  Use half the adult dose, adjusting based on response and tolerance.  *Note: The maximum duration of use for anxiety/insomnia is 2–4 weeks, including tapering, to prevent dependence and tolerance.* |
| Contraindications | Preexisting CNS depression or coma, acute pulmonary insufficiency, sleep apnoea, severe hepatic impairment, myasthenia gravis, respiratory depression, chronic psychosis or for phobic or obsessional states, avoid injections containing benzyl alcohol in neonates |
| Drug Interactions | Alcohol, antidepressants, antihistamines, antipsychotics, sedative, general anesthetics, other hypnotics, opioid analgesics, fluvoxamine, ketoconazole, nefazodone, zidovudine, aminophylline. |
| Side Effects | Drowsiness and light-headedness the next day, confusion, ataxia, amnesia, dependence, paradoxical increase in aggression, muscle weakness. |
| Cautions | Liver and kidney impairments, muscle weakness, elderly or debilitated patients, respiratory disease, history of alcohol abuse, marked personality disorder, prolonged use, abrupt withdrawal, porphyria pregnancy, breastfeeding |
| Storage Condition | Store below 300C. Protect from light. |
| **Fluoxetine** | |
| Pharmacological class | Selective Serotonin Reuptake Inhibitor (SSRI) |
| Dosage form | Capsule: 20 mg |
| Indications | Depression, anxiety disorders, obsessive-compulsive disorder (OCD), panic disorder, bulimia nervosa |
| Dose and administration | **Adult:**  **Anxiety disorders:** Starting dose is typically 10-20 mg daily, which can be increased to a maximum of 60 mg daily depending on response and tolerability.  **Panic disorder:** Starting dose of 10 mg/day, increased after one week to 20 mg/day. Maximum dose is 60 mg/day.  **Pediatric (7-17 years):** Starting dose is typically 10 mg/day, which can be increased to 20 mg/day after one week. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | MAO inhibitors, pimozide, thioridazine, linezolid, methylene blue, tricyclic antidepressants, lithium, warfarin, antiplatelet drugs, NSAIDs. |
| Side effects | Insomnia, nausea, headache, diarrhea, dry mouth anorexia, anxiety, nervousness, drowsiness, fatigue, sweating, tremor, Sexual dysfunction, hyperglycemia, Seizures, manic episodes, hyponatremia, allergic reactions, QT prolongation. |
| Cautions | History of seizures, mania/hypomania, liver impairment, diabetes, narrow-angle glaucoma, suicidal attempts, pregnancy, breastfeeding. |
| Storage condition | Store below 300C. Protect from light. |
| **Imipramine** | |
| Pharmacological Class | Tricyclic antidepressant (TCA) |
| Dosage Form | Tablet: 10mg, 25mg |
| Indications | Treatment of anxiety disorders, including generalized anxiety disorder (GAD), panic disorder, obsessive-compulsive disorder (OCD) |
| Dose and Administration | **Adult:** Initial dose 25-50 mg 3 times daily, may increase gradually up to 300 mg/day in divided doses.  **Elderly:** Start with lower doses (10-25 mg 3 times daily) and titrate cautiously. |
| Contraindications | Hypersensitivity to the drug or other TCAs, recent myocardial infarction, severe liver disease |
| Drug Interactions | MAOIs, serotonergic drugs (SSRIs, SNRIs, triptans, etc.), alcohol, barbiturates, and other CNS depressants, drugs that prolong QT interval, anticholinergics |
| Side Effects | Dry mouth, constipation, urinary retention, blurred vision, drowsiness, dizziness, tremor, arrhythmias, orthostatic hypotension, seizure |
| Cautions | Cardiovascular disease, bipolar disorder, seizure disorder, angle-closure glaucoma, prostatic hypertrophy, pregnancy, breastfeeding |
| Storage Conditions | Store below 300C. Protect from light. |
| **Lorazepam** | |
| Pharmacological Class | Benzodiazepine |
| Dosage Form | Tablet: 0.5mg, 1 mg  Injection: 1mg/ml, 4mg/ml |
| Indications | Conscious sedation for procedures, short-term use in anxiety or insomnia, status epilepticus, perioperative febrile convulsions. |
| Dose and Administration | **Anxiety,** oral**:**  **Adult:** 1–4 mg daily in divided doses.  **Insomnia associated with anxiety, Oral**:  **Adult:** 1–2 mg at bedtime.  **Acute panic attacks,** IM or slow IV injection (into a large vein):25–30 mcg/kg (usual range 1.5–2.5 mg), repeated every 6 hours if necessary. |
| Contraindications | Hypersensitivity to the drug, acute narrow-angle glaucoma, sleep apnea, intra-arterial injection, severe respiratory insufficiency, pregnancy |
| Drug Interactions | Alcohol, antidepressants, antihistamines, antipsychotics, sedatives, general anaesthetics, opioid analgesics, ketoconazole, zidovudine, aminophylline |
| Side Effects | Drowsiness and light headedness the next day, confusion and ataxia amnesia, dependence, paradoxical increase in aggression, Muscle weakness, headache, vertigo, salivation changes, GI disturbances, visual disturbances, dysarthria, tremor, changes in libido, incontinence, urinary retention, blood disorders, jaundice, skin reactions, raised liver enzymes |
| Cautions | Elderly, liver or kidney impairment, muscle weakness, respiratory disease, history of alcohol abuse, marked personality disorder, prolonged use, abrupt withdrawal, drowsiness, driving, respiratory depression |
| Storage Conditions | Store below 300C. Protect from light. |

## Medicines used for obsessive compulsive disorders

Medications commonly used to treat obsessive-compulsive disorder (OCD) include clomipramine and fluoxetine. Clomipramine, a tricyclic antidepressant, and fluoxetine, a selective serotonin reuptake inhibitor (SSRI), are both effective in reducing the symptoms of OCD by increasing serotonin levels in the brain. These medications are often prescribed in conjunction with cognitive-behavioral therapy (CBT) to provide comprehensive treatment for OCD. Treatment plans are tailored to individual patient needs, considering factors such as symptom severity, comorbid conditions, and medication tolerability. Regular monitoring and adjustments to the medication regimen may be necessary to optimize therapeutic outcomes and minimize side effects.

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| **Clomipramine** | |
| Pharmacological class | Tricyclic antidepressant |
| Dosage form | Tablet/Capsule: 10mg, 25mg |
| Indications | Obsessive-compulsive disorder |
| Dose and Administration | **Adult:** Initial dose typically starts at 25 mg per day, then gradually increases up to 100 mg per day as tolerated, with a maximum daily dose of 250 mg. |
| Contraindications | Refer to clomipramine under medicines used for anxiety and sleep disorders |
| Drug Interactions | Refer to clomipramine under medicines used for anxiety and sleep disorders |
| Side Effects | Refer to clomipramine under medicines used for anxiety and sleep disorders |
| Cautions | Refer to clomipramine under medicines used for anxiety and sleep disorders |
| Storage Condition | Store below 300C. Protect from light. |
| **Fluoxetine** | |
| Pharmacological Class | Selective Serotonin Reuptake Inhibitor (SSRI) |
| Dosage Form | Capsule: 20 mg |
| Indications | Obsessive-compulsive disorder |
| Dose and administration | **Adult:** Initially 20mg once daily, may increase up to 60mg/day based on response and tolerability. |
| Contraindications | Refer to fluoxetine under medicines used for anxiety and sleep disorders |
| Drug Interactions | Refer to fluoxetine under medicines used for anxiety and sleep disorders |
| Side Effects | Refer to fluoxetine under medicines used for anxiety and sleep disorders |
| Cautions | Refer to fluoxetine under medicines used for anxiety and sleep disorders |
| Storage Condition | Store below 300C. Protect from light. |

## Medicines used for mood disorders

Medications for mood disorders encompass a range of pharmacological classes targeting symptoms like depression and bipolar disorder. Common medications include selective serotonin reuptake inhibitors (SSRIs) such as fluoxetine, tricyclic antidepressants like clomipramine, and mood stabilizers such as lithium. These medications aim to rebalance neurotransmitters in the brain, alleviating symptoms and stabilizing mood.

**Medicines used for depressive disorders**

Medications for depressive disorders, such as amitriptyline and fluoxetine, belong to different pharmacological classes but share the goal of alleviating symptoms of depression. Amitriptyline and imipramine are tricyclic antidepressant, work by increasing levels of serotonin and norepinephrine in the brain. Fluoxetine, Sertraline hydrochloride, paroxetine and escitalopram are selective serotonin reuptake inhibitor (SSRI), specifically target serotonin levels.

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| **Amitriptyline** | |
| Pharmacological class | Tricyclic Antidepressant |
| Dosage form | Tablet: 25mg, 50mg |
| Indications | Major depression |
| Dose and Administration | **Adult:** Initially 75 mg daily (25–75 mg, daily in the elderly and adolescents) in divided doses or as a single dose at bedtime, increased gradually to 150–200 mg daily as necessary.  **Paediatric:**  **Child 9 to 12 years:** Initial 1 mg/kg/day in 3 divided doses, after 3 days, dose may be increased to 1.5 mg/kg/day in 3 divided doses.  **Child ≥12 years and adolescent:** 10 mg three times daily and 20 mg at bedtime, maximum daily dose: 200 mg/day. |
| Contraindications | Hypersensitivity to the drug, recent myocardial infarction, arrhythmias (especially heart block), manic phase in bipolar disorders |
| Drug Interactions | MAO inhibitors, SSRIs, anticholinergic drugs, CNS depressants, antihypertensives, alcohol, CYP2D6 inhibitors, antipsychotics, tramadol, warfarin, sympathomimetic agents. |
| Side Effects | Drowsiness, dry mouth, blurred vision, constipation, weight gain, dizziness, urinary retention, orthostatic hypotension, confusion, tachycardia, increased risk of arrhythmias, sexual dysfunction, sweating, headache. |
| Cautions | Cardiovascular disease, history of seizures, hyperthyroidism, bipolar disorder, glaucoma, urinary retention, elderly patients, hepatic impairment, risk of suicidal ideation, abrupt discontinuation. |
| Storage Condition | Store below 300C. Protect from light. |
| **Escitalopram** |  |
| Pharmacological Class | Selective Serotonin Reuptake Inhibitor (SSRI) |
| Dosage Form | Tablet: 5mg, 10mg, 20mg |
| Indications | Treatment of major depressive disorder (MDD), generalized anxiety disorder (GAD) |
| Dose and Administration | **Depression, GAD:**  **Adult:** Initial: 10mg/day, dose may be increased to 20mg/day after at least 1 week.  **Elderly:** 10mg/day, bioavailability and half-life are increased by 50% in the elderly. |
| Contraindications | Hypersensitivity to the drug |
| Drug Interactions | Non-selective MAO inhibitors, Other SSRIs and SNRIs, triptans, linezolid, methylene blue, pimozide, fluconazole, fluvoxamine, gemfibrozil, isoniazid, omeprazole, ciprofloxacin, clarithromycin, erythromycin, doxycycline, protease inhibitors, quinidine, verapamil, NSAIDs, aspirin, carbamazepine, phenytoin, rifampin, nevirapine, phenobarbital |
| Side Effects | Headache, somnolence, insomnia, nausea, dry mouth, increased sweating, chest pain, hypertension, palpitation, dizziness, fatigue, unusual dreams, impaired concentration, fever, irritability, lethargy, lightheadedness, migraine, vertigo, yawning, rash, hot flashes, sexual dysfunction, menstrual cramps, menstrual disorder, diarrhea, constipation, appetite changes, indigestion, abdominal pain, abdominal cramps, flatulence, heartburn, toothache, vomiting, weight changes, urinary tract infection, blurred vision, sinusitis, cough |
| Cautions | Suicidal attempt, previous seizure disorder, glaucoma, cardiac arrhythmias, history of bleeding disorders |
| Storage Condition | Store below 300C. Protect from light. |
| **Fluoxetine** | |
| Pharmacological Class | Selective Serotonin Reuptake Inhibitor (SSRI) |
| Dosage Form | Capsule: 20 mg |
| Indications | Major depression |
| Dose and administration | **Adult:** Initially 20 mg once daily, increased as necessary after 3 weeks to a maximum of 80 mg daily, usual maintenance dose range, 20–60 mg once daily.  **Elderly:** Initially 20 mg once daily, increased as necessary after 3 weeks to a maximum of 60 mg daily, maintenance dose range, 20–40 mg once daily.  **Child 8–12 years:** 10 mg once daily increased after 1–2 weeks if necessary to a maximum of 20 mg once daily |
| Contraindications | Refer to fluoxetine under medicines for insomnia and anxiety disorders |
| Drug Interactions | Refer to fluoxetine under medicines for insomnia and anxiety disorders |
| Side Effects | Refer to fluoxetine under medicines for insomnia and anxiety disorders |
| Cautions | Refer to fluoxetine under medicines for insomnia and anxiety disorders |
| Storage Condition | Store below 300C. Protect from light. |
| **Imipramine** |  |
| Pharmacological class | Tricyclic antidepressant |
| Dosage form | Tablet: 10mg, 25mg |
| Indications | Depression, nocturnal enuresis, chronic pain, panic disorders |
| Dose and administration | **Depression**:  **Adult:** Initially 25mg 3-4 times/day, increase dose gradually, total dose may be given at bedtime, maximum: 300mg/day. **Elderly:** initially 10- 25mg at bedtime, increasing up to 100mg/day as required and if tolerated.  **Nocturnal enuresis:**  **Child 6 - 7 years:** 10 - 25mg given as a single dose after the evening meal  **Child 8 - 11 years:** 25 - 50mg given as a single dose after the evening meal  **Child > 11 years:** 25 - 75mg given as a single dose after the evening meal |
| Contraindications | Refer to imipramine under medicines for insomnia and anxiety disorders |
| Drug interactions | Refer to imipramine under medicines for insomnia and anxiety disorders |
| Side effects | Refer to imipramine under medicines for insomnia and anxiety disorders |
| Cautions | Refer to imipramine under medicines for insomnia and anxiety disorders |
| Storage condition | Store below 300C. Protect from light. |
| **Paroxetine** |  |
| Pharmacological class | Selective Serotonin Reuptake Inhibitor (SSRI) |
| Dosage Form | Tablet: 20mg |
| Indication | Major depression, social anxiety disorder, post-traumatic stress disorder, generalized anxiety disorder |
| Dose and Administration | **Major depression:**  **Adult:** 20 mg daily in the morning; maximum 50 mg per day.  **Elderly:** 20 mg daily in the morning; maximum 40 mg per day. |
| Contraindications | Hypersensitivity to the drug. |
| Drug Interactions | MAOIs, thioridazine, pimozide, neuromuscular blockers, fosamprenavir/ritonavir, procyclidine, anticonvulsants, alcohol, oral anticoagulants, pravastatin, NSAIDs, acetylsalicylic acid, antiplatelet agents |
| Side Effects | Blurred vision, impaired diabetic control |
| Cautions | Achlorhydria or high gastric pH, pregnancy, breastfeeding |
| Storage Condition | Store below 300C. Protect from light. |
| **Sertraline Hydrochloride** | |
| Pharmacological class | Selective Serotonin Reuptake Inhibitor (SSRI) |
| Dosage form | Tablet: 50mg, 100mg |
| Indications | Major depressive disorders |
| Dose and Administration | **Adult:** Initially 50 mg once daily, may be increased in 50 mg increments at intervals of at least one week, up to a maximum of 200 mg/day. |
| Contraindications | Hypersensitivity to the drug. |
| Drug Interactions | MAO inhibitors, pimozide, disulfiram (oral solution), anticoagulants, alcohol, other SSRIs and SNRIs, antipsychotics, CNS depressants, NSAIDs, triptans, lithium, tramadol, warfarin |
| Side Effects | Nausea, diarrhea, insomnia, dry oral, dizziness, fatigue, sexual dysfunction, tremor, increased sweating, seizures, serotonin syndrome, manic episodes, hyponatremia, abnormal bleeding, angle-closure glaucoma, liver enzyme abnormalities |
| Cautions | History of seizures, bipolar disorder, liver or kidney impairment, bleeding disorders, suicidal attempt, pregnancy, breastfeeding |
| Storage Condition | Store below 300C. Protect from light. |

**Medicines used for bipolar disorders**

Bipolar disorder, characterized by episodes of mania and depression, often requires pharmacological intervention to manage symptoms and stabilize mood. Medications commonly prescribed include Carbamazepine, Lithium Carbonate, Sodium Valproate, Olanzapine, and Quetiapine. These drugs work through various mechanisms to regulate neurotransmitters and stabilize mood fluctuations. Lithium Carbonate, a mood stabilizer, is particularly effective in preventing manic and depressive episodes. Sodium Valproate, an anticonvulsant, also helps stabilize mood and prevent mood swings. Olanzapine and Quetiapine, atypical antipsychotics, can be used to treat manic or mixed episodes and help manage symptoms during depressive phases. Carbamazepine, another anticonvulsant, is often utilized for mood stabilization, particularly in cases where other medications are ineffective or poorly tolerated. While these medications offer significant benefits in managing bipolar disorder, they also carry potential side effects and require careful monitoring to optimize treatment outcomes.

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| **Carbamazepine** | |
| Pharmacological Class | Anticonvulsant |
| Dosage Form | Syrup: 100 mg/5 ml  Tablet: 100 mg, 200 mg |
| Indications | Bipolar disorders |
| Dose and Administration | **Adult:** Initially 200 mg twice daily, increased until symptoms are controlled up to a maximum of 1.6 g daily, maintenance dose: 800-1200 mg/day in divided doses.  **Child:** Initial dose 100 mg twice daily, increased gradually by up to 100 mg/day in divided doses until the desired response is achieved, maintenance dose typically 10-20 mg/kg/day in divided doses. |
| Contraindications | Hypersensitivity to the drug, bone marrow depression, acute intermittent porphyria |
| Drug Interactions | MAO inhibitors, nefazodone, voriconazole, certain HIV-protease inhibitors, other anticonvulsants, antipsychotics, anticoagulants, antidepressants, oral contraceptives, corticosteroids, cyclosporine, theophylline, grape fruit juice |
| Side Effects | Dizziness, drowsiness, nausea, vomiting, ataxia, dry oral, constipation, rash, blurred vision, Stevens-Johnson syndrome, toxic epidermal necrolysis, blood dyscrasias, hepatotoxicity, hyponatremia, cardiac arrhythmias, pancreatitis, suicidal thoughts and behavior. |
| Cautions | History of cardiac, hepatic, or renal disease, glaucoma, elderly, skin reactions, blood dyscrasias, pregnancy, breastfeeding |
| Storage Condition | Store below 300C. Protect from light. |
| **Lithium Carbonate** |  |
| Pharmacological class | Mood stabilizer |
| Dosage Form | Tablet: 300 mg |
| Indication | Bipolar disorders |
| Dose and Administration | **Adult:** Initially 1–1.5 g daily, dose adjusted according to serum lithium concentration. Initially given in divided doses, but once-daily administration is preferred when serum lithium concentration stabilized.  **Elderly:** 0.5-g per day, dose adjusted according to serum lithium concentration. |
| Contraindications | Hypersensitivity to the drug |
| Drug Interactions | Carbamazepine, loop diuretics, methyldopa, theophylline, alcohol, ACE inhibitors, antipsychotics, diuretics, NSAIDs, SSRIs, tricyclic antidepressants |
| Side Effects | Arrhythmia, fine hand tremors, GI upset, weight gain, hypothyroidism, nephrogenic diabetes insipidus, bradyarrhythmia, hypotension, electrolyte imbalances |
| Cautions | Renal impairment, cardiac disease, severe debilitation, dehydration, sodium depletion, pregnancy, breastfeeding |
| Storage Condition | Store below 300C. Protect from light. |
| **Olanzapine** |  |
| Pharmacological class | Antipsychotic |
| Dosage form | Tablet: 5mg |
| Indications | Bipolar disorders |
| Dose and Administration | **Adult:** Initially 5-10 mg once daily. Adjust dosage based on response and tolerability, maximum dose: 20 mg/day. |
| Contraindications | Hypersensitivity to the drug |
| Drug Interactions | Clozapine, fluoxetine, ketoconazole, phenytoin, alcohol, antihypertensives, benzodiazepines, carbamazepine, fluvoxamine, rifampicin |
| Side Effects | Weight gain, sedation, increased appetite, dry oral, orthostatic hypotension, hyperlipidemia |
| Cautions | Elderly, hepatic impairment, seizures, cardiovascular disease |
| Storage Condition | Store below 300C. Protect from light. |
| **Quetiapine** |  |
| Pharmacological Class | Atypical antipsychotic |
| Dosage Form | Tablet: 100 mg, 200 mg, 300 mg |
| Indication | Bipolar disorders |
| Dose and Administration | **Treatment of mania in bipolar disorder:**  **Adult:** starting from 50 mg twice daily on day 1, then 100mg twice daily on day 2, 150mg twice daily for day 3, 200mg twice daily for day 4, then adjusted in steps of up to 200 mg daily, adjusted according to clinical response. Usual dose 400mg-800mg in 2 divided doses with a maximum dose of 800mg.  **Treatment of depression in bipolar disorder:**  Adult: 50 mg once daily for day 1, dose to be taken at bedtime, then 100 mg once daily for day 2, then 200 mg once daily for day 3, then 300 mg once daily for day 4, then, adjusted according to response, usual dose 300 mg once daily, the rate of dose titration may need  to be slower and the daily dose lower in elderly patients; maximum 600 mg per day.  **Prevention of mania and depression in bipolar disorder:**  **Adult:** Continue at the dose effective for treatment of bipolar disorder and adjust to lowest effective dose; usual dose 300–800 mg daily in 2 divided doses. |
| Contraindication | Hypersensitivity to the drug. |
| Drug Interactions | Azelastine, cabergoline, carbamazepine, clozapine, metoclopramide, ketoconazole, phenytoin, ondansetron, alcohol, haloperidol, lithium, antidiabetic agents. |
| Side Effects | Somnolence, dizziness, headache, dry mouth, withdrawal symptoms, dyslipidemia, weight gain, decreased haemoglobin. |
| Cautions | Cerebrovascular disease, elderly, aspiration pneumonia, age under 25 years, suicidal attempts, pregnancy, breastfeeding. |
| Storage Condition | Store below 300C. Protect from light. |

## Antipsychotic medicines

Medications used to manage psychotic disorders, such as schizophrenia, include chlorpromazine hydrochloride, clozapine, fluphenazine decanoate, haloperidol, risperidone, olanzapine, and quetiapine. These drugs belong to various classes, including typical antipsychotics like haloperidol and fluphenazine decanoate, and atypical antipsychotics like risperidone and olanzapine. They work by targeting neurotransmitter imbalances in the brain, particularly dopamine and serotonin, to alleviate symptoms such as hallucinations, delusions, and disorganized thinking. While effective, these medications may carry risks and side effects, including weight gain, sedation, and metabolic abnormalities.

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| **Chlorpromazine hydrochloride** | |
| Pharmacological class | Antipsychotic |
| Dosage form | Injection: 25mg/ml  Tablet: 25mg, 50mg, 100mg |
| Indications | Psychotic disorders and excessive anxiety |
| Dose and Administration | **Adult:**  Oral**:** Initially 25-200 mg (base) 2-4 times/day, increased by 20-50 mg/day. Maximum: 1000 mg/day.  IM: (severe) 25-50 mg (base), repeated in 1 hour if needed, then every 3-12 hours. Dosage may be gradually increased.  **Child (>6 years),**  Oral: 0.5 mg/kg every 4-6 hours  IM: 0.55 mg/kg before surgery |
| Contraindications | Hypersensitivity to the drug, severe liver and cardiovascular disease, severe CNS depression, comatose states, pheochromocytoma, breast feeding, narrow angle glaucoma, bone marrow suppression |
| Drug interactions | Alcohol, CNS depressants, tricyclic antidepressants, antithyroid agents, epinephrine, extrapyramidal reaction, hypotension producing medication, levodopa, lithium, metrizamide, amphetamines, anticonvulsants. |
| Side effects | Akathisia, blurred vision, dry oral, tachycardia, urinary retention, increased appetite, weight gain, extrapyramidal effects, pigmentary retinopathy, hyperprolactinemia, neuroleptic malignant syndrome |
| Cautions | Cardiovascular and cerebrovascular disease, respiratory disease, parkinsonism, epilepsy, acute infection, renal and hepatic impairment, history of jaundice, leukopenia, hypothyroidism, myasthenia gravis, prostatic hypertrophy, closed-angle glaucoma, elderly, abrupt withdrawal, skin contact, driving, operating machinery. pregnancy, breastfeeding |
| Storage condition | Store below 300C. Protect from light. |
| **Clozapine** |  |
| Pharmacological class | Antipsychotic |
| Dosage form | Tablet: 25mg, 50mg, 100mg |
| Indications | Schizophrenia in patients unresponsive to or intolerant of conventional antipsychotic medicine |
| Dose and Administration | **Adult:** Initially 12.5 to 25 mg daily, gradually increased in 25 to 50 mg increments to achieve therapeutic doses in 2 to 3 weeks. Usual range is 200 to 450 mg/day in divided doses, up to 600 mg/day may be required. Maximum 900 mg/day |
| Contraindications | History of drug-induced agranulocytosis, bone marrow disorders, severe liver, renal, or cardiac disease, toxic or alcoholic psychoses, uncontrolled epilepsy |
| Drug interactions | Benzodiazepines, risperidone, amiodarone, ciprofloxacin, ketoconazole, norfloxacin, lidocaine, dextromethorphan, amphetamines, codeine, tramadol, phenobarbital |
| Side effects | Drowsiness, sedation, fatigue, orthostatic hypotension, dizziness, dry mouth, blurred vision, hypersalivation, weight gain, nausea, vomiting, constipation, urinary incontinence, urinary retention, increase in hepatic enzymes, agranulocytosis, |
| Cautions | Agranulocytosis, neutropenia, prostatic enlargement, narrow-angle glaucoma, history of seizure |
| Storage condition | Store below 300C. Protect from light. |
| **Haloperidol** |  |
| Pharmacological class | Antipsychotic |
| Dosage form | Injection: 5mg/ml, Injection (Depot oily): 50mg/ml, 100mg/ml, Tablet: 1mg, 2mg, 5mg |
| Indications | Schizophrenia and other psychotic disorders, mania, psychomotor agitation and violent behaviour, adjunct in severe anxiety |
| Dose and Administration | **Adult**:  **Moderate disease,** oral: 0.5 to 2mg every 8 to 12 hours initially. **Severe disease,** oral: 3 to 5mg every 8 to 12 hours initially, not to exceed 30mg per day (half of the adult dose in elderly or debilitated patients, 3–5 mg 2–3 times daily in severely affected or resistant patients, up to 30 mg daily in resistant schizophrenia).  **Schizophrenia, Psychosis,** IM (immediate acting – lactate): 2 – 5 mg every 4 to 8 hours as required; May require every one hour in acute agitation; not to exceed 20 mg per day.  **Schizophrenia, Psychosis,** IM depot (decanoate): Initial IM dose 10 – 20 times daily oral dose administered monthly, not to exceed 100mg. If conversion requires initial dose greater than 100mg, administer in 2 injections (e.g., 100mg initially, then remainder in 3 to 7 days).  Maintenance: Monthly dose 10 – 15 times daily oral dose.  **Schizophrenia, psychosis/sedation:**  **Child 3–12 years (15 – 40kg):** initially 0.125–0.25 mg twice daily, increase by 0.25–0.5 mg/day every 5–7 days as required. Maximum 0.15 mg/kg daily. Usual maintenance 0.025–0.05 mg/kg three times daily. IM (when rapid effect required). Schizophrenia, psychosis/sedation, IM lactate (immediate acting):  **Child 6–12 years:** 1–3 mg per dose every 4–8 hours to a maximum of 0.15 mg/kg daily. Change to oral therapy as soon as possible.  **Behavioral Disorders,** oral:  Child 3-12 years: 0.5 mg/day initially; dose increased as required by 0.5 mg every 5-7 days until therapeutic effect achieved, then reduced to lowest effective maintenance level of 0.05-0.075 mg/kg/day divided q8-12hr. Acute Agitation, oral: Child < 12 years: Safety and efficacy not established. Child > 12 years: 0.5-3 mg, repeated in 1 hour as required; alternatively, 2-5 mg IM, repeated in 1 hr. as required. IM depot decanoate not recommended in child. |
| Contraindications | Impaired consciousness due to CNS depression, bone-marrow depression, phaeochromocytoma; porphyria, basal ganglia disease |
| Drug interactions | Amitriptyline, clomipramine, halothane, ketamine, nitrous oxide, thiopental, ether (anaesthetic), ritonavir, Carbamazepine, ethosuximide, phenobarbital, phenytoin, procainamide, quinidine, rifampicin, valproic acid: Potential for altered efficacy or increased risk of adverse reactions with haloperidol. |
| Side effects | Drowsiness, dizziness, headache, blurred vision, dry oral, constipation, weight gain, Extrapyramidal symptoms (acute dystonia, parkinsonism, akathisia), tardive dyskinesia, neuroleptic malignant syndrome, orthostatic hypotension, hyperprolactinemia |
| Cautions | Cardiovascular and cerebrovascular disorders, respiratory disease, parkinsonism, epilepsy, acute infections, pregnancy, breastfeeding, renal and hepatic impairment, history of jaundice, leucopoenia, hypothyroidism, myasthenia gravis, prostatic hypertrophy, angle-closure glaucoma, elderly, child and adolescents, abrupt withdrawal. |
| Storage condition | Store below 300C. Protect from light. |
| **Olanzapine** |  |
| Pharmacological class | Antipsychotic |
| Dosage form | Tablet: 5mg Powder for injection, 10mg vial |
| Indications | Schizophrenia |
| Dose and Administration | **Adult** oral:  10 mg daily, adjusted according to response, usual dose 5–20 mg daily. Control of agitation and disturbed behaviour in schizophrenia or mania, **IM injection:** Initially 5–10 mg for 1 dose, usual dose 10 mg for 1 dose, followed by 5–10 mg after 2 hours if required, maximum 3 injections daily for 3 days, maximum daily combined oral and parenteral dose 20 mg.  **Paediatric** oral:  Child 12–17 years (under expert supervision): Initially 5–10 mg daily, adjusted according to response, usual dose 5–20 mg daily |
| Contraindications | Refer under medicines for bipolar disorders |
| Drug Interactions | Refer under medicines for bipolar disorders |
| Side Effects | Refer under medicines for bipolar disorders |
| Cautions | Refer under medicines for bipolar disorders |
| Storage Condition | Store below 300C. Protect from light. |
| **Quetiapine** |  |
| Pharmacological Class | Atypical antipsychotic |
| Dosage Form | Tablet: 100 mg, 200 mg, 300 mg |
| Indication | Schizophrenia |
| Dose and Administration | **Adult,** oral: 400–800 mg daily, depending on the clinical response and tolerability by the patient.  **Child 13–17 years:** 25 mg twice daily on day 1, 100 mg divided twice daily on day 2, 200 mg divided twice daily on day 3, 300 mg divided twice daily on day 4, 400 mg divided twice daily on day 5 with further dose adjustments with increments of not more than 100 mg/day up to a maximum of 800 mg/day. |
| Contraindication | Refer under medicines for bipolar disorders |
| Drug Interactions | Refer under medicines for bipolar disorders |
| Side Effects | Refer under medicines for bipolar disorders |
| Cautions | Refer under medicines for bipolar disorders |
| Storage Condition | Store below 300C. Protect from light. |
| **Risperidone** |  |
| Pharmacological Class | Antipsychotic Medicines |
| Dosage Form | Tablet: 1mg, 2mg, 3mg, 4mg |
| Indications | Schizophrenia |
| Dose and Administration | **Acute and chronic psychosis,** oral:  **Adult:** 2 mg daily in 1–2 divided doses for day 1, then 4 mg daily in 1–2 divided doses for day 2. Usual dose 4–6 mg daily.  **Mania,** oral: Initially 2 mg once daily, then increased in steps of 1 mg daily if required. Usual dose 1–6 mg daily.  **Autism-associated irritability (including aggression, temper tantrums, self-injurious behavior, and quickly changing moods),** oral:  **Child 5 to 8 years:** 15 to 20 kg: Initial: 0.25 mg once daily. After ≥4 days, may increase dose to 0.5 mg/day. Maintain this dose for ≥14 days. If no clinical response, may increase dose in increments of 0.25 mg/day at ≥2-week intervals. ≥20 kg: Initial: 0.5 mg once daily. After ≥4 days, may increase dose to 1 mg/day. Maintain this dose for ≥14 days. If no clinical response, may increase dose in increments of 0.5 mg/day at ≥2-week intervals. **Bipolar Mania, oral:**  **Child and adolescents 10 to 17 years:** Initial: 0.5 mg once daily. Dose adjusted if needed in increments of 0.5 mg/day to 1 mg/day at intervals ≥24 hours as tolerated, to a dose of 2.5 mg/day. |
| Contraindications | Hypersensitivity to the drug, severe CNS depression, acute porphyria. |
| Drug Interactions | Fluoxetine, paroxetine, carbamazepine, lithium, levodopa  ciprofloxacin, dopamine agonists (e.g., bromocriptine, pergolide), ketoconazole, tramadol, clozapine, benzodiazepines. |
| Side Effects | Somnolence, increased appetite, fatigue, increased risk of upper respiratory tract infection, vomiting, coughing, urinary incontinence, increased saliva, constipation, fever, extrapyramidal symptoms, hyperprolactinemia, orthostatic hypotension, weight gain, headache, dizziness, anxiety, insomnia. |
| Cautions | Cardiovascular disease, cerebrovascular disease, conditions that predispose to hypotension (dehydration, hypovolemia, treatment with antihypertensive medications), renal or hepatic impairment, history of seizures, diabetes (may worsen glucose control), elderly patients with dementia-related psychosis (increased risk of death), avoid abrupt withdrawal, monitor for signs of hyperglycemia and diabetes mellitus, Acute porphyrias, cataract surgery (risk of intra-operative floppy iris syndrome), dementia with Lewy bodies. prolactin dependent tumours. |
| Storage Condition | Store below 300C. Protect from light. |

## Medicines used for disorders due to psychoactive substance use

Medications play a vital role in addressing disorders stemming from psychoactive substance use, such as opioid use disorders (OUD) and alcohol use disorder (AUD). Key medications include Buprenorphine and Methadone Hydrochloride for OUD, which help manage cravings and withdrawal symptoms, facilitating recovery. Additionally, Naltrexone Hydrochloride aids in reducing the risk of relapse and supporting abstinence in AUD by blocking the effects of alcohol. These medications, when combined with therapy and behavioral interventions, offer comprehensive support for individuals seeking to overcome substance use disorders. However, they come with potential risks and side effects, underscoring the importance of close monitoring and personalized treatment plans under the guidance of healthcare professionals.

**Medicines used for alcohol use disorders**

Naltrexone and Clonidine are two medications commonly used in the treatment of alcohol use disorder. Naltrexone works by blocking the effects of opioids in the brain, thereby reducing the rewarding effects of alcohol consumption and helping to curb cravings. On the other hand, Clonidine, primarily used to treat high blood pressure, can also be effective in managing certain symptoms of alcohol withdrawal, such as anxiety and agitation.

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| **Clonidine** | |
| Pharmacological Class | Alpha-2 Adrenergic Agonist |
| Dosage Form | Tablet: 0.1 mg, 0.2 mg, 0.3 mg |
| Indications | Alcohol use disorder |
| Dose and Administration | **Adult,** oral**:** Initially 0.1 mg twice daily, titrated up to a total daily dose of 0.6 mg in divided doses, based on response and tolerability. |
| Contraindications | Hypersensitivity to the drug, severe bradyarrhythmia secondary to second or third-degree AV block or sick sinus syndrome. |
| Drug Interactions | Beta-blockers, calcium channel blockers, digoxin, other antihypertensives, tricyclic antidepressants, CNS depressants, alcohol, sedatives, barbiturates, opioids. |
| Side Effects | Drowsiness, dizziness, dry oral, constipation, headache, fatigue, weakness, Bradycardia, hypotension, rebound hypertension upon abrupt withdrawal, depression, erectile dysfunction, sleep disturbances, nausea. |
| Cautions | Cardiovascular disease, heart failure, constipation, peripheral vascular disease, renal impairment, patients at risk for bradycardia, monitor blood pressure and heart rate regularly, avoid abrupt withdrawal to prevent rebound hypertension, use with caution in patients with a history of depression. |
| Storage Condition | Store below 300C. Protect from light. |
| **Naltrexone Hydrochloride** |  |
| Pharmacological Class | Opioid Antagonist |
| Dosage Form | Tablet: 50mg, Injection: 380mg/Vial |
| Indications | Alcohol dependence, opioid dependence |
| Dose and Administration | **Treatment against alcoholism to reduce the risk of relapse, as support treatment in abstinence and to reduce the craving for alcohol:**  **Adult, oral:** start with 25 mg daily on the first day, then increased to 50 mg daily if tolerated. Then can be further increased up to 100 mg once daily after 1 week based on response and tolerability.  **Adult, IM**: 380 mg once every 4 weeks.  **Opioid use (mild to moderate),** oral: Initial: 25 mg once daily for 1 to 3 days, if no withdrawal signs occur, administer 50 mg once daily thereafter.  IM: 380 mg once every 4 weeks. |
| Contraindications | Hypersensitivity to the drug, acute hepatitis, liver failure, current opioid dependence, opioid withdrawal. |
| Drug Interactions | Opioid analgesics, opioid-containing medications, thioridazine, anticoagulants (e.g., warfarin), CNS depressants, other hepatotoxic drugs. |
| Side Effects | Nausea, headache, dizziness, nervousness, fatigue, insomnia, vomiting, anxiety, abdominal pain, muscle or joint pain, decreased appetite, hepatotoxicity, depression, suicidal thoughts, injection site reactions (for injectable form), elevated liver enzymes, rash. |
| Cautions | Caution in mild to moderate hepatic impairment andrenal impairment, avoid in severe renal and hepatic failure depression, history of suicidal thoughts or behavior, patients with a history of opioid addiction, monitor liver function tests, ensure opioid-free period before initiating treatment to avoid withdrawal symptoms, inform patients about the risk of hepatotoxicity. |
| Storage Condition | Store below 300C. Protect from light. |

**Medicines used for nicotine use disorders**

Medications for nicotine use disorders, such as Bupropion and Nicotine Replacement Therapy (NRT), offer valuable support for individuals striving to quit smoking. Bupropion, an antidepressant, helps reduce cravings and withdrawal symptoms associated with nicotine addiction. NRT, available in forms like chewing gum and transdermal patches, delivers controlled doses of nicotine to alleviate cravings while gradually weaning the body off nicotine dependence. Both options are typically used alongside counselling and behavioral therapy to enhance smoking cessation efforts.

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| **Bupropion** | |
| Pharmacological Class | Antidepressant |
| Dosage Form | Tablet: 75 mg, 100 mg |
| Indication | Nicotine Use Disorder |
| Dose and Administration | **Adult Smoking cessation,** oral: 150 mg daily for 3 days, THEN increase to 150 mg every 12 hours, should continue treatment for 7–12 weeks, if patient successfully quits after 7–12 weeks, consider ongoing maintenance therapy based on individual patient risk/benefit. Begin therapy 1 week before target quit date (usually second week of treatment). May be used in combination with nicotine patch. |
| Contraindications | Hypersensitivity to the drug, seizure disorder, current or prior diagnosis of bulimia or anorexia nervosa, undergoing abrupt discontinuation of alcohol or sedatives (including benzodiazepines). |
| Drug Interactions | MAO inhibitors, drugs metabolized by CYP2B6 (e.g., cyclophosphamide, ifosfamide), drugs that lower seizure threshold (e.g., antipsychotics, antidepressants, theophylline, systemic steroids) |
| Side Effects | Insomnia, dry mouth, headache, nausea, constipation, dizziness, Increased blood pressure, agitation, tremor, sweating, tinnitus, rash. |
| Cautions | History of seizure disorder, head trauma, central nervous system tumor, severe hepatic cirrhosis, and bipolar disorder. Monitor for neuropsychiatric symptoms, including mood changes, hallucinations, paranoia, delusions, and homicidal ideation. |
| Storage Condition | Store below 300C. Protect from light. |
| **Nicotine Replacement Therapy (NRT)** | |
| Pharmacological Class | Smoking Cessation Aid |
| Dosage Form | Chewing Gum: 2 mg, 4 mg Transdermal Patch: 5 mg – 30 mg/16 hrs, 7 mg - 21 mg/24 hrs |
| Indication | Smoking Cessation (Nicotine Use Disorder) |
| Dose and Administration | **Adult:**  Smoking cessation, Gum, oral**:** Weeks 1 to 6: Chew 1 piece of gum every 1 to 2 hours (maximum: 24 pieces/day), to increase chances of quitting, chew at least 9 pieces/day during the first 6 weeks. Weeks 7 to 9: Chew 1 piece of gum every 2 to 4 hours (maximum: 24 pieces/day).  Weeks 10 to 12: Chew 1 piece of gum every 4 to 8 hours (maximum: 24 pieces/day). Patients smoking >10 cigarettes/day: Begin with step 1 (21 mg/day) for 6 weeks, followed by step 2 (14 mg/day) for 2 weeks, finish with step 3 (7 mg/day) for 2 weeks. Patients smoking ≤10 cigarettes/day: Begin with step 2 (14 mg/day) for 6 weeks, followed by step 3 (7 mg/day) for 2 weeks. Smoking cessation, By transdermal  Application using patches**:** Individuals who smoke more than 10 cigarettes daily should apply a high-strength patch daily for 6–8 weeks, followed by the medium-strength patch for 2 weeks, and then the low-strength patch for the final 2 weeks, individuals who smoke fewer than 10 cigarettes daily can usually start with the medium strength patch for 6–8 weeks, followed by the low strength patch for 2–4 weeks. |
| Contraindications | Hypersensitivity to the drug, non-smokers, child under 12 years old. |
| Drug Interactions | Note significant |
| Side Effects | Local irritation or burning sensation, hiccups, dyspepsia, Nausea, vomiting, headache, dizziness, insomnia. |
| Cautions | Cardiovascular disease, hypertension, peptic ulcer disease, diabetes, hyperthyroidism, renal or hepatic impairment. Monitor for signs of nicotine overdose (e.g., nausea, vomiting, dizziness, weakness, palpitations). |
| Storage Condition | Store below 300C. Protect from light. |

**Medicines used for opioid use disorders**

Buprenorphine and Methadone Hydrochloride are two primary medications used for the treatment of opioid use disorders. Buprenorphine is a partial opioid agonist, meaning it activates opioid receptors in the brain but to a lesser extent than full agonists like heroin or methadone. This helps reduce cravings and withdrawal symptoms without producing the same high, thus lowering the potential for abuse. Methadone Hydrochloride, a full opioid agonist, works by fully activating opioid receptors in the brain, which helps to prevent withdrawal symptoms and reduce cravings.

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| **Buprenorphine** | |
| Pharmacological Class | Partial Opioid Agonist |
| Dosage Form | Tablet (sublingual): 2 mg, 8 mg |
| Indication | Treatment of opioid use disorders |
| Dose and Administration | **Adult:** Restricted. For use in medically assisted therapy clinics for people who use drugs, *sublingual*: Induction (sublingual tablet), 8 mg on day 1, then 16 mg on day 2, continued over 3–4 days.  *By mouth*: Initially 2 mg daily, followed by 2–4 mg if required on day one, adjusted in steps of 2–6 mg daily if required; maximum 18 mg per day. |
| Contraindications | Hypersensitivity to the drug, severe respiratory insufficiency, acute or severe bronchial asthma in an unmonitored setting. GI obstruction, including paralytic ileus. |
| Drug Interactions | Benzodiazepines or CNS Depressants (including alcohol), Profound sedation, respiratory depression, coma, death. |
| Side Effects | Headache, nausea, vomiting, hyperhidrosis, constipation, signs and symptoms of withdrawal, Respiratory depression, orthostatic hypotension, hepatotoxicity, adrenal insufficiency. |
| Cautions | Hepatic impairment |
| Storage Condition | Store below 300C. Protect from light. |
| **Methadone** |  |
| Pharmacological class | Medicines for Opioid use disorder |
| Dosage form | Tablet: 5mg, 10mg, 40mg  Concentrate for Oral liquid: 5mg/ml, 10mg/ml  Oral liquid: 5mg/5ml, 10mg/5ml |
| Indications | Treatment opioid dependence |
| Dose and administration | **Adult:**  Oral**:** 2.5-10mg every 3-4 hours as needed.  IV: initial: 2.5-10mg every 8-12 hours in opioid-naive patients also be administered by SC or IM injection |
| Contraindications | Hypersensitivity to the drug, known or suspected acute bronchial asthma or hypercarbia. |
| Drug Interactions | CNS Depressants (including alcohol), MAOIs, antidepressants. |
| Side Effects | Constipation, drowsiness, dizziness, nausea, vomiting, respiratory depression, hypotension, bradycardia, sweating, itching. |
| Cautions | Respiratory depression, severe asthma, paralytic ileus, hypotension, head injury, brain tumor, or alcoholism. |
| Storage Condition | Store below 300C. Protect from light. |

## Medicines used for attention deficit disorder

Attention Deficit Disorder (ADD) is a neurodevelopmental disorder characterized by persistent patterns of inattention, impulsivity, and hyperactivity. Medications play a crucial role in managing the symptoms of ADD and improving the quality of life for individuals affected by this condition. Among the medications commonly prescribed for ADD are Dextroamphetamine, Bupropion, and Methylphenidate.

These medications work by targeting neurotransmitters in the brain to enhance focus, attention, and impulse control. Dextroamphetamine, a central nervous system stimulant, increases dopamine and norepinephrine levels, while Bupropion, a norepinephrine-dopamine reuptake inhibitor (NDRI), prolongs the effects of these neurotransmitters. Methylphenidate, another central nervous system stimulant, blocks the reuptake of dopamine and norepinephrine, thereby increasing their availability in the brain. They are primarily used to manage the symptoms of ADD in both child and adults, improving attention span, concentration, and impulse control. However, they come with potential risks and side effects, including insomnia, loss of appetite, weight loss, and increased heart rate for Dextroamphetamine; dry oral, headache, nausea, and agitation for Bupropion; and insomnia, decreased appetite, weight loss, and irritability for Methylphenidate.

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| **Bupropion** | |
| Pharmacological Class | Norepinephrine-Dopamine Reuptake Inhibitor (NDRI) |
| Dosage Form | Tablet: 75 mg, 100 mg |
| Indication | Treatment of Attention Deficit Disorder (ADD) |
| Dose and Administration | **Adult**: Initial dose: 100 mg once daily, increased after 3 days to 100 mg twice daily, then increased gradually based on response and tolerability to a maximum of 450 mg per day in divided doses. |
| Contraindications | Refer under medicines for nicotine use disorders |
| Drug Interactions | Refer under medicines for nicotine use disorders |
| Side Effects | Refer under medicines for nicotine use disorders |
| Cautions | Refer under medicines for nicotine use disorders |
| Storage Condition | Store below 300C. Protect from light. |
| **Dextroamphetamine** |  |
| Pharmacological Class | CNS Stimulant |
| Dosage Form | Tablet: 2.5 mg, 5 mg, 10 mg, 15 mg; Oral Liquid: 5 mg/5 ml |
| Indication | Treatment of Attention Deficit Disorder (ADD) |
| Dose and Administration | **Adult and Pediatric (6 years and older):**  Oral: Initial: 5 mg once or twice daily, increased by 5 mg daily at weekly intervals until optimal response is obtained. Maximum: 40 mg/day.  Oral liquid: Initial: 5 mg once or twice daily, increased by 5 mg daily at weekly intervals until optimal response is obtained. Maximum: 40 mg/day. |
| Contraindications | Hypersensitivity to the drug, avanced arteriosclerosis, symptomatic cardiovascular disease, moderate to severe hypertension, hyperthyroidism, glaucoma, agitated states, history of drug abuse, during or within 14 days following MAO inhibitor therapy. |
| Drug Interactions | MAOIs, serotonergic drugs, CYP2D6 inhibitors, Acidifying and alkalizing agents, antihypertensives, tricyclic antidepressants, antipsychotics. |
| Side Effects | Insomnia, headache, decreased appetite, dry oral, abdominal pain, weight loss, Increased blood pressure, tachycardia, palpitations, anxiety, dizziness, growth suppression in child. |
| Cautions | history of cardiovascular disease, hypertension, mental health conditions (e.g., bipolar disorder, psychosis), seizure disorders, and those with a history of substance abuse. Monitor for signs of misuse, abuse, and dependence. |
| Storage Condition | Store below 300C. Protect from light. |
| **Methylphenidate** |  |
| Pharmacological Class | CNS Stimulant |
| Dosage Form | Tablet: 5 mg, 10 mg, 20 mg |
| Indication | Treatment of Attention Deficit Disorder (ADD) |
| Dose and Administration | **Adult:**  Oral (immediate release tablet): Initially 5 mg once daily or twice daily (e.g., at breakfast and lunch), increasing, if necessary, by weekly increments of 5–10 mg in the daily dose according to tolerability and degree of efficacy observed to a maximum of 100 mg per day. If the effect wears off in the evening, a bedtime dose may be appropriate.  **Attention-Deficit Hyperactivity Disorder,** oral (extended-release): Initially 18 mg once daily, dose to be taken in the morning, adjusted at weekly intervals according to response, maximum 108 mg per day.  **Pediatric,** oral (immediate release tablet):  **Child 6–17 years:** Initially 5 mg 1–2 times a day, increased in steps of 5–10 mg daily if required, at weekly intervals, increased if necessary up to 60 mg daily in 2–3 divided doses, increased if necessary up to 2.1 mg/kg daily in 2–3 divided doses, the licensed maximum dose is 60 mg daily in 2–3 doses, higher dose (up to a maximum of 90 mg daily) under the direction of a specialist, discontinue if no response after 1 month, if effect wears off in evening (with rebound hyperactivity) a dose at bedtime may be appropriate.  **Attention-Deficit Hyperactivity Disorder,** oral (extended-release):  **Child 6–17 years:** Initially 18 mg once daily, dose to be taken in the morning, increased in steps of 18 mg every week, adjusted according to response, increased if necessary up to 2.1 mg/kg daily, max. dose is 54 mg once daily, to be increased to higher dose only under direction of specialist, discontinue if no response after 1 month, maximum 108 mg per day. |
| Contraindications | Hypersensitivity to the drug, history of schizophrenia Marked anxiety, tension, and agitation, glaucoma, tics or a family history or diagnosis of Tourette syndrome, during or within 14 days following MAO inhibitor therapy discontinuation, anorexia nervosa, arrhythmia Heart failure, hyperthyroidism, uncontrolled bipolar, severe depression, severe hypertension cardiomyopathy, structural cardiac disease. |
| Drug Interactions | MAOIs, vasopressor agents. |
| Side Effects | Nervousness, insomnia, decreased appetite, abdominal pain, headache, dry mouth, loss of appetite, weight loss, Increased blood pressure, tachycardia, palpitations, anxiety, dizziness, growth suppression in childmood changes, movement changes, alopecia. |
| Cautions | History of cardiovascular disease, hypertension, mental health conditions (e.g., bipolar disorder, psychosis), seizure disorders, and those with a history of substance abuse. |

# Anesthetic, Preoperative Medicines and Medical Gases

## General anesthetics

Several different types of drugs are given together during general anesthesia. Anesthesia is induced and maintained with either a volatile drug given by inhalation or with an intravenously (IV) administered anaesthetic drugs. IV anaesthetics include propofol, thiopental sodium, etomidate and ketamine. Inhalational anaesthetics include gases and volatile liquids. Volatile liquid anaesthetics are administered using calibrated vaporisers, using air, oxygen, or nitrous oxide-oxygen mixtures as the carrier gas. Higher concentrations of oxygen (greater than 30%) are usually required during inhalational anesthesia when nitrous oxide is being administered.

Anaesthetic drugs may be fatal if inappropriately used. Irrespective of the type of anesthesia used (i.e., general or regional), it is essential that facilities for intubation, resuscitation, and mechanically assisted ventilation are available.

**Inhalational anaesthetics**

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| **Halothane** | |
| Pharmacological class | Inhalational anaesthetic |
| Dosage form | Inhalation: 250ml |
| Indications | Induction and maintenance of anesthesia in major surgery often combined with nitrous oxide/oxygen mixtures. |
| Dose and Administration | **Adult:**  **Induction:** initially 0.5% increase gradually to 2-4% in oxygen or nitrous oxide/oxygen mixture.  **Maintenance:** 0.5-1.5% in oxygen-air or nitrous oxide–oxygen  **Infant or child:**  **Induction**: Initially 0.5%, then gradually increase inspired gas concentration to 1.5–2% in oxygen or nitrous oxide–oxygen  **Maintenance**: 0.5–1.5% in oxygen-air or nitrous oxide–oxygen |
| Contraindications | Malignant hyperthermia, history of unexplained jaundice or fever following previous exposure to halothane and children under 18 years undergoing dental procedures outside hospital |
| Drug interactions | Amitriptyline, chlorpromazine, diazepam, enalapril, adrenaline, fluphenazine, haloperidol, isoniazid, levodopa, suxamethonium, vancomycin, vecuronium, verapamil morphine. |
| Side effects | Hepatotoxicity, malignant hyperpyrexia, agitation, bradycardia, hypotension, cough, dizziness, headache, hyper salivation, respiratory depression, post-operative nausea and vomiting. |
| Cautions | Pregnancy, breast-feeding, renal and hepatic failure, hyperkalaemia, phaeochromocytoma, myasthenia gravis, porphyria. |
| Storage condition | Store below 30⁰C. Protect from light. |
| **Isoflurane** | |
| Pharmacological class | Inhalational anaesthetic |
| Dosage form | Inhalation: 100ml, 250ml |
| Indications | Induction and maintenance of anesthesia in major surgery often combined with nitrous oxide-oxygen mixtures or oxygen alone |
| Dose and administration | **Adult,** inhalational:  **Induction (in oxygen or nitrous oxide-oxygen):** Initially 0.5 %, increased to 3 %, in 7-10min adjusted according to response, administered using specifically calibrated vaporiser.  **Maintenance of anesthesia (in nitrous oxide–oxygen):** 1–2.5 %, to be administered using specifically calibrated vaporiser; an additional 0.5–1% may be required when given with oxygen alone.  **Maintenance of anesthesia in caesarean section (in nitrous oxide–oxygen):** 0.5–0.75 %, to be administered using specifically calibrated vaporiser.  **Neonate and child:** 1– 2.5%, to be administered using specifically calibrated vaporizer; an additional 0.5–1% may be required when given with oxygen alone or oxygen –air mixture. |
| Contraindications | Hypersensitivity to the drug or to other halogenated anaesthetics, history of malignant hyperthermia. |
| Drug interactions | Benzodiazepine, sympathomimetic agents, dihydropyridines, beta-blockers, isoniazid, succinylcholine, muscle relaxants, nitrous oxide, monoamine oxidase inhibitors (MAOIs). |
| Side effects | Hypotension, arrhythmias, cardiac arrest, bradycardia and tachycardia, QT prolongation, respiratory depression, cough related to induction, malignant hyperthermia, elevated serum creatine kinase, cognitive impairment, delirium, dyspnea, anaphylactic reactions, hyperkaliemia. |
| Cautions | Children under 2 years, pregnancy, perioperative hyperkalaemia, coronary heart disease, hepatitis. |
| Storage condition | Store below 30°C. |

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| **Nitrous oxide** | |
| Pharmacological class | Inhalational anaesthetic |
| Dosage form | Medicinal gas: 100% v/v |
| Indications | Maintenance of anesthesia in conjunction with other anaesthetic agents and as analgesic . |
| Dose and administration | **Maintenance of anesthesia in conjunction with other anesthetic agents:**  **Adult,** inhalational: 50–66 %, to be administered using suitable anesthetic apparatus in oxygen.  **Analgesia:** Up to 50 %, to be administered using suitable anesthetic apparatus in oxygen, adjusted according to the patient’s needs. |
| Contraindications | Significant respiratory depression, in patients who had eye surgery that uses ocular gases. |
| Drug interactions | Methotrexate, local anaesthetics, MAO inhibitors. |
| Side effects | Abdominal distension, addiction, agranulocytosis, disorientation, dizziness, euphoria, megaloblastic anaemia, middle ear damage e.g. tympanic membrane perforation, myeloneuropathy, paraesthesia, sedation, vomiting. |
| Cautions | Pregnancy, entrapped air following recent underwater dive, pneumothorax, presence of intracranial air after head injury, recent intra-ocular gas injection. |
| Storage condition | The gas cylinders should be stored not above 52°C.  Store under preferably inside, kept dry and clean not subjected to the extremes of heat or cold. |
| **Sevoflurane** | |
| Pharmacological class | Inhalational anaesthetic |
| Dosage form | Inhalation: 250ml |
| Indications | Induction and maintenance of anesthesia (in oxygen, nitrous oxide–oxygen or oxygen–air) |
| Dose and administration | **Adult:**  **Induction of anesthesia (in oxygen or nitrous oxide– oxygen)**  Initially 0.5–1 %, then increased up to 8%, increased gradually, according to response.  **Maintenance of anesthesia (in oxygen or nitrous oxide– oxygen)**  0.5–3 %, adjusted according to response.  **Pediatric:**  **Induction of anesthesia (in oxygen, nitrous oxide– oxygen, or air–oxygen)**  **Neonate:** Up to 4%, adjusted according to response.  **Child:** Initially 0.5–1%, then increase up to 8%, increased gradually, according to response.  **Maintenance of anesthesia: In oxygen, nitrous oxide–oxygen, or air–oxygen**  **Neonate:** 0.5–2%, adjusted according to response, to be administered using specifically calibrated vaporizer.  **Child:** 0.5–3%, adjusted according to response, to be administered. |
| Contraindications | Hypersensitivity to the drug or other halogenated anaesthetics, known or suspected genetic susceptibility to malignant hyperthermia, patients in whom general anesthesia is contraindicated, unexplained moderate/severe hepatic dysfunction. |
| Drug interactions | Sympathomimetic agents, non-selective MAOIs, calcium channel blockers, succinylcholine, St John's Wort, opioids, benzodiazepines, barbiturates. |
| Side effects | Malignant hyperthermia, drowsiness, cardiopulmonary arrest, hepatitis, nephrotoxicity, elevation of intra-cranial pressure, bradycardia, agitation, dystonia, muscle rigidity, somnolence, headache, cough, nausea and vomiting |
| Cautions | Hepatic and renal impairment, perioperative hyperkalemia, seizure, pediatrics, pregnancy |
| Storage condition | Store below 30° C. Do not refrigerate. |

**Intravenous anaesthetics**

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| **Etomidate** | |
| Pharmacological class | IV anaesthetic |
| Dosage form | Injection: 2mg/ml in 10ml vial |
| Indications | For induction of general anesthesia. |
| Dose and Administration | **Adult:**  **For induction of general anesthesia,** IV: 0.3 mg/kg, injected over a period of 30 to 60 seconds but can range from 0.2 mg/kg to 0.6 mg/kg of body weight, individualized in each case.  **Elderly:** 0.15–0.2 mg/kg (max. per dose 60 mg), to be administered over 30-60 seconds (60 seconds in patients in whom hypotension might be hazardous)  **Pediatric:**  **Child greater than10 years:** IV: 0.2- 0.3mg/kg/dose as a single dose  **Child less than 10 years:** same dosage as adults. A supplementary dose of up to 30% of the normal dose for adults is sometimes necessary to obtain the same depth and duration of sleep as obtained in adults |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Neuroleptic drugs, opioids, sedatives, alcohol, antihypertensive agents, adrenaline/noradrenaline, MAOIs, and metoclopramide intranasal |
| Side effects | Apnoea, hypotension, movement disorders, nausea, respiratory depression, skin reactions, pain at injection site, vomiting, adrenal suppression, and hiccups |
| Cautions | Acute circulatory failure (shock), adrenal insufficiency, acute porphyria, cardiovascular disease, elderly, pediatrics less than 10years, in critically ill patients (e.g. Sepsis), respiratory disorders, liver cirrhosis, pregnancy, breastfeeding (withhold for 24hrs after treatment) |
| Storage condition | Store between 20°C and 30 °C. |

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| **Fentanyl** | |
| Pharmacological class | IV Anaesthetic |
| Dosage form | Injection: 50mg/ ml |
| Indications | For induction of general anesthesia and as premedication |
| Dose and administration | **Adults and children aged 12 years and above:**  **General anesthesia:**  Minor surgery: 0.5-2 mcg/kg/dose IV  Major surgery: 2-20 mcg/kg/dose initially; 1-2 mcg/kg/ hr maintenance infusion IV; discontinue infusion 30-60 min prior to end of surgery; limit total fentanyl doses to 10-15 mcg/kg.  **Surgery Premedication:**  50-100 mcg/dose IM or slow IV 30-60 min prior to surgery  Adjunct to regional anesthesia: 25-100 mcg/dose slow IV over 1-2 min  **Pediatric:**  Induction of anesthesia Child 2-12years: 2-3mcg/kg  Maintenance of anesthesia: Child 2-12years 2-3mcg/kg |
| Contraindications | Hypersensitivity to the drug, significant respiratory depression, known or suspected gastrointestinal obstruction, including paralytic ileus, concurrent administration with MAO inhibitors or within 2 weeks of their discontinuation. |
| Drug interactions | Barbiturates, benzodiazepines, neuroleptics, other non-selective CNS depressants (e.g., alcohol), beta-blockers, suxamethonium, halothane, vecuronium, IV midazolam. |
| Side effects | Drowsiness, nausea or vomiting, muscle rigidity, agitation, bronchospasm, bradycardia, hypotension, respiratory depression, cardiac arrhythmia, biliary spasm, visual disturbances, apnoea, constipation, ureteral spasm, allergic dermatitis, postoperative confusion |
| Cautions | Acute pancreatitis, addison disease, benign prostatic hyperplasia, cardiac arrhythmias, CNS depression, gallbladder disease, gastrointestinal (GI) disorder, pseudomembranous colitis, GI surgery, head injury, hepatic impairment, hypothyroidism, renal impairment, chronic pulmonary disease, elderly age, pregnancy and breastfeeding. |
| Storage condition | Store below 30°C. Protect from light. |

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| **Ketamine** | |
| Pharmacological class | IV Anaesthetic |
| Dosage form | Injection: 10 mg/ml in 20ml, 50mg/ml |
| Indications | Induction and maintenance of anesthesia, analgesia for painful procedures of short duration. |
| Dose and administration | **Adult:**  **Induction of anesthesia for short procedures:**  **IM injection:** Initially 4–6 mg/kg, adjustedaccording to response.  **IV injection:** Initially 1–2 mg/kg, adjusted according to response, administered over at least 60 seconds, a dose of 2 mg/kg usually produces 5–10 minutes of surgical anesthesia  **Maintenance of anesthesia for short procedures:**  **IV:** 0.25- 0.35mg/kg followed by continuous infusion up to 1mg/kg/hr  **Diagnostic manoeuvres and procedures not involving intense pain**  **IM injection:** Initially 4 mg/kg induction and maintenance of anesthesia for long procedures  **IV infusion:** Initially 0.5–2 mg/kg, using an infusion solution containing 1 mg/ml, maintenance 10–45 micrograms/kg/min (0.01–0.045 mg/kg/min), adjusted according to response  **Pediatric**  **Neonate, infant, or child:** 1–2 mg/kg produces 5–10 minutes of surgical anesthesia, adjusted according to response  **IM injection**  **Neonate:** 4 mg/kg for 15 minutes of surgical anesthesia (adjusted according to response)  **Infant or child:** 4–6 mg/kg (4 mg/kg sufficient for some diagnostic procedures), adjusted according to response  **Induction and maintenance of anesthesia (longer procedures)**  **Continuous IV infusion**  **Neonate:** Initially 0.5–2 mg/kg followed by a continuous IV infusion of 500 micrograms/kg/hour adjusted according to response, up to 2 mg/kg/hour may be used to produce deep anesthesia  **Infant or child:** Initially 0.5–2 mg/kg followed by a continuous IV infusion of 0.6–2.7 mg/kg/hour adjusted according to response. |
| Contraindications | Hypersensitivity to the drug, uncontrolled hypertension, hyrotoxicosis, severe cardiac disease, history of cerebrovascular accident, cerebral trauma, intracerebral mass or hemorrhage, eye injury and increased intraocular pressure, psychiatric disorders particularly hallucinations, porphyria. |
| Drug interactions | Sympathomimetics, theophylline/ aminophylline, CNS depressants, muscle relaxants, inhalational halogenated anaesthetics, antihypertensive, ergometrine, thyroid hormones. |
| Side effects | Hypertension, tachycardia, abnormal behaviour, agitation, nightmare, confusion, diplopia, visual hallucination, nausea, nystagmus, skin reactions, sleep disorders, tonic-clonic movements, vomiting, injection-site pain. |
| Cautions | Psychiatric illness (e.g. schizophrenia and acute psychosis), acute intermittent porphyria, in patients with seizure, hyperthyroidism, pulmonary or upper respiratory infection, pediatric less than 3years, in patients with intracranial mass lesions, head injury, hydrocephalus, glaucoma. |
| Storage condition | Store below 30⁰C. Protect from light. |

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| **Propofol** | |
| Pharmacological class | IV anaesthetic |
| Dosage form | Injection:10mg/ml in 20ml |
| Indications | For induction and maintenance of anesthesia |
| Dose and administration | **Adult:**  **Induction of anesthesia using 0.5% or 1% injection,** slow IV, or by IV infusion:  **18–54 years**: Usual dose 1.5–2.5 mg/kg, to be administered at a rate of 20–40mg every 10 seconds until response, for debilitated patients use dose for 55 years and over  **55 years and over:** Usual dose 1–1.5 mg/kg, to be administered at a rate of 20mg every 10 seconds until response  **Induction of anesthesia using 2% injection,** IV infusion:  **18–54 years:** Usual dose 1.5–2.5 mg/kg, to be administered at a rate of 20–40mg every 10 seconds until response. For debilitated patients use dose for 55 years and over  **55 years and over:** Usual dose 1–1.5 mg/kg, to be administered at a rate of 20mg every 10 seconds until response.  **Maintenance of anesthesia using 1% injection:**  Initially by IV infusion usual dose 4–12 mg/kg/hour, alternatively (by slow IV injection) 25–50 mg, dose may be repeated according to response, for debilitated patients use dose for elderly  **Elderly:** Usual dose 3–6 mg/kg/hour  **Maintenance of anesthesia using 2% injection**, IV infusion:  Usual dose 4–12 mg/kg/hour, for debilitated patients use dose for elderly  **Elderly:** Usual dose 3–6 mg/kg/hour  **Sedation of ventilated patients in intensive care using 1% or 2% injection**, by continuous IV infusion:  Usual dose 0.3–4 mg/kg/hour, adjusted according to response  **Induction of sedation for surgical and diagnostic procedures using 0.5% or 1% injection,** by slow IV injection:  Initially 0.5–1 mg/kg, to be administered over 1–5 minutes, dose and rate of administration adjusted according to desired level of sedation and response.  **Maintenance of sedation for surgical and diagnostic procedures using 0.5% injection,** by IV infusion: Initially 1.5–4.5 mg/kg/hour, dose and rate of administration adjusted according to desired level of sedation and response, followed by (by slow IV injection) 10–20 mg, patients over 55 years or debilitated may require lower initial dose and rate of administration  **Maintenance of sedation for surgical and diagnostic procedures using 2% injection,** by IV infusion initially: 1.5–4.5 mg/kg/hour, dose and rate of administration adjusted according to desired level of sedation and response, followed by (by slow IV injection) 10–20 mg, using 0.5% or 1% injection (if rapid increase in sedation required), patients over 55 years or debilitated may require lower initial dose and rate of administration.  **Pediatric:**  **Induction of anesthesia using 0.5% or 1% injection,** by slow IV injection or by IV infusion:  **Child 1 month–16 years:** Usual dose 2.5–4 mg/ kg, dose adjusted according to age, body weight, and response  **Child 17 years:** Usual dose 1.5–2.5 mg/kg, to be administered at a rate of 20–40 mg every 10 seconds until response  **Induction of anesthesia using 2% injection,** by IV infusion**:**  Child 3–16 years: Usual dose 2.5–4 mg/kg, dose adjusted according to age, body weight, and response  **Child 17 years:** Usual dose 1.5–2.5 mg/kg, to be administered at a rate of 20–40 mg every 10 seconds until response  **Maintenance of anesthesia using 1% injection,** by continuous IV infusion:  **Child 1 month–16 years**: Usual dose 9–15 mg/ kg/hour, dose adjusted according to age, body weight, and response  **Child 17 years:** Usual dose 4–12 mg/kg/hour, adjusted according to response  **Maintenance of anesthesia using 2% injection,** by continuous IV infusion:  **Child 3–16 years:** Usual dose 9–15 mg/kg/ hour, dose adjusted according to age, body weight, and response  **Child 17 years:** Usual dose 4–12 mg/kg/hour, adjusted according to response  **Sedation of ventilated patients in intensive care using 1% or 2% injection,** by continuous IV infusion:  **Child 16–17 years:** Usual dose 0.3–4 mg/kg/hour, adjusted according to response  **Induction of sedation for surgical and diagnostic procedures using 0.5% or 1% injection,** by slow IV injection:  **Child 1 month–16 years:** Initially 1–2 mg/kg, dose, and rate of administration adjusted according to desired level of sedation and response  **Child 17 years:** Initially 0.5–1 mg/kg, to be administered over 1–5 minutes; dose and rate of administration adjusted according to desired level of sedation and response  **Maintenance of sedation for surgical and diagnostic procedures using 0.5% injection,** by IV infusion:  **Child 17 years:** Initially 1.5–4.5 mg/kg/hour, dose and rate of administration adjusted according to desired level of sedation and response, followed by (by slow IV injection) 10–20 mg (if rapid increase in sedation required)  **Maintenance of sedation for surgical and diagnostic procedures using 1%injection,** by IV infusion**:**  **Child 1 month–16 years:** Usual dose 1.5–9 mg/kg/ hour, dose and rate of administration adjusted according to desired level of sedation and response, followed by (by slow IV injection) up to 1 mg/kg (if rapid increase in sedation required).  **Child 17 years:** Initially 1.5–4.5 mg/kg/hour, dose and rate of administration adjusted according to desired level of sedation and response, followed by (by slow IV injection) 10–20 mg (if rapid increase in sedation required).  **Maintenance of sedation for surgical and diagnostic procedures using 2% injection,** by IV infusion:  **Child 3–16 years:** Usual dose 1.5–9 mg/kg/hour, dose and rate of administration adjusted according to desired level of sedation and response  **Child 17 years:** Initially 1.5–4.5 mg/kg/hour, dose and rate of administration adjusted according to desired level of sedation and response, followed by (by slow IV injection) 10–20 mg, using 0.5% or 1% injection (if rapid increase in sedation required) |
| Contraindications | Hypersensitivity to the drug, egg or soybean, in patients of 16 years of age or younger in intensive care unit. |
| Drug interactions | Benzodiazepines, opioids, ethanol, narcotics, carbamazepine and valproate. |
| Side effects | Transient apnoea during induction, bradycardia, arrhythmias, headache during recovery, hypotension, local pain, nausea and vomiting during recovery, respiratory acidosis, anaphylaxis, epileptiform movements, pancreatitis, postoperative fever. |
| Cautions | Acute circulatory failure (shock), severe cardiac disease (EF<50%), elderly, hypotension, in patients with raised intracranial pressure, respiratory disorders, history of epilepsy or seizures. |
| Storage condition | Store between 2 oC to 30oC. Do not freeze. |

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| **Thiopental sodium** | |
| Pharmacological class | IV anaesthetic |
| Dosage form | Powder for injection: 0.5gm, 1gm in vial |
| Indications | Induction of general anesthesia particularly anesthesia of short duration. |
| Dose and administration | **Adult:**  **Induction of anesthesia prior to administration of inhalational anaesthetic, anesthesia of short duration,** IV injection**:** Usually as a 2.5% (25 mg/ml) solution over 10–15 seconds, 100–150 mg (reduced in elderly or debilitated patients), followed by a further 100–150 mg if necessary, according to response after 30–60 seconds, or up to 4 mg/kg (maximum 500 mg)  **Pediatric**  **Induction of anesthesia, anesthesia of short duration (<15–20 minutes),** sow IV injection: usually as a 2.5% (25 mg/ml) solution over 10–15 seconds.  **Neonate:** Initially up to 2 mg/kg, then 1mg/kg repeated as necessary (maximum total dose 4 mg/kg)  **Infant or child:** Initially up to 5 mg/kg, then 1 mg/kg repeated as necessary (maximum total dose 7 mg/kg) |
| Contraindications | Hypersensitivity to the drug or other barbiturates, acute asthma, severe shock, dystrophia myotonica, severe cardiovascular disease, respiratory obstruction, porphyria |
| Drug interactions | Antihypertensive drugs (Beta-blockers, calcium channel blockers, ACEIs, ARBs, diuretics, vasodilators, alpha blockers), aspirin, MAOIs, nitrates, CNS depressants, metoclopramide, antibacterials (Vancomycin and sulphonamides), valerian and St John’s Wort, phenothiazines. |
| Side effects | Hypotension, transient erythema, cardiorespiratory depression, prolonged somnolence, cough, sneezing, cardiac arrhythmias, hypotension, laryngospasm, rash, allergic reactions, anaphylaxis, thrombophlebitis, haemolytic anaemia, thrombosis. |
| Cautions | Severe cardiovascular diseases, severe respiratory diseases, severe hypertension, hepatic impairment, hepatic impairment, elderly age group. |
| Storage condition | Store below 30°C.  Store reconstituted solution between 2ºC to 8ºC for a maximum of 24 hours and in room temperature for a maximum of 6 hours. |

## Local anesthetics

Local anaesthetic drugs act by causing a reversible block to conduction along nerve fibres. They vary widely in their potency, toxicity, duration of action, stability, solubility in water, and ability to penetrate mucous membranes. These factors determine their application, e.g. topical (surface), infiltration, peripheral nerve block, intravenous regional anesthesia (Bier’s block), plexus, epidural (extradural), or spinal (intrathecal or subarachnoid) block. Local anaesthetics may also be used for postoperative pain relief, thereby reducing the need for analgesics such as opioids.

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| **Bupivacaine** | |
| Pharmacological class | Local anaesthetic |
| Dosage form | Injection: 0.25%; 0.5% (hydrochloride) in vial.  Injection for spinal anesthesia, 0.5% (HCl) in 5 mg/ml with 8% glucose solution (80 mg/ml) 4-ml amp |
| Indications | For local or regional anesthesia or analgesia for surgery, dental and oral surgery, diagnostic procedures & therapeutic procedures, and for obstetrical procedures. |
| Dose and Administration | **Adult:**  **Local infiltration, peripheral nerve block, epidural block, sympathetic block by regional administration:**  75–150mg, dose administered using a 5 mg/ml (0.5%) solution  **Surgical anesthesia, field block by regional administration:**  Up to 150 mg, dose administered using a 2.5 mg/ml (0.25%) or 5 mg/ml (0.5%) solution  **Surgical anesthesia, thoracic epidural block by thoracic epidural:**  12.5–50 mg, dose administered using a 2.5 mg/ml (0.25%) or 5 mg/ml (0.5%) solution  **Surgical anesthesia, caudal epidural block by regional administration:** 50–150 mg, dose administered using a 2.5 mg/ml (0.25%) or 5 mg/ml (0.5%) solution  **Surgical anesthesia, major nerve block by regional administration:** 50–175 mg, dose administered using 5mg/ml (0.5%) solution.  **Acute pain, intra-articular block by intra-articular injection:**  Up to 100 mg, dose administered using a 2.5mg/ml (0.25%) solution; when co-administered with bupivacaine by another route: Total max. 150 mg.  **Acute pain, thoracic epidural block by continuous epidural infusion:** 6.3–18.8 mg/hour, dose administered using a 1.25 mg/ml (0.125%) or 2.5 mg/ml (0.25%) solution, maximum 400 mg per day  **Acute pain, labour by continuous epidural infusion:** 6.25–12.5 mg/hour, dose administered using a 1.25 mg/ml (0.125%) solution; maximum 400 mg per day  **Acute pain, lumbar epidural block, b**y lumbar epidural: Initially 15–37.5 mg, then (by lumbar epidural) 15–37.5 mg, repeated as required at intermittent injection using a 2.5 mg/ml (0.25%) solution; alternatively, by continuous epidural infusion: 12.5–18.8 mg/hour, dose administered using a 1.25 mg/ml (0.125%) or 2.5 mg/ml (0.25%) solution, maximum 400 mg per day  **Acute pain, field block by regional administration:**  Up to 150 mg, dose administered using a 2.5 mg/ml (0.25%) solution  **Dental block:** 0.5% with epinephrine 1:200,000  **Pediatric:**  **Local infiltration:** 0.5–2.5 mg/kg as a 0.25% or 0.5% solution; maximum dose 1 ml/kg of 0.25% solution, 0.5 ml/kg of 0.5% solution (2.5 mg/kg).  **Peripheral nerve block:** 0.3–2.5 mg/kg as a 0.25% or 0.5% solution; maximum dose 1 ml/kg of 0.25% solution, 0.5 ml/kg of 0.5% solution.  **Epidural block in surgery**: using 0.5% preservative-free solution: 1–2.5 mg/kg.  **Caudal block in surgery:** using 0.5% preservative-free solution: 1–2.5 mg/kg.  *Note: Do not use solutions containing preservatives for spinal, epidural or caudal anesthesia in pediatrics age group.* |
| Contraindications | Hypersensitivity to the drug, local inflammation or infection, septicaemia, IV regional anesthesia (e.g., Bier’s block), obstetrical paracervical block anesthesia, Severe haemorrhage, severe heart disease, hypotension or shock and arrhythmias (e.g. complete heart block), severe anaemia. |
| Drug interactions | Lidocaine, procainamide, propranolol, quinidine and anticoagulants. |
| Side effects | Arrhythmias, dizziness, hypertension, hypotension, nausea, paraesthesia, urinary retention, vomiting, blurred vision, anaemia, restlessness, tremors, somnolence, constipation, confusion, headache, oedema, erythema at injection site, skin irritation, light-headedness, neurotoxicity, seizures, arrhythmias, cardiac arrest, diplopia, nerve disorders, paraplegia, paresis, respiratory depression, hypersensitivity reactions |
| Cautions | Respiratory disorders, hepatic impairment, renal impairment, epilepsy, porphyria, myasthenia gravis, pregnancy, breastfeeding. |
| Storage condition | Store below 30° C. Do not refrigerate or freeze. |
| **Lidocaine hydrochloride** | |
| Pharmacological class | Local anaesthetic |
| Dosage form | Injection: 0.5%, 1%, 2%, 5%,  Jelly: 2% in 30 ml, Ointment: 5% in 10gm,  Spray: 2%, 4%, 10 % in 80g,  Injection for spinal anesthesia: 5% (hydrochloride) in 2- ml ampoule to be mixed with 7.5% glucose solution |
| Indications | Local anaesthetics for surface anesthesia of mucous membranes; infiltration anesthesia; peripheral and sympathetic nerve block; dental anesthesia; spinal anesthesia and IV regional anesthesia. |
| Dose and administration | **Adult:**  **Sympathetic nerve block:**  Cervical (stellate ganglion): 5 ml of 1% solution (50 mg total dose)  Lumbar: 5-10 ml of 1% solution (50-100 mg total dose)  **Infiltration Anesthesia:**  Percutaneous: 1-60 ml of 0.5-1% solution (5-300 mg total dose)  IV regional: 10-60 ml of 0.5% solution (50-300 mg total dose)  **Peripheral Nerve Blocks:**  Brachial: 15-20 ml of 1.5% solution (225-300 mg total dose)  Dental: 1-5 ml of 2% solution (20-100 mg total dose)  Intercostal: 3 ml of 1% solution (30 mg total dose)  Paravertebral: 3-5 ml of 1% solution (30-50 mg total dose)  Pudendeal (each side): 10 ml of 1% solution (100 mg total dose)  Paracervical obstetrical analgesia (each side): 10 ml of 1% solution (100 mg total dose)  **Central Neural Blocks/Epidural:**  General: 2-3 ml/dermatome for anesthesia  Thoracic: 20-30 ml of 1% solution (200-300 mg total dose)  Lumbar analgesia: 25-30 ml of 1% solution (250-300 mg total dose)  Lumbar anesthesia: 15-20 ml of 1.5% solution (225-300 mg), or 10-15 ml of 2% solution (200-300 mg total dose)  **Pediatric:**  **Local infiltration:**  Percutaneous: 4-4.5 mg/kg maximum  IV regional: 3 mg/kg |
| Contraindications | Hypersensitivity to the drug, local inflammation or infection, severe anaemia or heart disease, spinal or epidural anesthesia. |
| Drug interactions | Acetazolamide, atenolol, bupivacaine, furosemide, hydrochlorothiazide, lopinavir, procainamide, propranolol, quinidine, suxamethonium, timolol, verapamil, anticoagulant therapy. |
| Side effects | Anxiety, arrhythmias, cardiac arrest, circulatory collapse, confusion, dizziness, drowsiness, euphoric mood, headache, hypotension, loss of consciousness, muscle twitching, nausea, nystagmus, respiratory depression, seizure, altered temperature sensation, tinnitus, tremor, blurred vision, vomiting. |
| Cautions | Respiratory impairment, hepatic and renal impairment, epilepsy, porphyria, myasthenia gravis, cardiac disorders, severe shock, breastfeeding, pregnancy. |
| Storage condition | Store below 30°C. Avoid freezing |
| **Lidocaine Hydrochloride + Adrenaline** | |
| Pharmacological class | Local anaesthetic |
| Dosage form | Injection: 1% + 1:200, 000 in 20ml vial  Injection: 2%+1:200,000 in 20ml vials |
| Indications | Local anaesthetics for surface anesthesia of mucous membranes; infiltration anesthesia; peripheral and sympathetic nerve block; dental anesthesia; spinal anesthesia and IV regional anesthesia. |
| Dose and administration | **Adult:**  **Dental anesthesia (for infiltration or nerve block):** 20 to 100 mg (1 to 5 ml) of lidocaine hydrochloride as 2 % solution with epinephrine 1:2000,000.  **Child:**  4 to 5 mg/kg of Lidocaine hydrochloride of body weight or 100 to 150 mg as a single dose.  **Local infiltration or nerve block** 7 mg of lidocaine hydrochloride per kg of body weight as a 0.25 to 1 % solution with epinephrine 1:200,000 |
| Contraindications | Hypersensitivity to the drug, narrow angle (congestive) glaucoma, shock and with lidocaine in fingers, toes. |
| Drug interactions | Acetazolamide, bupivacaine, furosemide, hydrochlorothiazide, lopinavir, procainamide, quinidine, suxamethonium, verapamil, tricyclic antidepressants, MAOIs, halogenated general anesthesia, oxytocic drugs of the ergot type, phenothiazines, beta-blockers. |
| Side effects | Allergic reactions including anaphylaxis, bradycardia, hypotension, and cardiovascular collapse, drowsiness, respiratory depression. |
| Cautions | Severe asthma, elderly, cardiovascular disease, diabetes, renal failure, liver failure, hyperthyroidism, psychiatric disorders, pregnancy. |
| Storage condition | Store below 30°C. Protected from light and do not freeze. |

## Preoperative medication and sedation for short term procedure

Preoperative medication refers to the drugs administered to a patient before surgery to prepare them for the procedure. These medications can serve various purposes, including alleviating anxiety, providing sedation, preventing infection, and managing pain. The specific medications used may vary based on the type of surgery, the patient's health status, and the anesthetic plan.

Regurgitation and aspiration of gastric contents (Mendelson’s syndrome) can be an important complication of general anesthesia, particularly in obstetrics and during emergency surgery, and requires prophylaxis against acid aspiration.

Anti-muscarinic drugs such as atropine are used as premedication to reduce bronchial and salivary secretions which are increased by intubation, upper airway surgery, or some inhalational anaesthetics. They are also used before or with neostigmine to prevent bradycardia, excessive salivation, and other muscarinic actions of neostigmine. They also prevent bradycardia and hypotension associated with drugs such as propofol and suxamethonium chloride.

Sedation of patients during diagnostic and therapeutic procedures is used to reduce fear and anxiety, to control pain, and to minimise excessive movement. The choice of sedative drug will depend upon the intended procedure; some procedures are safer and more successful under anesthesia. Opioid analgesics such as morphine used as premedication and more likely to be administered at induction. Preoperative use of opioid analgesics is generally limited to those patients who require control of existing pain. An oral opioid should only be offered if immediate postoperative pain is expected to be moderate to severe.

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| **Atropine sulphate** | |
| Pharmacological class | Anti-cholinergic |
| Dosage form | Injection:1mg/ml |
| Indications | As anti-sialagogue pre-anaesthetic medication to prevent or reduce salivation and respiratory tract secretions. |
| Dose and Administration | **Adult:**  Premedication IV: 300- 600 mcg immediately before induction of anesthesia.  Premedication IM: 300–600 mcg, 30-60 minutes before induction  **Pediatric:**  **Premedication, IV**  **Child all ages:** 20 mcg /kg (max 600 mcg) immediately before induction of anesthesia  **Premedication, SC**  **Neonate:** 10–15 mcg /kg 30–60 minutes before induction of anesthesia  **Premedication, IM**  **Infant or child:** 20 mcg /kg (minimum dose 100 mcg, maximum dose 600 mcg) 30–60 minutes before induction of anesthesia |
| Contraindications | Closed-angle glaucoma, myasthenia gravis, severe ulcerative colitis. GI obstruction, asthma, toxic megacolon, bladder outlet obstruction. |
| Drug interactions | Phenothiazines, amantadine, tricyclic antidepressants, MAOI's, chlorpheniramine, metoclopramide, neostigmine, pyridostigmine, ketoconazole. |
| Side effects | Dry mouth, blurred vision, photophobia, flushing and dryness of oral, nose and throat, skin; difficulty in micturition, constipation, arrhythmias, tachycardia, palpitations, nausea, vomiting, hyperthermia, mydriasis, confusion, seizures, nasal dryness. |
| Cautions | Pregnancy, breastfeeding, children and elderly patients, hyperthyroidism, hepatic or renal disease, chronic obstructive pulmonary disease, reflux oesophagitis, cardiac disease, bening prostatic hyperplasia (BPH). |
| Storage condition | Store below 30°C. Protect from light. |
| **Diazepam** | |
| Pharmacological class | Benzodiazepine |
| Dosage form | Injection: 10mg/2ml |
| Indications | As pre-operative medication in surgery for sedation |
| Dose and administration | **Adult:**  IV: 0.1-0.2 mg/kg titrated to patient response.  **Elderly or debilitated patient:** use half of the adult dose |
| Contraindications | Hypersensitivity to the drug, myasthenia gravis, sleep apnoea syndrome, severe hepatic insufficiency, severe respiratory insufficiency, acute narrow-angle glaucoma and open-angle glaucoma. |
| Drug interactions | Opioids, CNS depressants including alcohol, phenobarbital, drug abuse, clozapine, theophylline, muscle relaxants (suxamethonium, tubocurarine), rifampicin, phenytoin, azoles. |
| Side effects | Anaphylaxis, leukopenia, confusion, drowsiness, ataxia, impaired motor ability, tremor, bradycardia, respiratory depression, pain at the injection site, neutropenia, jaundice, phlebitis. |
| Cautions | COPD, sleep apnoea, renal/hepatic disease, respiratory disorders, history of suicide ideation, impaired gag reflex, history of drug abuse, obese patients. |
| Storage condition | Store below 30°C. Do not freeze |

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| **Midazolam** | |
| Pharmacological class | Benzodiazepine |
| Dosage form | Injection: 1 mg/ml |
| Indications | As pre-operative medication in surgery for sedation. |
| Dose and administration | **Slow IV injection (Over 2min):**  **Adult-** initial**:** 2 to 2.5 mg; Usual total dose 3.5 to 5mg (Max. 7.5 mg).  Maintenance: 25% of initial effective dose PRN by slow titration; reduce 30% if pre-medicated with opiate (50% in elderly/chronically ill)  **Elderly-** 0.5 to 1.0 mg; increase, if necessary, in steps of 1 mg not to exceed 2.5mg.  **IV injection (Over 2 to 3 min):**  **Child- 6 months to 7 years**: initially 50 to 100 µg/kg; increase, if necessary, in steps (max. total dose 6 mg).  **6 to 12 years:** initially 25 to 50 µg/kg increase in steps if necessary (max. total dose 10 mg).  **Intramuscular injection:**  **Adult-** Sedation in combined anesthesia: 30 to 100 µg/kg repeated as required by continuous IV infusion 30 to 100 µg/ kg/h (lower doses in elderly). Premedication: 70 to 100 µg/kg. 1 to 15 years: 50 to 150 µg/kg (max.1 mg).  **Elderly and debilitated**- 25 to 50 µg/kg. (20 to 60 min induction). |
| Contraindications | Acute or severe pulmonary insufficiency, severe liver disease, acute narrow angle glaucoma, comatose patients, shock, acute alcohol intoxication. |
| Drug interactions | Azole antifungals, macrolide antibiotics, propofol, protease inhibitors, atorvastatin, opioids, CNS depressants, psychoactive medications. |
| Side effects | Drowsiness and light headedness in the next day; confusion and ataxia (especially in the elderly), amnesia, hypotension, hiccup, cough, apnoea or respiratory depression (particularly with IV administration), erythema, rash, confusion, arrhythmias, cardiorespiratory arrest and anaphylactic reactions. |
| Cautions | Respiratory disorders, chronic renal failure, cardiac disease, open angle glaucoma, neonates, hepatic impairment; pregnancy, breastfeeding and elderly. |
| Storage condition | Store below 30°C. Protect from light. |

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| **Morphine** | |
| Pharmacological class | Opioid analgesic |
| Dosage form | Injection: 10 mg (sulfate or hydrochloride) in 1 ml ampoule |
| Indications | Preoperative medication as analgesic |
| Dose and administration | **Adult:**  IV: 2.5 -10 mg (maximum 10 mg) of morphine sulphate given by IV infusion over 4 or 5 minutes to be administered 5 minutes before operation  SC/IM: 5- 20 mg, dose to be administered 60–90 minutes before operation (maximum 10 mg).  **Pediatric:**  **Infant or child: IV:** 0.05–0.1 mg/kg 5 minutes before the procedure; maximum dose 10 mg  **Infant or child: IM:** 0.1 mg/kg 20 minutes before the procedure; maximum dose 15 mg  *Note: Only use IM route for premedication if patient has no IV access and adequate respiratory monitoring is available.* |
| Contraindications | Respiratory depression, acute abdomen, toxin-mediated diarrhea, heart failure secondary to chronic lung disease, phaeochromocytoma, CNS depression, acute or severe bronchial asthma, upper airway obstruction; paralytic ileus and upper airway obstruction. |
| Drug interactions | Amitriptyline, chlorpromazine, MAOIs, ciprofloxacin, diazepam, haloperidol, metoclopramide, ritonavir. |
| Side effects | Somnolence, cardiac arrest, hiccup, nausea, anaphylaxis, dyspnoea, altered mood, myoclonus, postural hypotension, sexual dysfunction, ureteral spasm, urinary retention, diaphoresis, vision disturbances, respiratory depression, bradycardia, tachycardia, constipation. |
| Cautions | Cardiac arrhythmias, acute pancreatitis, renal and hepatic impairment; elderly and debilitated, hypothyroidism, convulsive disorders, benign prostatic hypertrophy, adrenocortical insufficiency, obstructive bowel disorders, myasthenia gravis, pregnancy. |
| Storage condition | Store below 30°C. Protect from light. |

## Medical gases

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| **Oxygen** | |
| Pharmacological class | Medical gas |
| Dosage form | Inhalation |
| Indications | Maintain adequate tissue oxygenation in inhalational anesthesia. |
| Dose and administration | It is administered by means of nasal catheter, facemask, endotracheal tube or oxygen tent. Concentration of oxygen in inspired aesthetic gases should never be less than 29-30% and use sodalime (carbon dioxide absorbent).  *Note: Inappropriate concentration may have serious or even lethal effects, e.g., brain damage and especially in pre-term neonates, can cause retinopathy with blindness and chronic lung disease.* |
| Contraindications | No absolute contraindication |
| Drug interactions | Amiodarone, bleomycin and alcohol |
| Side effects | Pulmonary congestion, exudation, and atelectasis. |
| Cautions | Any fire or spark, new-born infant, pre-term infant, pneumothorax, thoracic surgery, insufficient controlled epilepsy and recent middle ear surgery. |
| Storage condition | The gas cylinders must be stored at temperatures not to exceed 52°C. |

# Muscle Relaxants (Peripherally – Acting) And Cholinesterase Inhibitor

Neuromuscular blocking drugs (NMBDs) used in anesthesia are also known as muscle relaxants. These drugs are used in anesthesia to impair neuromuscular transmission and provide skeletal muscle relaxation. They enable the anaesthetist to perform tracheal intubation, facilitate ventilation and to provide optimal surgical operating conditions, for example during laparotomy. NMBDs are quaternary ammonium compounds structurally similar to acetylcholine (ACh); they act mostly at the post-junctional nicotinic receptor of the neuromuscular junction. NMBDs may be agonists (“depolarising” NMBDs) or antagonists (“non-depolarizing” NMBDs) at the nicotinic receptor.

Anticholinesterase drugs (also known as acetylcholinesterase inhibitors) are used to reverse the effects of non-depolarizing NMBDs. These drugs increase the concentration of ACh at the neuromuscular junction by inhibiting the enzyme acetylcholinesterase.

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| **Atracurium** | |
| Pharmacological class | Non-depolarizing neuromuscular blocker |
| Dosage form | Injection, 10 mg (as besilate)/ml, 5-ml amp |
| Indications | As an adjunct to general anesthesia to facilitate endotracheal intubation and to provide skeletal muscle relaxation during surgery or mechanical ventilation. |
| Dose and Administration | **Adult and Child:**  **Neuromuscular blockade (short to intermediate duration) for surgery and intubation:**  By IV injection: Initially 0.3–0.6 mg/kg, then by IV injection 0.1–0.2mg/kg as required; alternatively,  By IV injection: 0.3–0.6 mg/kg, then by IV infusion 0.3–0.6 mg/kg /hour  **Neuromuscular blockade during intensive care:**  By IV injection: Initially 0.3–0.6 mg/kg, initial dose is optional, then by IV infusion 0.27–1.77 mg/kg/hour  By IV infusion: Usual dose 0.65–0.78 mg/kg/hour  **Neonate:**  **Neuromuscular blockade (short to intermediate duration) for surgery and intubation:**  Initially by IV injection 0.3–0.5 mg/kg, followed by IV injection 0.1–0.2 mg/kg, repeated if necessary: alternatively,  by IV infusion 0.3–0.4mg/kg/hour,  **Neuromuscular blockade during intensive care:**  **Neonate:** Initially by IV injection 0.3–0.5mg/kg, followed by IV injection 0.1–0.2mg/kg, repeated if necessary; alternatively, by IV infusion 0.3–0.4 mg/kg/hour. |
| Contraindications | Hypersensitivity to the drug or other neuromuscular blocker |
| Drug interactions | Aminoglycosides, other non-depolarizing neuromuscular blocking drugs, beta-blockers, clindamycin, calcium channel blocker, halogenated general anaesthetics, magnesium and lithium salts ketamine, lidocaine, loop diuretics, theophylline and sympathomimetics. |
| Side effects | Seizure, erythema, wheezing, urticaria, cardiac arrest, skin flushing, transient hypotension, bronchospasm, pain at injection site and cardiac arrest. |
| Cautions | Severe electrolyte disorders, myasthenia gravis, patients with bronchogenic carcinoma, dehydration, hypotension, hypothermia and pulmonary disease. |
| Storage condition | Store in a refrigerator (2ºC – 8ºC). |
| **Cisatracurium** | |
| Pharmacological class | Non-depolarizing neuromuscular blocker |
| Dosage form | Injection: 2mg/ml in 10ml ampoule |
| Indications | As an adjunct to general anesthesia to facilitate endotracheal intubation and to provide skeletal muscle relaxation during surgery or mechanical ventilation. |
| Dose and administration | **Adult:**  **Neuromuscular blockade (intermediate duration) during surgery and intubation:**  By IV injection**:** Initially 0.15mg/kg, then maintenance 0.03mg/kg every 20 minutes,  IV infusion: Initially 0.18mg/kg/hour, then (by IV infusion) maintenance 0.06–0.12 mg/kg/hour, maintenance dose administered after stabilization.  **Neuromuscular blockade (intermediate duration) during intensive care:**  By IV injection: Initially 0.15mg/kg, then (by IV infusion) 0.18mg/kg/hour, adjusted according to response; (by IV infusion) usual dose 0.03–0.6mg/kg/hour.  **Pediatric:**  **Neuromuscular blockade (intermediate duration) during surgery and intubation and intensive care: IV**  **Child 1 month–1 year:** Initially 0.15mg/kg, then by IV injection 0.03mg/kg every 20minutes as required  **Child 2–11 years:** Initially 0.15mg/kg, 0.08 – 0.1mgkg if not for intubation, then by IV injection 0.02mg/kg every 10 minutes as required; OR  By IV injection initially 0.15mg/kg, followed by IV infusion 0.18mg/kg/hour, by IV infusion reduced to 0.06 -.12mg/kg/hour, adjusted according to response  **Child 12–17 years:** Initially 0.15mg/kg, then by IV injection 0.03mg/kg every 20 minutes as required OR  By IV injection: initially 0.15mg/kg, followed by IV infusion 0.18mg/kg/hour, by IV infusion reduced to 0.06 -0.12mg /kg/hour, adjusted according to response. |
| Contraindications | Hypersensitivity to the drug or other neuromuscular blocker or benzene sulfonic acid and pediatric <1month (benzyl alcohol). |
| Drug interactions | Other non-depolarizing neuromuscular blocking drugs, phenytoin, aminoglycosides, tetracyclines, clindamycin, halogenated general anaesthetics, suxamethonium, magnesium and lithium salts and carbamazepine. |
| Side effects | Anaphylactic reaction, bradycardia, hypotension, bronchospasms, myopathy, muscle weakness. |
| Cautions | Myasthenia gravis, pregnancy, severe acid-base and/or serum electrolyte abnormalities, seizure, hypovolemia. |
| Storage condition | Store in a refrigerator (2° C to 8° C). |
| **Pancuronium Bromide** | |
| Pharmacological class | Non-depolarizing neuromuscular blocker |
| Dosage form | Injection, 1mg/ml, 2mg/ml |
| Indications | As an adjuvant to surgical anesthesia to obtain relaxation of the skeletal muscles in a wide range of surgical procedures. |
| Dose and administration | **Adult:**  **Neuromuscular blockade (long duration) during surgery:**  By IV: Initially 0.04 - 0.1mg/kg  Maintenance: 0.01 mg/kg administered 60–100 minutes after initial dose and then 0.01mg/kg every 25- 60 min.  **Endotracheal intubation:**  IV: 0.06 -0.1mg/kg bolus  **Neuromuscular blockade (long duration) during intensive care:**  By IV: Initially 0.1mg/kg, initial dose is optional, then 0.05mg/kg every 60–90 minutes |
| Contraindications | Hypersensitivity to the drug, neonates including premature infants (formulation containing benzyl alcohol). |
| Drug interactions | Suxamethonium, volatile general anaesthetics, aminoglycoside, diazepam, thiamine (high dose), MAOIs, quinidine, magnesium sulfate, protamine sulfate, narcotic analgesics, phenytoin, alpha- and beta-adrenergic blocking agents, theophylline, pyridostigmine. |
| Side effects | Hypersensitivity, bronchospasm, apnoea, arrhythmia, hyper-salivation, hypertension, miosis, injection site reactions, dose related tachycardia, wheezing and excessive sweating (children). |
| Cautions | Renal impairment, liver impairment, patients who have had previous anaphylactic reactions to other neuromuscular blocking agents, hypertension. |
| Storage condition | Store in a refrigerator (2ºC – 8ºC). |
| **Rocuronium** | |
| Pharmacological class | Non-depolarizing neuromuscular blocker |
| Dosage form | Injection, 10mg/ml, (as bromide), 5 ml Vial |
| Indications | As an adjunct to general anesthesia to facilitate endotracheal intubation and to provide skeletal muscle relaxation during surgery or mechanical ventilation. |
| Dose and administration | **Adults and pediatric (>3 months):**  Dose should be calculated based on body weight.  **Rapid Sequence Intubation:** 0.6-1.2 mg/kg IV  **Tracheal Intubation:** 0.45-0.6 mg/kg IV  Maintenance dose: 0.1-0.2 mg/kg IV repeat PRN OR  Continuous infusion: 0.01-0.012 mg/kg/min IV. |
| Contraindications | Hypersensitivity to the drug, neuromuscular disease. |
| Drug interactions | Aminoglycosides, corticosteroids, amphotericin B deoxycholate, clindamycin, opioids, CNS sedatives, quinine, tetracyclines, protease inhibitors, other muscle relaxants. |
| Side effects | Transient hypotension, hypertension, dose-related tachycardia, malignant hyperthermia, apnoea, injection site oedema, hiccups, pruritus, nausea, wheezing, residual muscle weakness and allergic or idiosyncratic hypersensitivity reactions |
| Cautions | Hepatic and renal impairment, pregnancy, breastfeeding, neonates and infants, cardiac disease, advanced age and severe anaphylactic reactions to neuromuscular blocking agents. |
| Storage condition | Store in a refrigerator (2ºC – 8ºC). |
| **Suxamethonium chloride (succinylcholine)** | |
| Pharmacological class | Depolarizing neuromuscular blocker |
| Dosage form | Powder for injection: 50mg, 100mg, 500mg,  Injection: 50mg/ml |
| Indications | Skeletal muscle relaxation in procedures of short duration, such as endotracheal intubation or endoscopy. |
| Dose and administration | **Adult:**  **Muscle relaxation (prolonged procedures),IV infusion:**  Initially: 0.3–1.1 mg/kg at 5–10-minute interval  Maintenance: 2.5–4 mg/min of solution containing 1–2 mg/ml, maximum, 500 mg/hour  **Muscle relaxation, IV injection:**  Initially: 0.3–1.1 mg/kg at 5–10-minute intervals  Maintenance: 0.04 -0.07mg/kg every 5–10-minute PRN  **Pediatric:**  **Muscle relaxation (neuromuscular blockade) in procedures of short duration:** IM  **Neonate or infant:** Up to 4–5 mg/kg produces a 10–30-minute paralysis (after 2–3-minute delay).  **Child:** Up to 4 mg/kg produces a 10–30-minute paralysis (after 2–3-minute delay); maximum dose 150 mg  IV  **Neonate:** 2 mg/kg produces 5–10-minute paralysis, 3 mg/kg results in full neuromuscular block  **Infant:** Initially 2 mg/kg; maintenance is usually 1–2 mg/kg at 5–10-minute intervals as necessary  **Child:** Initially 1 mg/kg, then 0.5–1 mg/kg repeated every 5–10 minutes as necessary |
| Contraindications | Hyperkalaemia, severe liver disease, major trauma, chronic abdominal infection, subarachnoid haemorrhage, degenerative or dystrophic neuromuscular disease, family history of malignant hyperthermia, prolonged immobilisation (risk of hyperkalaemia), severe burns and skeletal muscle myopathies (e.g. Duchenne muscular dystrophy). |
| Drug interactions | Opioids, CNS sedatives, volatile general anaesthetics, aminoglycosides, cyclophosphamide, digoxin, lidocaine, lithium, magnesium (parenteral), metoclopramide, neostigmine, procainamide, propranolol, pyridostigmine, quinine, streptomycin. |
| Side effects | Arrhythmias, bradycardia, flushing, involuntary muscle contractions, myoglobinuria, myopathy, post procedural muscle pain, rash, apnoea, cardiac arrest, hypersensitivity and malignant hyperthermia, increased intra ocular pressure (IOP), jaw rigidity, excessive sweating. |
| Cautions | Cardiac, respiratory or neuromuscular disease, narrow angled glaucoma, severe sepsis, hepatic and renal impairment, digitalis toxicity or recent digitalization, electrolyte imbalance. |
| Storage condition | Storage between 2° to 8° C. |
| **Vecuronium Bromide** | |
| Pharmacological class | Non-depolarizing neuromuscular blocker |
| Dosage form | Powder for injection: 10mg in a vial |
| Indications | As an adjunct to general anesthesia to facilitate tracheal intubation and to provide skeletal muscle relaxation during surgery. |
| Dose and administration | **Adult:**  **Intubation, by IV injection:**  Initially 80-100 micrograms/ kg, usual maintenance dose, 20-30 micrograms/kg  **Surgical procedures after intubation with suxamethonium**  30 to 50 micrograms/kg body weight.  **Muscle relaxation, by IV infusion:**  Initially, 40–100micrograms/kg, then 0.8–1.4 micrograms/kg/min  **Pediatric:**  **Intubation by IV injection**  **Child 1–4 months:** Initially 10–20 micrograms/kg, followed by incremental doses according to response  **Child over 5 months:** Initially 80–100 micrograms/kg, usual maintenance dose, 20–30 micrograms/kg  **Muscle relaxation during surgery, IV infusion:**  **Neonate:** Initially 80–100 micrograms/kg, then 30– 50 micrograms/kg adjusted according to response.  **Infant or Child:** Initially 80–100 micrograms/kg, then either by IV injection 20–30 micrograms/kg repeated as required, or by IV infusion 50–80 micrograms/kg per hour, adjusted according to response |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Aminoglycosides, opioids, sedatives, volatile general anaesthetics, carbamazepine, clindamycin, neostigmine, phenytoin, procainamide, propranolol, pyridostigmine. |
| Side effects | Hypersensitivity reactions, including bronchospasm, hypotension, tachycardia, oedema, erythema, pruritus; apnoea, respiratory insufficiency and paralysis. |
| Cautions | Hepatic impairment, electrolyte disturbances, respiratory disorders, history of asthma, severe obesity, neuromuscular disease, myasthenia gravis. |
| Storage condition | Store in a refrigerator (2ºC – 8ºC). |
| **Neostigmine** | |
| Pharmacological class | Cholinesterase inhibitor |
| Dosage form | Injection: 500 mcg/ml, 2.5 mg/ml in 1 ml ampoule. |
| Indications | For reversal of the effects of non-depolarizing neuromuscular blocking agents (e.g. tubocurarine, gallamine or pancuronium) after surgery and in the treatment of post-operative non-obstructive urinary retention. |
| Dose and administration | **Adult:**  **Reversal of non-depolarizing block by IV injection:**  Over 1 minute, 2.5 mg, followed, if necessary, by supplements of 500 micrograms to maximum total dose of 5 mg  **Post-operative urinary retention, by SC or IM injection:**  500 micrograms; catheterization required if urine not passed within 1 hour  **Pediatric:**  **Reversal of non-depolarizing muscle block (using neostigmine metal sulphate), IV over 1 minute:**  **Neonate:** 50–80 micrograms/kg, after or with atropine.  **Infant or child:** 50–80 micrograms/kg (maximum 2.5 mg) after or with atropine |
| Contraindications | Hypersensitivity to the drug, recent intestinal or bladder surgery, mechanical intestinal or urinary tract obstruction and peritonitis. |
| Drug interactions | Anticholinergics, aminoglycosides, chloroquine, clindamycin, paromomycin, propranolol, suxamethonium, vecuronium, cyclopropane, halothane, thiopental. |
| Side effects | Increased salivation, nausea, vomiting, abdominal cramps, diarrhoea, bradycardia, thrombophlebitis, bronchoconstriction, increased bronchial secretions, lacrimation, excessive sweating, involuntary defecation and micturition, miosis, arrhythmias, hypotension. |
| Cautions | Bronchial asthma, recent coronary occlusion, peptic ulcer hyperthyroidism, epilepsy, renal impairment and cardiovascular conditions such as coronary artery disease, cardiac arrhythmias or recent acute coronary syndrome. |
| Storage condition | Store below 30°C. Protect from light. |
| **Pyridostigmine** | |
| Pharmacological class | Cholinesterase inhibitor |
| Dosage form | Injection, 5mg/ml  Tablets (coated), 60 mg |
| Indications | For reversal of the effects of non-depolarizing neuromuscular blocking agents (e.g. tubocurarine, gallamine or Pancuronium) after surgery and in the treatment of post-operative non-obstructive urinary retention. |
| Dose and administration | **Adult:**  **Reversal of non-depolarizing block, IV injection:**  Initial: 0.1-0.25 mg/kg/dose 10-20 mg generally effective; full recovery may occur as early as <15 min but may require >30 min  To minimize side effects 0.6-1.2 mg IV atropine sulfate recommended immediately prior to pyridostigmine  **Pediatric**  **Reversal of non-depolarizing muscle block (using neostigmine metal sulphate), IV**  Initial: 0.1-0.25 mg/kg/dose IV  Dosing range: 0.1-0.25 mg/kg/dose; full recovery may occur as early as <15 min but may require >30 min. |
| Contraindications | Hypersensitivity to the drug, recent intestinal or bladder surgery, mechanical intestinal or urinary tract obstruction and peritonitis. |
| Drug interactions | Anticholinergics, aminoglycosides, atropine, chloroquine, clindamycin, paromomycin, propranolol, suxamethonium, vecuronium, cyclopropane, halothane, thiopental. |
| Side effects | Increased salivation, nausea, vomiting, abdominal cramps, diarrhoea, bradycardia, thrombophlebitis, bronchoconstriction, increased bronchial secretions, lacrimation, excessive sweating, involuntary defecation and micturition, miosis, arrhythmias, hypotension. |
| Cautions | Bronchial asthma, recent coronary occlusion, peptic ulcer, hyperthyroidism, epilepsy, renal impairment and cardiovascular conditions such as coronary artery disease, cardiac arrhythmias or recent acute coronary syndrome. |
| Storage condition | Store below 30°C. Protect from light. |

# Medicines Used For Joint Diseases

Managing joint diseases involves medications targeting inflammation, pain, and underlying disease mechanisms, significantly impacting conditions like gout, rheumatoid arthritis, and juvenile idiopathic arthritis.

## Medicines used for gout

Gout management involves treatment of both acute attacks and chronic hyperuricemia. Acute gout attacks are commonly managed with nonsteroidal anti-inflammatory drugs (NSAIDs) such as meloxicam, indomethacin, and ibuprofen, or with short courses of corticosteroids like prednisolone and triamcinolone acetonide. NSAIDs exert their effect by inhibiting cyclooxygenase (COX) enzymes, thereby reducing prostaglandin production and alleviating inflammation and pain. Corticosteroids are utilized for their potent anti-inflammatory effects, particularly in patients who are intolerant to NSAIDs. For long-term management, xanthine oxidase inhibitors, such as allopurinol, are employed to reduce uric acid synthesis by inhibiting the enzyme xanthine oxidase, thus preventing the recurrence of gout flares.

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| **Allopurinol** | |
| Pharmacological class | Xanthine Oxidase Inhibitor |
| Dosage form | Tablet: 100mg |
| Indications | Prophylaxis of gout, uric acid and calcium oxalate renal stones, and hyperuricemia associated with cancer chemotherapy |
| Dose and administration | **Gout:**  **Adult:**  **Mild:** Start with 100 mg/day; increase weekly to 100–200 mg daily.  **Moderate:** Start with 100 mg/day; increase weekly to 300–600 mg daily in divided doses (maximum per dose: 300 mg).  **Severe:** Start with 100 mg/day; increase weekly to 700–900 mg daily in divided doses (maximum per dose: 300 mg).  *Note: Initiate allopurinol 2–3 weeks after the acute gout attack has subsided. Administer a suitable NSAID (not ibuprofen) at the start of allopurinol treatment and continue for at least 1 month after correction of hyperuricemia. For hyperuricemia associated with cancer therapy, allopurinol should be started before the initiation of cancer treatment.* |
| Contraindications | Hypersensitivity reactions to the drug, previous allopurinol-induced rash |
| Drug interactions | Warfarin, enalapril, captopril, amoxicillin, ampicillin |
| Side effects | Rash, gastrointestinal upset, nausea, diarrhea, stevens-Johnson syndrome, toxic epidermal necrolysis, hepatitis, renal failure |
| Cautions | Renal impairment, hepatic impairment, pregnancy, breastfeeding |
| Storage condition | Store below 300C |
| **Ibuprofen** | |
| Pharmacological class | NSAID |
| Dosage form | Capsule: 300mg  Syrup: 100mg/5ml  Tablet: 200mg, 400mg (e/c optional) |
| Indications | Acute gout attack, pain and inflammation in rheumatic disease and other musculoskeletal disorders, dysmenorrhea, headache, acute migraine attack |
| Dose and administration | **Acute gout flare:**  **Adult:** Initial Dose: 800 mg three times daily.  Maintenance Dose: Continue 800 mg three times daily until the acute flare has resolved, typically for a period of 3 to 7 days. The maximum daily dose should not exceed 3200 mg. |
| Contraindications | Hypersensitivity (including asthma, angioedema, urticaria or rhinitis) to acetylsalicylic acid or any other NSAID, active/history of GI bleeding/perforation/ulceration related to NSAID therapy, severe heart failure, varicella infection, severe renal failure, and hepatic failure. |
| Drug interactions | Acetylsalicylic acid, dexamethasone, hydrocortisone, fluoxetine, prednisolone, warfarin, digoxin, lithium, methotrexate, phenytoin, enalapril, propranolol, ciclosporin, penicillamine, heparin, levofloxacin, ofloxacin, fluoxetine, ritonavir |
| Side effects | GI disturbances, headache, dizziness, nervousness, depression, drowsiness, insomnia, vertigo, tinnitus, photosensitivity, hematuria, fluid retention, raised blood pressure, renal failure, alveolitis, pulmonary eosinophilia, pancreatitis, visual disturbances, erythema multiforme. |
| Cautions | Asthma, cardiac disease, volume depletion (e.g., in gastroenteritis or dehydration - risk of renal impairment), concomitant use of drugs that increase the risk of bleeding, coagulation defects, elderly, pregnancy, hepatic impairment, renal impairment |
| Storage condition | Store below 30°C. |
| **Indomethacin** | |
| Pharmacological class | NSAID |
| Dosage form | Capsule: 25 mg, 50 mg, 75 mg  Suppository: 50 mg, 100 mg |
| Indications | Acute gout, acute or chronic rheumatoid arthritis, relief of acute or chronic osteoarthritis, ankylosing spondylitis, juvenile arthritis, psoriatic arthritis |
| Dose and administration | **Acute Gout,** oral:  Initial Dose: 50 mg three times daily until pain is tolerable.  Maintenance Dose: reduce to 25 mg three times daily until the attack has resolved.  100 mg per rectum 1–2 times a day, dose to be administered at night and in the morning if required, combined oral and rectal treatment maximum total daily dose 150–200 mg  Modified-release medicines: 75 mg 1–2 times a day |
| Contraindications | Hypersensitivity to the drug, active/history of GI bleeding/ulceration/perforation related to NSAID therapy, severe heart failure, preoperative pain associated with coronary artery bypass graft surgery (CABG) surgery, history of proctitis or recent rectal bleeding |
| Drug interactions | Anticoagulants, heparin, or thrombolytic agents, antihypertensives or diuretics, aspirin and anti-inflammatory agents |
| Side effects | Diarrhea, nausea, abdominal pain, headache, dizziness, lightheadedness, GI ulceration |
| Cautions | Allergic disorders and connective-tissue disorders, cardiac impairment, cerebrovascular disease, ischemic heart disease, peripheral arterial disease, uncontrolled hypertension, renal impairment, dehydration, elderly, inflammatory bowel disease, neurological and psychiatric conditions such as epilepsy, parkinsonism, and psychiatric disturbances. |
| Storage condition | Store below 300C |
| **Meloxicam** | |
| Pharmacological class | NSAID |
| Dosage form | Tablet: 7.5mg, 15mg |
| Indications | Pain and inflammation in rheumatic disease, exacerbation of osteoarthritis (short-term), ankylosing spondylitis, relief of pain and inflammation in juvenile idiopathic arthritis |
| Dose and administration | **Acute gout flare:**  Initial dose: 15 mg once daily.  Maintenance dose: Continue with 15 mg once daily until the acute flare has resolved. |
| Contraindications | Hypersensitivity to the drug and other NSAID, active GI bleeding, active GI ulceration, following CABG, history of GI bleeding and perforation related to previous NSAID therapy, history of recurrent GI hemorrhage/ulceration, severe heart failure, |
| Drug interactions | Captopril, enalapril, methotrexate |
| Side effects | Constipation, diarrhea, gastrointestinal discomfort, headache, nausea, vomiting. |
| Cautions | Refer to Indomethacin monograph, elderly |
| Storage condition | Store below 300C |
| **Prednisolone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Tablet: 5mg |
| Indications | Suppression of inflammatory and allergic disorders |
| Dose and administration | **Acute gout flare**  Initial Dose: 30-60 mg once daily.  Duration: Typically prescribed for 5-10 days.  Tapering: If used for more than a few days, the dose may need to be tapered to prevent withdrawal symptoms. |
| Contraindications | Hypersensitivity to the drug, untreated bacterial, viral, and fungal infections |
| Drug interactions | Mifepristone, carbamazepine, vaccines (live virus), erythromycin, metoprolol succinate, aspirin, esomeprazole, furosemide, albuterol, atorvastatin, hydroxychloroquine, pregabalin, cetirizine. |
| Side effects | GI effects including dyspepsia, esophageal ulceration, development or aggravation of peptic ulcers, abdominal distension, acute pancreatitis, increased appetite and weight gain, fluid retention, dizziness, spinning sensation, changes in menstrual periods, headache, muscle pain or weakness, stomach discomfort, osteoporosis, increased risk of infection, psychiatric disturbances (mood swings, depression), hypertension, cataracts, glaucoma, hyperglycemia. |
| Cautions | Cirrhosis, diabetes, ocular herpes simplex, hypertension, diverticulitis, myocardial infarction, seizure, hypothyroidism, myasthenia gravis, hepatic impairment, peptic ulcer disease, osteoporosis, ulcerative colitis, psychotic tendencies, untreated systemic infections, renal insufficiency, varicella, live vaccines, pregnancy. |
| Storage condition | Store below 30°C. |
| **Triamcinolone acetonide** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection: 40mg/ml in Vial |
| Indications | Suppression of inflammatory and allergic disorders including skin conditions, ulcerative colitis, arthritis, lupus, psoriasis, or breathing disorders. |
| Dose and administration | **Acute gout flare, Adult:**  IM Injection:  Dose: 60 mg as a single injection. In some cases, a higher dose of up to 80 mg may be used, depending on the severity of the flare and the patient’s response.  Intra-articular Injection:  Dose: 10-40 mg injected directly into the affected joint, depending on the size of the joint and the severity of inflammation. |
| Contraindications | Hypersensitivity to the drug, live attenuated vaccines, and primary treatment for acute asthma. |
| Drug interactions | Rotavirus vaccine, levofloxacin, moxifloxacin, norfloxacin, ofloxacin, aspirin, phenytoin, atracurium. |
| Side effects | Anorexia, weight loss, flushing, depression, and muscle wasting, proximal myopathy, secondary ocular infection, cataracts, glaucoma |
| Cautions | High dose, chronic therapy. |
| Storage condition | Store below 30°C. |

## Disease modifying anti-rheumatic drugs

Disease modifying anti-rheumatic medicines (DMARDs) are critical in managing rheumatoid arthritis and other autoimmune joint diseases by slowing disease progression and preventing joint damage. Methotrexate is often the first-line treatment, working as a folate antagonist to inhibit DNA synthesis, reduce the proliferation of immune cells, and decrease inflammation. Sulfasalazine acts through a combination of anti-inflammatory and immunomodulatory effects, though its exact mechanism is not fully understood. Chloroquine phosphate, an antimalarial drug, modulates the immune system by inhibiting toll-like receptor signaling pathways, reducing the activation of immune cells. Azathioprine is an immunosuppressant that interferes with DNA synthesis, reducing the proliferation of immune cells and controlling severe cases of rheumatoid arthritis. Penicillamine can be used as an alternative to azathioprine, providing similar immunosuppressive effects.

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| **Azathioprine** | |
| Pharmacological class | DMARD |
| Dosage form | Tablet: 50 mg |
| Indications | Rheumatoid arthritis when no response is obtained with chloroquine, or hydroxychloroquine |
| Dose and administration | **Adult:** Initially 1.5–2.5 mg/kg daily in divided doses, adjusted according to response, maintenance dose, 1–3 mg/kg daily, consider withdrawal if no improvement within 3 months. |
| Contraindications | Hypersensitivity to the drug or mercaptopurine, psoriatic arthritis, pregnancy |
| Drug interactions | Allopurinol, live vaccines, phenytoin, sulfamethoxazole + trimethoprim, trimethoprim, ACE inhibitors, warfarin |
| Side effects | Bone marrow depression (dose-related), increased risk of infection, leucopenia, thrombocytopenia, anemia, pancreatitis, hepatic disorders |
| Cautions | Liver and renal disease, deficiency of thiopurine methyltransferase |
| Storage condition | Store below 30°C. |
| **Chloroquine phosphate** | |
| Pharmacological class | Antimalarial |
| Dosage form | Tablet: 150mg |
| Indications | Rheumatoid arthritis |
| Dose and administration | **Adult:** Initial dose: 250 mg orally once daily.  Maintenance dose: Continue with 250 mg once daily. In some cases, the dose may be adjusted to 500 mg twice weekly. |
| Contraindications | Hypersensitivity to the drug, preexisting retinopathy or other significant visual field changes, psoriasis. |
| Drug interactions | Aspirin, epinephrine, azithromycin, ciprofloxacin, amiodarone, antiepileptics, metoprolol, paracetamol, alprazolam, antacids, kaolin |
| Side effects | Nausea, vomiting, diarrhea, abdominal pain, headache, blurred vision, difficulty focusing, skin reactions, convulsions, depigmentation or loss of hair, bone-marrow suppression, hearing loss, tinnitus, retinal damage, cardiomyopathy, myopathy |
| Cautions | Acute porphyrias, diabetes, G6PD deficiency, long-term therapy; myasthenia gravis, exacerbate psoriasis, neurological disorders, GI and dermatological conditions, pregnancy, breastfeeding |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Methotrexate** | |
| Pharmacological class | DMARD |
| Dosage form | Tablet: 2.5 mg, 5 mg, 7.5 mg, 10 mg, 15 mg  Powder for Injection: 5 mg, 50mg in vial |
| Indications | Rheumatoid arthritis, psoriatic arthritis, juvenile idiopathic arthritis, other autoimmune diseases |
| Dose and administration | **Rheumatoid arthritis and psoriatic arthritis**  **Adult:** Initial dose: 7.5-15 mg orally or SC once weekly.  Maintenance dose: Increase by 2.5-5 mg weekly as needed, based on response and tolerance. Maximum weekly dose: 25-30 mg. |
| Contraindications | Refer to Methotrexate under medicines for sarcoidosis and ILD |
| Drug interactions | Refer to Methotrexate under medicines for sarcoidosis and ILD |
| Side effects | Refer to Methotrexate under medicines for sarcoidosis and ILD |
| Cautions | Refer to Methotrexate under medicines for sarcoidosis and ILD |
| Storage condition | Store below 30°C and protect from light. |
| **Pencilamine** | |
| Pharmacological class | DMARD |
| Dosage form | Tablet: 125 mg, 250 mg |
| Indications | Severe active rheumatoid arthritis, Willson’s disease, cystinuria, other autoimmune diseases |
| Dose and administration | **Rheumatoid arthritis**  **Adult:** Initially 125–250 mg daily for 1 month, then increased in steps of 125–250 mg, at intervals of not less than 4 weeks; maintenance 500–750 mg daily in divided doses, then reduced in steps of 125–250 mg every 12 weeks, dose reduction attempted only if remission sustained for 6 months; maximum 1.5 g per day  **Elderly:** Initially up to 125 mg daily for 1 month, then increased in steps of up to 125 mg, at intervals of at least 4 weeks; maximum 1 g per day |
| Contraindications | Hypersensitivity to the drug, history of penicillamine-induced aplastic anemia or agranulocytosis, lupus erythematosus |
| Drug interactions | Gold salts, antimalarials (chloroquine, hydroxychloroquine), digoxin, iron supplements, NSAIDs |
| Side effects | Nausea, vomiting, diarrhea, anorexia, taste alteration, proteinuria, hematuria, rash, fever, lymphadenopathy, aplastic anemia, agranulocytosis, thrombocytopenia, lupus-like syndrome. |
| Cautions | Renal impairment, bone marrow suppression, immunosuppressive treatment, pregnancy |
| Storage condition | Store below 30°C. Protect from light and moisture. |
| **Sulfasalazine** | |
| Pharmacological class | DMARD |
| Dosage form | Tablet: 500mg |
| Indications | Rheumatoid arthritis, juvenile idiopathic arthritis, inflammatory bowel disease |
| Dose and administration | **Rheumatoid arthritis**  **Adult:** Initial dose: 500 mg to 1 g orally once daily.  Maintenance dose: Gradually increases to 2 g/day in two divided doses. Some patients may require up to 3 g/day for adequate control.  Maximum dose: 3 g/day. |
| Contraindications | Hypersensitivity to the drug, its metabolites, sulphonamides, or salicylates, intestinal or urinary obstruction, porphyria |
| Drug interactions | Warfarin, digoxin, azathioprine, folic acid, folinic acid, mercaptopurine |
| Side effects | Headache, nausea, vomiting, gastric distress, skin rash, pruritus, fever, insomnia, stomatitis, altered taste, tinnitus, urine abnormalities, anorexia, hemolytic anemia, cyanosis, reversible oligospermia. |
| Cautions | G6PD deficiency, history of allergy or asthma, a risk of hematological or hepatic toxicity. renal impairment, acute porphyria. |
| Storage condition | Store below 30°C. |

## Medicines for juvenile joint diseases

Medicines for juvenile joint diseases are essential in managing conditions such as juvenile idiopathic arthritis (JIA) to prevent joint damage and maintain function. Acetylsalicylic acid (aspirin) provides anti-inflammatory and analgesic properties by inhibiting COX enzymes, reducing prostaglandin production and inflammation. Adalimumab, a biologic TNF inhibitor, blocks tumour necrosis factor (TNF), a key cytokine involved in inflammatory processes, thereby reducing inflammation and preventing disease progression in severe cases. Methotrexate is a cornerstone treatment in juvenile arthritis, functioning as a folate antagonist to inhibit DNA synthesis and reduce immune cell proliferation. Triamcinolone hexacetonide is a corticosteroid used for intra-articular injections, providing targeted relief of inflammation by suppressing multiple inflammatory pathways. Triamcinolone acetonide can be used as an alternative corticosteroid with similar effects.

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| **Acetylsalicylic acid** | |
| Pharmacological class | NSAID |
| Dosage form | Suppository: 50 mg, 100 mg, 150 mg  Tablet: 100 mg, 300 mg, 500 mg |
| Indications | Juvenile idiopathic arthritis (JIA) and other inflammatory conditions |
| Dose and administration | **JIA:**  Up to 80mg/kg daily in 5 – 6 divided doses, increased in an acute exacerbation to 130mg/kg. Doses should be taken after food. |
| Contraindications | Hypersensitivity reactions to the drug, active peptic ulceration, bleeding disorders, child under 16 years, haemophilia, previous peptic ulceration, severe cardiac failure |
| Drug interactions | Heparin, ibuprofen, methotrexate, warfarin, dexamethasone, hydrocortisone, prednisolone, fluoxetine, metoclopramide, phenytoin, spironolactone, valproic Acid |
| Side effects | Nausea, dyspepsia, GI ulceration or bleeding, tinnitus, vertigo, confusion, iron deficiency anemia, major hemorrhage, blood dyscrasias, edema, myocarditis, Reye syndrome with subsequent encephalopathy and severe hepatic injury. |
| Cautions | Allergic disease, anemia, asthma, dehydration, elderly, G6PD deficiency, hypertension, hepatic impairment, renal impairment, increased risk of sodium and water retention |
| Storage condition | Store below 300C |
| **Adalimumab** | |
| Pharmacological class | Immunomodulator |
| Dosage form | Injection: 10 mg/0.2 ml, 20 mg/0.4 ml, 40 mg/0.8 ml, 40 mg/0.4 ml |
| Indications | Moderate to severe active rheumatoid arthritis, active and progressive psoriatic arthritis, severe active ankylosing spondylitis, inflammatory bowel disease, plaque psoriasis |
| Dose and administration | **JIA:**  **Child 2 Years and Older (10 kg to <30 kg):** 20 mg SC for 2 weeks, review treatment if no response withing 12 weeks.  **Child 2 Years and Older (≥30 kg):** 40 mg SC for 2 weeks, review treatment if no response withing 12 weeks. |
| Contraindications | Moderate or severe heart failure, severe infections |
| Drug interactions | Azathioprine, live vaccines, betamethasone, dexamethasone, hydrocortisone, prednisolone, carboplatin, cyclosporine, linezolid, primaquine, etanercept, infliximab, abatacept, anakinra |
| Side effects | Headache, cold symptoms such as stuffy nose, sinus pain, sneezing, sore throat, rash or redness, bruising, itching, or swelling at the injection site |
| Cautions | Active infections, immunosuppression, history of malignancy or taking concomitant immunosuppressants, demyelinating disorders, hepatitis B virus |
| Storage condition | Store below 30OC |
| **Methotrexate** | |
| Pharmacological class | Antimetabolite |
| Dosage form | Tablet: 2.5 mg |
| Indications | Juvenile idiopathic arthritis and other autoimmune diseases such as rheumatoid arthritis, psoriasis |
| Dose and administration | **JIA:**  Initial dose: 10-15 mg/m² (body surface area) once weekly.  Maintenance dose: Adjust based on clinical response and tolerance. The usual dose range is 10-20 mg/m² once weekly.  Maximum dose: 25 mg/week |
| Contraindications | Immunodeficiency syndromes |
| Drug interactions | Refer to Methotrexate under medicines for sarcoidosis and ILD |
| Side effects | Refer to Methotrexate under medicines for sarcoidosis and ILD |
| Cautions | Refer to Methotrexate under medicines for sarcoidosis and ILD |
| Storage condition | Store below 30OC. Protect from light, moisture and heat. |
| **Triamcinolone acetonide** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection: 10 mg/ml, 40 mg/ml in vial  Topical: Cream, Ointment, Lotion (0.025%, 0.5%, 0.1%) |
| Indications | Juvenile idiopathic arthritis and other inflammatory conditions |
| Dose and administration | **JIA:**  **Intra-articular Injection:**  Dose: 1-2 mg/kg per joint, not to exceed 40 mg per joint.  Frequency: Can be repeated every 3-6 months, depending on clinical response and tolerance.  **IM Injection:**  Dose: 0.11-1.6 mg/kg (usually 0.11-0.22 mg/kg) as a single dose.  Frequency: Can be repeated every 3-6 months based on clinical response and tolerance.  **Topical Application (not typically used for JIA):**  Dose: Apply a thin layer to the affected area 2-4 times daily. |
| Contraindications | Refer to triamcinolone acetonide under medicines used for Gout section |
| Drug interactions | Refer to triamcinolone acetonide under medicines used for Gout section |
| Side effects | Refer to triamcinolone acetonide under medicines used for Gout section |
| Cautions | Refer to triamcinolone acetonide under medicines used for Gout section |
| Storage condition | Store below 30OC. Protect from light, moisture and heat. |
| **Triamcinolone Hexacetonide** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection: 20 mg/ml in vial. |
| Indications | Rheumatoid arthritis, osteoarthritis, JIA, synovitis, bursitis, tendinitis, and other inflammatory joint conditions |
| Dose and administration | **JIA:**  Dose: small joints: 2-6 mg per joint; medium joints: 5-10 mg per joint; and large joints: 10-20 mg per joint.  Maximum dose: Do not exceed 1 mg/kg or 30 mg per joint.  Frequency: Can be repeated every 3-6 months, depending on clinical response and tolerance. |
| Contraindications | Refer to triamcinolone acetonide under medicines used for Gout section |
| Drug interactions | Refer to triamcinolone acetonide under medicines used for Gout section |
| Side effects | Refer to triamcinolone acetonide under medicines used for Gout section |
| Cautions | Refer to triamcinolone acetonide under medicines used for Gout section |
| Storage condition | Store below 30OC. Protect from light, moisture and heat. |

# Vitamins and Minerals

## Vitamins

Vitamins are used for the prevention and treatment of specific deficiency states or when the diet is known to be inadequate. They are broadly categorized into fat-soluble and water-soluble vitamins. The water-soluble vitamins comprise the B complex and vitamin C and function as enzyme cofactors. The lipid-soluble vitamins such as vitamin A, D, E and K are nonpolar hydrophobic compounds that can only be absorbed efficiently when there is normal fat absorption. Excessive intakes of most water-soluble vitamins have little effects due to their rapid excretion in urine, but excessive intakes of fat-soluble vitamins accumulate in the body and are potentially dangerous.

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| **Alfacalcidol** | |
| Pharmacological class | Vitamin D3 derivative |
| Dosage form | Capsule: 0.25mcg  Injection: 2mcg/ml |
| Indications | Vitamin D deficiency, including hypocalcaemia and hypophosphatemia associated with chronic kidney disease, hypoparathyroidism. |
| Dose and administration | **Patients with severe renal impairment requiring vitamin D therapy:** oral or IV injection  **Adult**: Initially 1 mcg daily, dose to be adjusted to avoid hypercalcaemia; maintenance 0.25–1 mcg daily  **Elderly**: Initially 500 ng daily, dose adjusted to avoid hypercalcaemia; maintenance 0.25–1 mcg daily  **Hypophosphatemia rickets, persistent hypocalcaemia due to hypoparathyroidism or pseudohypoparathyroidism:** oral or IV injection  **Child 1 month–11 years**: 25–50 ng /kg once daily, dose to be adjusted as necessary; maximum 1 mcg per day  **Child 12–17 years**: 1 mcg once daily, dose to be adjusted as necessary  **Prevention of vitamin D deficiency in renal or cholestatic liver disease:** oral or IV injection  **Child 1 month–11 years (body weight up to 20 kg)**: 15–30 ng/kg once daily (max. per dose 500 ng)  **Child 1 month–11 years (body weight 20 kg and above)**: 250–500 ng once daily, dose to be adjusted as necessary  **Child 12–17 years**: 250–500 ng once daily, dose to be adjusted as necessary |
| Contraindications | Hypersensitivity to the drug, hypercalcemia, vitamin D toxicity, hyperphosphotemia. |
| Drug interactions | Other vitamin D analogs, thiazide diuretics, calcium supplements, as phenytoin, carbamazepine, phenobarbital, rifampin, magnesium containing drugs (e.g. antacids). |
| Side effects | Hypercalcemia, hypercalciuria, nausea, vomiting, constipation, arrhythmias, renal dysfunction, metastatic calcification, hyperphosphatemia, rash pustular and urinary tract infection |
| Cautions | Impaired liver or kidney function, granulomatous diseases, nephrolithiasis, infants. |
| Storage condition | Store between 15°C and 30°C. Protect from light and moisture. |
| **Ascorbic Acid (vitamin C)** | |
| Pharmacological class | Vitamin |
| Dosage form | Tablet: 100mg, 500mg |
| Indications | For prophylaxis and treatment of vitamin C (ascorbic acid) deficiency. |
| Dose and administration | **Adult:**  **Treatment of scurvy**: Oral 1 to 2 g for the first 2 days, then 500 mg daily for a week. Alternative dose: 250mg four times daily for a week  **Prophylaxis of scurvy, oral recommended daily intake:**  Males: 90mg/day Females: 75mg/day  Pregnancy: 85mg/day; not to exceed 2000mg/day (80mg if less than 18years old; not to exceed 1800mg/day)  **Pediatric:**  **Treatment of scurvy**: not less than 250 mg daily oral in 1–2 divided doses untilclinical signs of scurvy disappear.  **Prophylaxis of scurvy**: 25–75 mg oral daily.  **Recommended daily intake:**  Infant 0–6 months: 25 mg/day  Child 7–12 months: 30 mg/day  Child 1–8 years: 35 mg/day  Child over 9 years: 40 mg/day. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Deferoxamine, aluminium hydroxide, disulfiram, vitamin B12 |
| Side effects | Faintness, diarrhea, dyspepsia, nausea, vomiting, kidney stones (oxalate nephrolithiasis), hyperoxolaurea. |
| Cautions | Pregnancy, renal insufficiency, diabetes, glucose-6-phosphate dehydrogenase deficiency/defect. |
| Storage condition | Store below 30°C. |
| **Calcitriol (Vitamin D3)** | |
| Pharmacologic class | Vitamin D |
| Dosage form | Capsule: 250 mcg  Injection: 1 microgram/ml |
| Indications | Hypocalcaemia due to hypoparathyroidism (postsurgical or idiopathic), pseudo hypoparathyroidism, hypocalcaemia in patients undergoing chronic renal dialysis. |
| Dose and administration | **Adult:**  **Hypocalcaemia, hypoparathyroidism, pseudohypoparathyroidism, postsurgical or idiopathic,** oral:  Initial, 0.25 mcg/day in the morning, dose may be increased at 2- to 4-wk intervals, usual dose range, 0.5 to 2 mcg once daily.  **Hypocalcaemia – renal dialysis (chronic),** oral:  Initial, 0.25 mcg daily or every other day (may require 0.5 to 1 mcg /day); increases of 0.25 mcg /day may be made at 4 to 8 wk. intervals.  **Hypocalcaemia – renal dialysis (chronic),** IV:  1 to 2 mcg /day 3 times/wk. on approximately every other day (may require 0.5 to 4 mcg /day 3 times/wk.), may increase by 0.5 to 1 mcg /dose at 2 to 4 wk. intervals to optimal response.  **Pediatric:**  **Hypocalcaemia - hypoparathyroidism, postsurgical or idiopathic:** oral  **Child 1 to 5 years**: 0.25 mcg /day orally in the morning, dose may be increased at 2- to 4-wk intervals, usual dose range, 0.25 to 0.75 mcg orally once daily.  **6 years of age and older**: initial, 0.25 mcg /day orally in morning, dose may be increased at 2- to 4-wk intervals, usual dose range, 0.5 to 2 mcg orally once daily. |
| Contraindications | Hypersensitivity to the drug and to other vitamin D, pre-existing hypercalcemia, |
| Drug interactions | Thiazide diuretics, digoxin, phenytoin, corticosteroids calcium supplements, antacids, cholestyramine and magnesium containing products. |
| Side effects | Upper abdominal pain, apathy, dehydration, drowsiness, fever, growth retardation muscle weakness, paralytic ileus, polydipsia, psychiatric disorder, sensory disorder, thirst and urinary disorders. |
| Cautions | Hypercalcemia, hypercalciuria, and hyperphosphatemia (excessive dosage), patients receiving calcium supplements or high doses of vitamin D. |
| Storage condition | Store below 30 0C. |
| **Cholecalciferol (Vitamin D3)** | |
| Pharmacological class | Vitamins D |
| Dosage form | Capsule: 10,000IU, 50,000IU  Injection: 300,000IU/ml |
| Indications | Prevention and treatment of vitamin D deficiency, treatment of chronic hypocalcaemia associated with various medical conditions including chronic renal failure, familial hypophosphatemia and hypoparathyroidism |
| Dose and administration | **Primary prevention of vitamin deficiency,** oral:  **Adult**: 400 units daily  1 mcg = 40 international units (IU)  **Treatment of chronic hypocalcaemia:**  **Treatment of vitamin D deficiency [loading dose],** oral:  **Adult**: 50,000 units once weekly for 6 weeks, alternatively 40 000 once weekly for 7 weeks, alternatively 4000 units daily for 10 weeks, different loading regimens can be used to achieve a cumulative total of approximately 300 000 units divided into daily or weekly doses over 6–10 weeks  **Treatment of vitamin D deficiency [maintenance dose],** oral:  **Adult**: 800–2000 units daily, maintenance dosing maybe given daily, or the equivalent dose given intermittently. Maintenance to be started one month after loading dose completed, or if correction of vitamin D deficiency is less urgent, maintenance may be started without the use of loading doses. Higher maintenance doses may be necessary in those at high risk of vitamin D deficiency; maximum 4000 units per day  **Pediatrics:**  **Vitamin D-resistant rickets:** 12,000-500,000 IU (0.3-12.5 mg) orally once daily.  **Familial hypophosphatemia:** 40,000-80,000 IU (1-2 mg) orally once daily with phosphate supplements; may be reduced after stage of growth is complete. |
| Contraindications | Hypersensitivity to the drug, hypercalcemia, metastatic calcification, nephrolithiasis (renal calculi) and severe renal impairment. |
| Drug interactions | Antacids (magnesium containing), calcium containing preparations, diuretics (thiazide), cholestyramine and other vitamin D analogue. |
| Side effects | Anorexia, tiredness, nausea and vomiting, diarrhea, weight loss, polyuria, sweating, headache, thirst, vertigo, hyperphosphatemia, soft tissue calcification, raise the concentrations of calcium level in urine and increased risk of kidney stones. |
| Cautions | Impaired renal function, heart disease, renal stones, arteriosclerosis, breastfeeding and sarcoidosis. |
| Storage condition | Store below 30°C. |
| **Cyanocobalamin (Vitamin B 12)** | |
| Pharmacological class | Vitamin B |
| Dosage form | **Injection**: 1mg/ml in 1ml ampoule |
| Indications | Treatment of pernicious anemia, nutritional Supplementation, anemia related to vitamin B12 deficiency |
| Dose and administration | **Nutritional Supplementation:** recommended daily allowance (RDA)  Age >19 years: 2.4 mcg  Pregnant women: 2.6 mcg  Breastfeeding women: 2.8 mcg  Dietary supplement: 50-6,000 mcg/day  **Pernicious Anemia:**  100 mcg IM/SC once daily for 6-7 days, then every other day for 7 doses, then every 3-4 days for 2-3 weeks, then monthly  **Alternative parenteral dosing:** 1000 mcg IM/SC once daily for 7 days, then weekly for 1 month, then monthly  **Vitamin B12 Deficiency:** Initial: 30 mcg IM once daily for 5-10 days**;** Maintenance: 100-200 mcg IM monthly |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Ethanol, chloramphenicol, cimetidine, colchicine, potassium, warfarin, phenothiazines, metformin |
| Side effects | Injection site reactions, dizziness, headache and anaphylactic shock |
| Cautions | History of anaphylactic shock, concurrent iron or folic acid deficiency, cyanocobalamin, hypokalaemia and thrombocytosis. |
| Storage condition | Store below 30° C. Protect from light. |
| **Folic acid** | |
| Pharmacological class | Vitamin |
| Dosage form | Tablet: 0.4mg ,1mg, 5mg |
| Indications | For prevention and treatment of folic acid deficiency states, including megaloblastic anemia and in anemia of nutritional origin, pregnancy, infancy, or childhood |
| Dose and administration | **Adult**  **Folate-deficiency, megaloblastic anemia:**  Oral: 5 mg daily for 4 months (in pregnancy continued to term), up to 15mg daily may be necessary in malabsorption states  **Prevention of first occurrence of neural tube defects:**  Oral: 400 mcg daily before conception and during the first 12 weeks of pregnancy  Pr**evention of recurrence of neural tube defects:**  Oral: 5mg daily (reduce to 4 mg daily, if suitable preparation available) from at least 4 weeks before conception until 12th week of pregnancy  **Pediatric**:  **Folate deficiency, megaloblastic anemia:** oral  **Neonate to child 1 year:** initially 500 mcg/kg (maximum 5 mg) once daily for up to 4 months; up to 10 mg once daily may be required in malabsorption states  **Child over 1 year:** 5 mg daily for 4 months; up to 15 mg daily may be required in malabsorption states  **Hemolytic anemia:** oral  **Child 1 month–12 years:** 2.5–5 mg once daily |
| Contraindications | Hypersensitivity to the drug, patients with malignant disease. |
| Drug interactions | Phenobarbital, phenytoin, sulfasalazine, cholestyramine, trimethoprim, sulphonamides, cotrimoxazole and zinc. |
| Side effects | Allergic reactions including erythema, rash, pruritus, urticaria, dyspnoea, and anaphylactic reactions; abdominal distension, appetite decreased, flatulence and nausea. |
| Cautions | Pernicious anaemia or undiagnosed megaloblastic anaemia, in patients receiving coronary stents, hereditary problems of galactose intolerance or glucose-galactose malabsorption. |
| Storage condition | Store below 30°C. |
| **Nicotinamide (vitamin B3)** | |
| Pharmacological class | Vitamin |
| Dosage form | Tablet: 50 mg. |
| Indications | Supplement in nutrition in order to meet the daily requirements of the water-soluble vitamins in adults, adolescents, children and infants and used to treat pellagra. |
| Dose and administration | **Deficiency (prophylaxis),** **amount based on normal daily- recommended intakes: oral**  Adolescent and adult males: 15 – 20mg, Adolescent and adult males: 3 – 15mg, Pregnant female: 17mg, Breast feeding females: 20mg, Birth to 3 years of age: 5-9mg, 4 to 6 years of age: 12mg , 7 to 10 years of age: 13mg  **Parenteral**:  **Deficiency (prophylaxis),** **IV infusion**: as part of total parenteral nutrition (TPN) solutions, the specific amount determined by individual patient need.  **Treatment of deficiency of vitamin B3 (pellagra)**  **Adult: IM**: 50 to 100 mg five to more times a day;  **IV (slow)**: 25 to 100 mg 2 or more times a day;  **Child**, **IV (slow):** up to 300 mg a day |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Anti-diabetic medications, statins, tetracycline antibiotics |
| Side effects | Anaphylactic reaction (injection), hepatotoxicity |
| Cautions | Gallbladder disease or a history of jaundice or liver disease, diabetes mellitus, gout, peptic ulcer, allergy or pregnant. |
| Storage condition | Store below 30°C. |
| **Phytomenadiaone (Vitamin k1)** | |
| Pharmacological class | Vitamin K |
| Dosage form | Injection, 1mg/0.5ml, 10mg/ml in 1ml ampoule  Tablet, 10mg |
| Indications | Reverse warfarin toxicity; treatment and prophylaxis against haemorrhagic disease of the newborn |
| Dose and administration | **Reversal of warfarin toxicity:** IM or slow IV: **Adult**: 10 mg  **Warfarin-induced hypoprothrombinaemia with no or minor bleeding**, **IV**  **Child 1 month–12 years:** 15–30 mcg/kg (maximum 1 mg) as a single dose, repeated as necessary  **Warfarin-induced hypoprothrombinaemia; Reversal of anticoagulation or if significant bleeding**, t**reatment of hemorrhage associated with vitamin K deficiency, IV**  **Child 1 month–12 years:** 250–300 mcg /kg (maximum 10 mg) as a single dose  **Prophylaxis of haemorrhagic disease of the newborn**  **IM**: 0.5–1 mg as single dose at birth.  **Oral**: 2 mg followed by a second dose after 4–7 days and, for breastfed babies, a third dose after 1 month;  **IV**: Pre-term neonate: 400 mcg /kg (maximum 1 mg)  **Treatment of Haemorrhagic disease of the newborn**  **IV:** 1 mg with further doses if necessary, every 8 hours |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Warfarin, certain antibiotics (e.g., cephalosporins), cholestyramine, anticonvulsants |
| Side effects | Flushing, dyspnea, bronchospasm, dizziness, hypotension, and respiratory or circulatory collapse. |
| Cautions | Hepatic impairment, elderly and pregnancy. |
| Storage condition | Store below 30°C. Protect from light |
| **Pyridoxine hydrochloride (Vitamin B6)** | |
| Pharmacological class | Vitamin |
| Dosage form | Tablet: 25mg, 50mg |
| Indications | Prevention and treatment of pyridoxine deficiency states, treatment of idiopathic sideroblastic anemia, prevention neuropathy associated with isoniazid poisoning and for nausea in pregnancy |
| Dose and administration | **Adult:**  **Pyridoxine deficiency, oral,** 20 – 50 mg 1 – 3 times a day  **Nausea in Pregnancy, oral:** 10–25 mg every 8 hours  **Isoniazid-induced neuropathy (prophylaxis), oral:** 10 – 20 mg daily  **Isoniazid-induced neuropathy (treatment), oral:** 50 mg 3 times a day  **Idiopathic sideroblastic anemia, oral:** 100 – 400 mg daily in divided doses  **Pediatric:**  **Metabolic disorders responsive to pyridoxine, sideroblastic anemia:** oral  **Neonate:** 50–100 mg 1–2 times daily; Infant or child: 50–250 mg 1–2 times daily.  **Treatment of isoniazid-induced neuropathy:** oral  **Neonate:** 5–10 mg daily; Infant or child: 10–20 mg 2–3 times daily.  **Prevention of isoniazid-induced neuropathy:** oral  **Neonate:** 5 mg daily; Infant or child: 5–10 mg daily. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Levodopa, isoniazid, phenytoin and corticosteroids |
| Side effects | Peripheral neuropathies, GI disturbances and seizure |
| Cautions | Impaired renal function and neonates. |
| Storage condition | Store below 30°C. Protect from light. |
| **Riboflavin (vitamin B2)** | |
| Pharmacological class | Vitamin |
| Dosage form | Tablet: 5 mg |
| Indications | Vitamin B2 deficiency (ariboflavinosis) |
| Dose and administration | **Adult and child:**  **Treatment of vitamin B 2 deficiency:** up to 30 mg daily in divided doses.  **Prophylaxis of vitamin B 2 deficiency:** 1 to 2 mg daily. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Anticholinergic drugs, tetracyclines, tricyclic antidepressants |
| Side effects | Swelling of lips, face, dark yellow discolorations of urine (harmless), and tongue and difficulty in breathing. |
| Cautions | Pregnancy and breastfeeding. |
| Storage condition | Store below 30°C. Protect from light. |
| **Thiamine hydrochloride (Vitamin B1)** | |
| Pharmacological class | Vitamin |
| Dosage form | Tablet: 50mg, 100mg  Injection, 50mg/ml in 2ml ampoule |
| Indications | For prevention and treatment of thiamine deficiency states that may occur as a result of inadequate nutrition or intestinal malabsorption. |
| Dose and administration | **Adult**:  **For the prevention and treatment of vitamin B1 deficiency or beriberi:**  IM or slow IV infusion: 10–20 mg 3 times/day for up to 2 weeks, then oral maintenance with therapeutic multivitamin preparation containing 5–10 mg thiamine daily for 1 month: 5–10 mg orally 3 times/day  **Thiamine deficiency, treatment and prophylaxis:**  Oral: Dietary supplement, 100 mg daily  **Pediatric**:  **Prevention of thiamine deficiency:** oral  **Infant:** 0.3–0.5 mg/day; Child: 0.5–1 mg/day  **Treatment of thiamine deficiency (beriberi):** oral  **Child:** 10–50 mg/dose daily for 2 weeks, then 5–10 mg/dose daily for 1 month. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Alcohol, antacids, diuretics (furosemide) |
| Side effects | Anaphylactic reaction (coughing, difficulty in swallowing; hives; itching of the skin, swelling of face, lips or eyelids, or wheezing or difficulty in breathing). |
| Cautions | Pregnancy, dextrose administration. |
| Storage condition | Store below 30°C. Protect from light. |
| **Vitamin A** | |
| Pharmacological class | Vitamin |
| Dosage form | Capsule: 50,000IU, 100,000IU, 200,000IU  Injection: 50,000IU/ml |
| Indications | For prevention or treatment of vitamin A deficiency states, causing keratomalacia, xerophthalmia and nyctalopia (night blindness). |
| Dose and administration | **Vitamin A deficiency:** oral  **Adult:** Prophylaxis: 50,000 IU once per day  **Pregnant women:** up to 10,000 units daily or 25,000 units once weekly  **Postpartum females:** 200,000 units at delivery or within 8 weeks of delivery  **Xerophthalmia:** oral  Recommended dose except for females of reproductive age: 200,000 units orally once daily for 2 days. Repeat dose again after 2 weeks  **Females of reproductive age with night blindness or Bitot’s spots**: 5,000-10,000 units per day; 10,000 units per day maximum of 25,000 units once weekly for no more than 4 weeks  **Pediatrics:**  **Prevention of vitamin A deficiency (universal or targeted distribution programmes):** oral  **Infant under 6 months:** 50 000 IU single dose.  **Infant 6–12 months:** 100 000 IU every 4–6 months.  **Child over 12 months:** 200 000 units every 4–6 months.  A dose should preferably be administered with measles vaccination.  **Treatment of xerophthalmia caused by vitamin A deficiency:** oral  **Infant under 6 months:** 50,000IU on diagnosis, repeated the next day and then after 2 weeks.  **Infant 6–12 months:** 100 000 IU immediately on diagnosis, repeated next day and then after 2 weeks.  **Child over 12 months:** 200 000 IU on diagnosis, repeated next day and then after 2 weeks.  **Measles (unless the child has already had adequate treatment with retinol for measles):** oral  **Infant under 6 months:** 50 000IU daily for 2 days.  **Infant 6–11 months:** 100 000 IU daily for 2 days.  **Infant or child 11 months–5 years:** 200 000 IU daily for 2 days.  If the child shows any eye signs of vitamin A deficiency or is severely malnourished, a third dose must be given 2–4 weeks after the second dose. |
| Contraindications | Hypersensitivity to the drug, pregnancy |
| Drug interactions | Retinoids (such as acitretin, alitretinoin, isotretinoin) |
| Side effects | Rough skin, dry hair, an enlarged liver, and increases in erythrocyte sedimentation rate, serum calcium and serum alkaline phosphatase concentration, diarrhea, dizziness, or drowsiness, double vision, headache, irritability, peeling of skin, especially on lips and palms, vomiting. |
| Cautions | Young children, elderly, chronic renal failure, chronic alcoholism, cirrhosis, hepatic disease and viral hepatitis, choking (capsules) |
| Storage condition | Store below 30°C. Protect from light. |
| **Vitamin B1 + B6 + B12** | |
| Pharmacological class | Vitamins |
| Dosage form | Tablet/Injection: 100mg +200mg+1000mcg |
| Indications | Prevention and treatment vitamin B deficiencies in people with a higher risk of vitamin B deficiencies include those who are pregnant, over the age of 50, gastric bypass surgeries and nutritional deficiency. |
| Dose and administration | **Daily Dietary Supplement**: 1-2-tab PO Q Day, or as recommended by healthcare professional |
| Contraindications | There is no known significant drug interaction. |
| Drug interactions | See above under each vitamin |
| Side effects | Excessive urination, nausea, vomiting, diarrhea, nerve damage |
| Cautions | Impaired kidney function, pregnancy and breastfeeding |
| Storage condition | Store below 30°C. |
| **Vitamin E (Tocopherol)** | |
| Pharmacological class | Vitamin |
| Dosage form | Capsule: 10mg |
| Indications | Dietary supplement and vitamin E deficiency |
| Dose and administration | **Recommended daily allowance**: 15 mg PO Q Day; not to exceed 1000 mg/day  **Pregnant women**  <18 years: 15 mg PO Q Day; not to exceed 800 mg/day; >18 years: 15 mg PO Q Day; not to exceed 1000 mg/day  **Lactating women**  **Age <18 years:** 19 mg PO Q Day; not to exceed 800 mg/day  **Age >18 years:** 19 mg/day PO Q Day; not to exceed 1000 mg/day  **Vitamin E Deficiency**: 60-75 units PO Q Day |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Warfarin, aspirin, iron-containing medicines, vitamin K, cholestyramine and colestipol |
| Side effects | Diarrhea, blurred vision, abdominal pain with doses more than 1 g daily |
| Cautions | Use of large doses, neonate weighing less than 1.5 kg, pregnancy, hepatic and renal failure |
| Storage condition | Store below 30°C. Protect from light. |

## Minerals

Minerals play a crucial role in healthcare and are used for various medical purposes. They are classified into two main categories based on the amounts needed by the body: macro minerals (sodium, potassium, calcium, magnesium and chloride) and micro minerals (also known as trace minerals). Minerals are essential for the normal growth and maintance of the body. If the daily requirement is more than 100mg/day they are called major elements and if the daily requirements is less than 100mg/day they are called minor elements. They are responsible in the maintenance of homeostatic balance and mediation of metabolic reactions in the skeleton, tissues, body fluids, digestive juices, etc.

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| **Calcium** | |
| Pharmacological class | Mineral |
| Dosage form | Tablet: 500 mg |
| Indications | Used as calcium supplementation (pregnant, lactating women and in growing children), rickets, prevention of pre-and postmenopausal bone demineralisation and osteoporosis |
| Dose and Administration | **Hypocalcaemia (prophylaxis):** oral  **Amount based on normal daily-recommended intakes:** Adolescent and adult males/females: 800 – 1200mg; Pregnant females and Breast-feeding: 1200 mg; Birth to 3 years of age: 400 – 800 mg; 4 to 10 years of age: 800mg  **Hypocalcaemia (treatment):** treatment dose is individualized based on severity of deficiency: 1,000 to 2,000 mg of elemental calcium per day divided into 2 to 4 doses. |
| Contraindications | Hypersensitivity to the drug, hypercalcaemia, severe renal failure, and renal calculi. |
| Drug interactions | Fluoroquinolone, tetracycline, levothyroxine, iron, zinc and strontium ranelate, cardiac glycosides, calcium channel blockers, phenytoin, and thiazides, nutrients (such as milk), bisphosphonates |
| Side effects | Hypotension (dizziness), flushing and /or sensation of warmth or heat, irregular heartbeat, hypercalcaemia/hypercalciuria, constipation, dyspepsia, flatulence, nausea, abdominal pain and diarrhea. |
| Cautions | Sarcoidosis, renal or cardiac disease, a high doses of vitamin D, hyperphosphatemia |
| Storage condition | Store below 30°C. Protect from moisture. |
| **Calcium Gluconate** | |
| Pharmacological class | Calcium salt, antidote |
| Dosage form | Injection: 100 mg/ml in 10 ml ampoule |
| Indications | To decrease or reverse the cardiac depressant effect of hyperkalemia on electrocardiographic (ECG) function and as an aid in the treatment of CNS depression, for treatment of hypocalcaemia. |
| Dose and administration | **Calcium Supplementation:**  **19-50 years old**: 1000 mg/day PO divided q8-12hr, preferably 1-2 hours after meals  >**50 years old**: 1200 mg/day PO divided q8-12hr, preferably 1-2 hours after meals  **Pregnant or breastfeeding patient**: 1000mg/day PO divided q8-12hr, preferably 1-2 hours after meals  **Hypocalcaemia:**  **Treatment of conditions arising from calcium deficiency (e.g., hypocalcemic tetany, hypoparathyroidism):**  **Mild (ionized calcium 1-1.2 mmol/L), management of non-life-threatening symptoms**  **Oral**: 1-3 g/day in divided doses; oral repletion may be considered and administered on outpatient basis  **IV**: 1-2 g over 2 hours  **Severe (ionized calcium <1 mmol/L**), **without seizure or tetany**:  **IV**: 0.5 mg/kg/hr; may be increased to 2 mg/kg/hr; not to exceed 3-4 g over 4 hours  **Hypocalcemic tetany**:  **IV**: 100-300 mg elemental calcium (~3 g calcium gluconate) over 5-10 minutes, followed by continuous IV infusion at 0.5 mg/kg/hr. (may be increased to 2 mg/kg/hr) |
| Contraindications | Hypersensitivity to the drug, IM administration, ventricular fibrillation, hypercalcemia, digoxin poisonings, severe hyperphosphatemia. |
| Drug interactions | Calcium and magnesium containing medications, milk and milk products, iron preparations, oral tetracyclines, vitamin D, ceftriaxone, beta-blockers, ciprofloxacin, calcium channel blockers, levothyroxine |
| Side effects | Hypotension (esp., rapid infusion), flushing and/or sensation of warmth or heat, irregular heartbeat; nausea or vomiting, skin redness, rash, pain, or burning at injection site, sweating, tingling sensation. bradycardia, constipation, diarrhea, flatulence, and extravasation necrosis |
| Cautions | Rapid IV infusion, hepatic or renal impairment, cardiovascular disease, history of renal calculi, severe hyperphosphatemia |
| Storage condition | Store below 30°C. Protect from moisture. |
| **Iodine** | |
| Pharmacological class | Mineral |
| Dosage form | Capsule: 190 mg  Iodized oil: 1 ml (480 mg iodine)  0.5 ml (240 mg iodine) in ampoule (oral or injectable);  0.57 ml (308 mg iodine) ampoule in dispenser bottle |
| Indications | Prevention and treatment iodine deficiency including goiter, prevention of thyroid damage after a radioactive accident, managing overactive thyroid gland, treating thyroid cancer and for prevention of neurodevelopmental disorders during pregnancy |
| Dose and administration | **Prevention: the recommended intake of iodine, oral**  **Adult:** 150 µg daily;  **Pregnant and lactation women:** 200 µg daily  **Infants under 1 year:** 50 mcg daily for,  **Children aged 2–6 years:** 90 mcg daily  **Children aged 7–12 years:** 120mcg daily |
| Contraindications | Hypersensitivity to drug. |
| Drug interactions | Propylthiouracil, amiloride, iodine (radioactive), amiodarone, lithium, methimazole, potassium acid phosphate, potassium chloride, Spironolactone |
| Side effects | Metallic taste, fever, arthralgia, diarrhea, angioedema, urticaria, eosinophilia, headache, pulmonary edema, thyroid suppression and acne (high dose) |
| Cautions | Hypothyroidism, renal impairment |
| Storage condition | Store between 20°C to 30°C. Protect from light. |
| **Multiple micronutrient powder (MNPs)** | |
| Pharmacological class | Minerals |
| Dosage form | Sachets containing:  - Iron (elemental) 12.5 mg (as coated ferrous fumarate)  - Zinc (elemental) 5 mg  - Vitamin A 300 mcg  - with or without other micronutrients at recommended daily values |
| Indications | To increase the micronutrient content of a child's diet without changing their usual dietary habits. |
| Dose and Administration | **Dosage**: The standard dose for MNPs is one single-dose sachet per day.  **Administration**: MNPs are typically administered by mixing the powder into semi-solid or liquid foods, such as porridge, mashed vegetables, or milk.  *Note: it should not be cooked, as high temperatures can destroy some of the nutrients.* |
| Contraindications | Individuals with known allergies to any of the components of the MNP |
| Drug interactions | Refer drug interactions under each vitamin and minerals |
| Side effects | Abdominal discomfort |
| Cautions | Kidney disease, liver disease, hemochromatosis, thyroid disorders, mal-absorption disorders, pregnancy and breastfeeding |
| Storage condition | Store between 30°C. Protect from light. |
| **Zinc sulphate** | |
| Pharmacologic class | Mineral |
| Dosage form | Tablet: 20 mg |
| Indications | Zinc deficiency, prevention of diarrhea in infants |
| Dose and Administration | **Adult**  **Mild zinc deficiency**, **oral**: two to three times the RDA of zinc for 6 months.  **Moderate to severe deficiency zinc deficiency**, **oral**: four to five times the RDA for 6 months.  **For diarrhea:** to prevent diarrhea in infants  Pregnant women have used 15 mg of zinc, 15 mg of zinc, with or without 60 mg of iron and 250 micrograms of folic acid, starting 10–24 weeks into pregnancy through one month after giving birth.  **Adult RDA**: 8- 12 mg/day;  **child RDA**: 2 - 11 mg/day  **Pediatrics:**  **Adjunct in management of diarrhea;** oral  Infant under 6 months: 10 mg (elemental zinc) daily for 10–14 days,  Child 6 months–5 years: 20 mg (elemental zinc) daily for 10–14 days.  ***Note:*** *Zinc sulphate tablets may be dispersed in breast milk, in oral rehydration solution, or in water on a small spoon; older children may chew the tablets or swallow them with water.* |
| Contraindication | Hypersensitivity to the drug |
| Precautions | Renal impairment, pregnancy, copper deficiency |
| Side effects | Abdominal pain, dyspepsia, nausea, vomiting, diarrhoea, gastric irritation, gastritis, irritability, headache, lethargy. |
| Interactions | Tetracycline, Quinolone antibacterials, Calcium Salts, Iron, Penicillamine, bisphosphonates, diets high in phytates |
| Storage condition | Store between 30°C. Protect from light. |

# Antiallergics and Medicines Used in Anaphylaxis

Antiallergics and anaphylaxis medicines manage allergic reactions, from mild symptoms to life-threatening emergencies. Antiallergics like chlorpheniramine (first-generation antihistamine) and loratadine, desloratadine, and cetirizine (second-generation antihistamines) reduce symptoms such as itching, swelling, and hives. First-generation antihistamines like promethazine provide additional sedation for severe reactions.

For anaphylaxis, immediate intervention with adrenaline (epinephrine), a first-line treatment, is crucial for vasoconstriction, bronchodilation, and increasing heart rate. Dexamethasone and hydrocortisone (injectable corticosteroids) reduce inflammation and prevent late-phase reactions, while prednisolone (oral corticosteroid) helps manage symptoms and prevent recurrence after adrenaline administration.

Antiallergics control mild to moderate reactions, while adrenaline and corticosteroids are vital for severe allergic reactions like anaphylaxis. Proper understanding of their use ensures effective treatment.

## Antiallergics

Antiallergics relieve symptoms of allergic reactions such as itching, swelling, runny nose, and hives. Chlorpheniramine maleate, a first-generation antihistamine available in tablet and syrup forms, blocks histamine receptors but often causes sedation. Loratadine, a second-generation antihistamine in syrup and tablet forms, provides effective relief with less sedation by selectively blocking peripheral histamine receptors. Desloratadine and Cetirizine are similar second-generation options with a favorable side effect profile. Promethazine hydrochloride, a first-generation antihistamine in elixir and tablet forms, offers additional sedative properties, making it useful for severe reactions and allergy-related insomnia.

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| **Adrenaline (Epinephrine)** | |
| Pharmacological class | [Adrenergic bronchodilator](https://www.drugs.com/drug-class/adrenergic-bronchodilators.html), [Catecholamine](https://www.drugs.com/drug-class/catecholamines.html), [Vasopressor](https://www.drugs.com/drug-class/vasopressors.html) |
| Dosage form | Injection (1mg/1ml) |
| Indications | Emergency treatment of acute anaphylaxis or angioedema,  Cardiopulmonary resuscitation |
| Dose and administration | **Emergency treatment of acute anaphylaxis or angioedema (if laryngeal oedema is present)**  **Adult:**  IM injection**:** 500 mcg (0.5 mg), to be injected preferably into the anterolateral aspect of the middle third of the thigh. Doses may be repeated several times, if necessary, at 5-minute intervals according to blood pressure, pulse, and respiratory function.  *Note: Acute anaphylaxis when there is doubt as to the adequacy of the circulation (specialist use only), angioedema (if laryngeal oedema is present) (specialist use only)*  Slow IV injection**:** `50 micrograms, using 0.5 ml of the dilute 1 in 10,000 epinephrine injection; dose to be repeated according to response; if multiple doses required, epinephrine should be given as a slow IV infusion, stopping when a response has been obtained.  **Anaphylaxis, by IM injection:**  **Infant under 6 months:** 0.05 ml of 1 mg/ml solution  **Infant or child 6 months to 6 years:** 150 mcg (0.15 ml of 1 mg/ml solution)  **Child 6 to 12 years:** 0.3 ml of 1 mg/ml solution; these doses may be repeated at 5-minute intervals, several times if necessary, depending on blood pressure, pulse, and respiratory function.  **Anaphylaxis, by slow IV injection:**  **Infant or child:** 0.1 ml/kg of the dilute 1 mg/10 ml solution) given over several minutes |
| Contraindications | Closed-angle glaucoma, Use during halothane or cyclopropane anesthesia |
| Drug interactions | Amitriptyline, cyclopropane, ergot derivatives, fluoxetine, halothane |
| Side effects | Nausea, vomiting, anxiety, headache, fear, palpitations, tachycardia, restlessness, tremor, dizziness, dyspnea, weakness, sweating, pallor, hyperglycemia, excessive increase in blood pressure, ventricular arrhythmias, pulmonary oedema, angina, cold extremities, peripheral ischemia and necrosis, allergic reaction. arrhythmias (ventricular and supraventricular), severe hypertension, cerebral hemorrhage, pulmonary oedema |
| Cautions | Hyperthyroidism, diabetes mellitus, heart disease, hypertension, arrhythmias, cerebrovascular disease, angle-closure glaucoma, second stage of labor, elderly patients. |
| Storage condition | Store below 300C. Protect from light |
| **Cetirizine** | |
| Pharmacological class | [Antihistamine](https://www.drugs.com/drug-class/antihistamines.html) (H1-receptor antagonist) |
| Dosage form | Syrup (1mg/ml)  Tablet (10mg) |
| Indications | Symptomatic relief of hypersensitivity reactions, including allergic rhinitis (hay fever), chronic urticaria (hives), other allergic conditions |
| Dose and administration | **Adults and Child 12 Years and Older:** 10 mg once daily or 5 mg once daily may be sufficient for some patients and can be taken to reduce the risk of drowsiness.  **Child 6 to 11 Years:** 5-10 mg once daily, depending on the severity of symptoms or 5 mg once daily or 2.5 mg twice daily.  **Child 2 to 5 Years:** 2.5 mg twice daily or 5 mg once daily may be considered.  **Child 6 Months to 2 Years:** 2.5 mg once daily. In cases of severe symptoms, the dose may be increased to 2.5 mg twice daily under medical supervision. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Olopatadine (intranasal), metoclopramide (intranasal), isocarboxazid, alcohol, sedatives, and tranquilizers |
| Side effects | Somnolence, headache, agitation, fatigue, dry oral, aggression, malaise, diarrhea, paresthesia, skin reactions, bronchospasms and epistaxis, stomach pain, angioedema, tongue discoloration and tremors |
| Cautions | Epilepsy and convulsions, driving, hepatic and renal impairment |
| Storage condition | Store below 300C. Protect from light and moisture |
| **Chlorpheniramine malate** | |
| pharmacological class | [Antihistamine](https://www.drugs.com/drug-class/antihistamines.html) (H1-receptor antagonist) |
| dosage form | Tablet (2mg, 4mg, 6mg), Syrup (2mg/5ml)  Injection (10mg) |
| indications | Symptomatic relief of allergies such as hay fever, urticaria, food allergies, and drug reactions, relief of itch associated with chickenpox, emergency treatment of anaphylactic reactions |
| dose and administration | **Child under 1 year:** Not recommended  **Child 1-2 years:** 1 mg orally twice daily  **Child 2–5 years:** 1 mg orally every 4–6 hours; maximum 6 mg per day  **Child 6–11 years:** 2 mg orally every 4–6 hours; maximum 12 mg per day  **Child 12–17 years:** 4 mg orally every 4–6 hours; maximum 24 mg per day  **Adult:** 4 mg orally very 4–6 hours; maximum 24 mg per day  **Elderly:** 4 mg orally every 4–6 hours; maximum 12 mg per day  **IM or intravenous Injection**  **Child 1–5 years:** 2.5 mg, repeated if necessary. maximum 10mg per day  **Child 6–11 years:** 5 mg, repeated if necessary; maximum 20mg per day  **Child 12 years and above:**10 mg, repeated if necessary; maximum 40mg per day |
| contraindications | Hypersensitivity to the drug or dexchlorpheniramine |
| drug interactions | Tricyclic antidepressants, anticholinergics, benzodiazepines, protease inhibitors, alcohol |
| side effects | Drowsiness, impaired concentration, abnormal coordination, dizziness, dry mouth, fatigue, headache, nausea, blurred vision, agitation, decreased appetite, blood disorders, increased bronchial secretion viscosity, depression, diarrhea, hemolytic anemia, hypotension, irritability, muscle twitching, muscle weakness, nightmares, palpitations, photosensitivity reaction, skin reactions, tinnitus, urinary retention, vomiting |
| cautions | Epilepsy, asthma, urinary retention, bladder neck obstruction, hepatic insufficiency, narrow-angle glaucoma, pyloroduodenal obstruction, sedative effects, stenosing peptic ulcer, symptomatic prostatic hypertrophy, renal and hepatic impairment |
| storage condition | Store below 300C. |
| **Desloratadine** | |
| Pharmacological class | [Antihistamine](https://www.drugs.com/drug-class/antihistamines.html) (H1-receptor antagonist) |
| Dosage form | Syrup (0.5mg/ml)  Tablet (5mg) |
| Indications | Symptomatic relief of nasal and non-nasal symptoms of seasonal allergic rhinitis and perennial allergic rhinitis, treatment of chronic idiopathic urticaria |
| Dose and administration | **Child 6 to 11 Months:** 1 mg orally once daily  **Child 1–5 years:** 1.25 mg orally once daily  **Child 6–11 years:** 2.5 mg orally once daily  **Child 12–17 years:** 5 mg orally once daily  **Adult:** 5 mg orally once daily |
| Contraindications | Hypersensitivity to the drug or loratadine |
| Drug interactions | Erythromycin, ketoconazole |
| Side effects | Asthenia, dry oral, headache, akathisia, arrhythmias, diarrhea, dizziness, drowsiness, gastrointestinal discomfort, hallucination, hepatic disorders, insomnia, myalgia, nausea, palpitations, seizure, vomiting |
| Cautions | Allergic reactions, a history of cardiovascular issues, hepatic and renal impairment, pregnancy, breastfeeding |
| Storage condition | Store below 300C. |
| **Dexamethasone** | |
| Pharmacological class | Corticosteroid (Glucocorticoid) |
| Dosage form | Injection: 4 mg/ml (as disodium phosphate salt) in 1 ml ampoule |
| Indications | Adjunct in the emergency treatment of anaphylaxis, short-term suppression of inflammation in allergic disorders |
| Dose and Administration | **Allergy (short-term use), oral:**  **Adult:** Usual range 0.5–10 mg daily as a single dose in the morning  **Anaphylaxis (adjunct), by slow IV injection or infusion (as**  **dexamethasone phosphate)**  **Adult:** 0.5–24 mg  **Inflammatory and allergic disorders, IM or slow IV injection or infusion**  **Child**:100–400 mcg/kg in 1–2 divided doses (maximum 24 mg daily |
| Contraindications | Not relevant to emergency use |
| Drug interactions | Acetylsalicylic acid, albendazole, amphotericin B, carbamazepine, contraceptives (oral), digoxin, enalapril, erythromycin, furosemide,  hydrochlorothiazide, ibuprofen, insulins, lopinavir, metformin, methotrexate, phenobarbital, phenytoin, praziquantel, propranolol, rifampicin, ritonavir, salbutamol, saquinavir, spironolactone,  infuenza vaccine, live vaccines, warfarin |
| Side effects | Fluid retention, hypertension, electrolyte imbalance, osteoporosis, gastrointestinal bleeding, delayed wound healing, immunosuppression, psychiatric disturbances, hyperglycemia, increased risk of infections |
| Cautions | Increased susceptibility to and severity of infection, activation or exacerbation of TB, amoebiasis, strongyloidiasis, risk of severe chickenpox in nonimmune patients (varicella zoster immunoglobulin required if exposed to chickenpox); avoid exposure to measles (normal immunoglobulin possibly required if  exposed); diabetes mellitus, peptic ulcer, hypertension, corneal perforation, osteoporosis, myasthenia gravis |
| Storage Condition | Store below 30°C. Protect from light. |
| **Hydrocortisone** | |
| Pharmacological Class | Corticosteroid |
| Dosage Form | Powder for injection: 100 mg (as sodium succinate) in vial |
| Indications | Acute hypersensitivity reactions, such as angioedema of the upper respiratory tract and anaphylaxis |
| Dose and Administration | **Adjunct to epinephrine) IV injection**  **Adult:** 100 to 300 mg, to be administered as sodium succinate  **Adjunct in the emergency treatment of anaphylaxis, IM injection or IV injection.**  **Child under 6 months:** Initially 25 mg up to 4 times daily adjusted according to response.  **Child 6 months to 6 years:** Initially 50 mg up to 4 times daily adjusted according to response.  **Child 6 to 12 years:** Initially 100 mg up to 4 times daily adjusted according to response. |
| Contraindications | Not relevant to emergency use |
| Drug Interactions | Refer under anti-asthmatic Medicines |
| Side Effects | Refer under anti-asthmatic Medicines |
| Cautions | Not relevant to emergency use |
| Storage Condition | Store below 300C. Protect from light. |
| **Loratadine** | |
| Pharmacological class | [Antihistamine](https://www.drugs.com/drug-class/antihistamines.html) (H1-receptor antagonist) |
| Dosage form | Syrup (5mg/5ml), Tablet (10mg) |
| Indications | Symptomatic relief of allergies such as hay fever and urticaria |
| Dose and administration | **Child 2–11 years (body weight up to 31 kg):** 5 mg orally once daily  **Child 2–11 years (body weight 31 kg and above):** 10 mg orally once daily  **Child 12 years and beyond:** 10 mg orally once daily |
| Contraindications | Hypersensitivity to loratadine or any component of the formulation |
| Drug interactions | Ketoconazole (systemic), erythromycin, cimetidine, alcohol (ethyl), amitriptyline, clozapine |
| Side effects | Headache, fatigue, drowsiness, nervousness (in child), insomnia, alopecia, angioedema, dizziness, dry oral, gastritis, hepatic function abnormalities, nausea, palpitations, rash, seizure, tachycardia |
| Cautions | Pregnancy, lactation, allergic reactions, enlarged prostate gland, liver or kidney disease, alcohol consumption |
| Storage condition | Store below 300C. Protect from moisture and light. |
| **Promethazine hydrochloride** | |
| Pharmacological class | [Antihistamine](https://www.drugs.com/drug-class/antihistamines.html), [phenothiazine antiemetic](https://www.drugs.com/drug-class/phenothiazine-antiemetics.html) |
| Dosage form | Elixir (5mg/5ml), Tablet (25mg), Injection (25 mg/ml, 50 mg/ml) |
| Indications | Symptomatic relief of allergies such as hay fever and urticaria, Premedication, emergency treatment of anaphylactic reactions, sedation, motion sickness, Insomnia associated with urticaria and pruritus, nausea, vomiting, vertigo, and labyrinthine disorders |
| Dose and administration | **Elixir (5 mg/5 ml)**  **Adult and Child 12 years and older**  **Allergic Conditions:** 25 mg (25 ml) at bedtime or 12.5 mg (12.5 ml) before meals and at bedtime as needed. Maximum: 50 mg (50 ml) per day.  **Motion Sickness:** 25 mg (25 ml) 30 to 60 minutes before travel, then 12.5 mg (12.5 ml) to 25 mg (25 ml) every 12 hours as needed. Maximum: 50 mg (50 ml) per day.  **Nausea and Vomiting:** 12.5 mg (12.5 ml) to 25 mg (25 ml) every 4 to 6 hours as needed. Maximum: 100 mg (100 ml) per day.  **Child 6 to 11 Years**  **Allergic Conditions:** 12.5 mg (12.5 ml) at bedtime or 6.25 mg (6.25 ml) before meals and at bedtime as needed. Maximum: 25 mg (25 ml) per day.  **Motion Sickness:** 12.5 mg (12.5 ml) 30 to 60 minutes before travel, then 6.25 mg (6.25 ml) to 12.5 mg (12.5 ml) every 12 hours as needed. Maximum: 25 mg (25 ml) per day.  **Nausea and Vomiting:** 6.25 mg (6.25 ml) to 12.5 mg (12.5 ml) every 4 to 6 hours as needed. Maximum: 50 mg (50 ml) per day.  **Child 2 to 5 Years:**  **Allergic Conditions:** 6.25 mg (6.25 ml) at bedtime or 3.125 mg (3.125 ml) before meals and at bedtime as needed. Maximum: 12.5 mg (12.5 ml) per day.  **Motion Sickness:** 6.25 mg (6.25 ml) 30 to 60 minutes before travel, then 3.125 mg (3.125 ml) to 6.25 mg (6.25 ml) every 12 hours as needed. Maximum: 12.5 mg (12.5 ml) per day.  **Nausea and Vomiting:** 3.125 mg (3.125 ml) to 6.25 mg (6.25 ml) every 4 to 6 hours as needed. Maximum: 25 mg (25 ml) per day.  **Child Under 2 Years:**  **Contraindicated:** Promethazine should not be used due to the risk of severe respiratory depression.  **Tablets (25 mg):**  **Adults and Child 12 Years and Older:**  **Allergic Conditions:** 25 mg at bedtime or 12.5 mg before meals and at bedtime as needed. Maximum: 50 mg per day.  **Motion Sickness:** 25 mg taken 30 to 60 minutes before travel, then 12.5 mg to 25 mg every 12 hours as needed. Maximum: 50 mg per day.  **Nausea and Vomiting:** 12.5 mg to 25 mg every 4 to 6 hours as needed. Maximum: 100 mg per day.  **Child 6 to 11 Years**  **Allergic Conditions:** 12.5 mg at bedtime or 6.25 mg before meals and at bedtime as needed. Maximum: 25 mg per day.  **Motion Sickness:** 12.5 mg taken 30 to 60 minutes before travel, then 6.25 mg to 12.5 mg every 12 hours as needed. Maximum: 25 mg per day.  **Nausea and Vomiting**: 6.25 mg to 12.5 mg every 4 to 6 hours as needed. Maximum: 50 mg per day.  **Child 2 to 5 Years**  **Allergic Conditions:** 6.25 mg at bedtime or 3.125 mg before meals and at bedtime as needed. Maximum: 12.5 mg per day.  **Motion Sickness:** 6.25 mg taken 30 to 60 minutes before travel, then 3.125 mg to 6.25 mg every 12 hours as needed. Maximum: 12.5 mg per day.  **Nausea and Vomiting:** 3.125 mg to 6.25 mg every 4 to 6 hours as needed. Maximum: 25 mg per day.  **Injection (25 mg/ml, 50 mg/ml)**  **Adults and Child 12 years and older:** 12.5 mg to 25 mg by deep IM injection or slow IV injection. Maximum: 50 mg per day.  **Child 6 to 11 years:** 6.25 mg to 12.5 mg by deep IM injection or slow intravenous injection. Maximum: 25 mg per day.  **Child 2 to 5 years:** 3.125 mg to 6.25 mg by deep IM injection or slow IV injection. Maximum: 12.5 mg per day. |
| Contraindications | Child under 2 years, porphyria, severe hepatic disease |
| Drug interactions | Alcohol, barbiturates, hypnotics, opioid analgesics, anxiolytic sedatives, neuroleptics, MAOIs, tricyclic antidepressants, ototoxic drugs (e.g., aminoglycoside antibiotics) |
| Side effects | Drowsiness, dizziness, dry oral, headache, hypotension, urinary retention, blurred vision, confusion, jaundice, movement disorders, photosensitivity reaction, palpitations, arrhythmia, blood disorders |
| Cautions | Epilepsy, prostatic hypertrophy (in adults), pyloroduodenal obstruction, severe coronary artery disease, angle-closure glaucoma, urinary retention, child under 6 years |
| Storage condition | Store below 300C. Protect from light and moisture. |

## Medicines used in anaphylaxis

Anaphylaxis is a severe allergic reaction requiring immediate treatment. Adrenaline (Epinephrine), the first-line treatment, is administered via injection and stimulates alpha and beta-adrenergic receptors, causing vasoconstriction, bronchodilation, and increased heart rate to counteract anaphylaxis. Dexamethasone and hydrocortisone (injectable corticosteroids) reduce inflammation and prevent late-phase allergic reactions. Prednisolone, available as an oral liquid and in tablet form, provides anti-inflammatory effects to manage allergic reactions and prevent recurrence after adrenaline administration.

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| **Dexamethasone** | |
| Pharmacological class | Glucocorticoid |
| Dosage form | Injection (4mg/ml) |
| Indications | Allergic reactions, adjunct in the emergency treatment of anaphylaxis, short-term suppression of inflammation in allergic disorders |
| Dose and administration | **Oral Administration (Tablets and Elixir):**  **Allergic Reactions and Short-term Inflammation:**  **Adult:** Initial dose: 4 mg to 8 mg per day in divided doses.  Maintenance dose: Adjust based on response, usually 0.5 mg to 4 mg per day.  Duration: Short courses (e.g., 3 to 7 days) for acute flare-ups.  **Child:**  **Allergic reactions and short-term inflammation:** 0.02 mg to 0.3 mg/kg/day in divided doses for short courses (e.g., 3 to 7 days) for acute flare-ups.  **Injection administration (4 mg/ml, 10 mg/ml)**  **Adult:**  **Allergic Reactions and Anaphylaxis:**  Initial dose: 4 mg to 10 mg intravenously or IM.  Maintenance dose: Adjust based on response, usually 0.5 mg to 4 mg per day orally or via injection.  **Allergic Reactions and Anaphylaxis**  **Child:** 0.02 mg to 0.3 mg/kg intravenously or IM. |
| Contraindications | Untreated systemic infection (unless condition is life-threatening), administration of live virus vaccines |
| Drug interactions | Refer under Corticosteroids Preparation |
| Side effects | Refer under Corticosteroids Preparation |
| Cautions | Refer under Corticosteroids Preparation |
| Storage condition | Store below 300C. Protect from light and moisture |
| **Hydrocortisone** | |
| Pharmacological class | Mineralocorticoid |
| Dosage form | Oral Tablets: 5 mg, 10 mg, 20 mg  Injection: 100 mg/ml, 250 mg/ml, 500 mg/ml  Topical Cream/Ointment: 0.5%, 1%, 2.5% |
| Indications | Acute hypersensitivity reactions, such as angioedema of the upper respiratory tract and anaphylaxis (adjunct to epinephrine) |
| Dose and administration | **Oral Administration (Tablets)**  **Allergic Reactions**  **Adult:** 20 mg to 240 mg per day in divided doses, depending on the severity of the condition. Maintenance dose: Adjust based on clinical response, usually 20 mg to 60 mg per day.  **Allergic Reactions:**  **Child:** 0.5 mg to 2 mg/kg/day in divided doses. Maximum dose: Up to 10 mg/day for severe cases.  **Injection Administration (100 mg/ml, 250 mg/ml, 500 mg/ml)**  **Emergency Anaphylaxis**  **Adult**  Initial dose: 100 mg to 500 mg IV or IM, repeated every 2 to 6 hours as needed. Maintenance dose: Adjust based on clinical response, typically 100 mg every 8 hours intravenously or IM.  **Emergency Anaphylaxis**  **Child**  Initial dose: 1 to 2 mg/kg iv. or IM., repeated every 2 to 6 hours as needed. Maximum dose: Typically, up to 100 mg per dose. |
| Contraindications | Refer under Corticosteroids Preparation |
| Drug interactions | Refer under Corticosteroids Preparation |
| Side effects | Refer under Corticosteroids Preparation |
| Cautions | Refer under Corticosteroids Preparation |
| Storage condition | Store below 30C0, protected from light and moisture |
| **Prednisolone** | |
| Pharmacological class | Glucocorticoid |
| Dosage form | Oral liquid (15 mg/5 ml), Tablet (5 mg) |
| Indications | Suppression of inflammation in allergic disorders |
| Dose and Administration | **Allergy (short-term use), oral:**  **Adult:** Initially up to 10 to 20 mg daily as a single dose in the morning (in severe allergy, up to 60 mg daily as a short course of 5 to 10 days)  **Allergy, oral:**  **Child:** 1 to 2 mg/kg once daily (usual maximum 60 mg), reducing after a few days if appropriate; increased frequency may be required in certain clinical indications. |
| Contraindications | Untreated systemic infection, administration of live vaccines (usually not relevant to emergency treatment). |
| Drug interactions | Refer under Corticosteroids Preparation. |
| Side effects | Refer under Corticosteroids Preparation. |
| Cautions | Refer under Corticosteroids Preparation. |
| Storage condition | Store below 300C. Protect from light and moisture. |

# Medicines Used in Endocrine Disorders

Maintaining Managing endocrine disorders involves medications targeting specific hormonal imbalances. Corticosteroids (e.g., betamethasone, dexamethasone, hydrocortisone, prednisolone) mimic cortisol to control inflammation, immune responses, and metabolism, essential for conditions like asthma, rheumatoid arthritis, and lupus. Fludrocortisone, mimicking aldosterone, is used for Addison’s disease to regulate sodium and water balance.

Thyroid and anti-thyroid medications manage metabolic disorders. Lugol’s solution, carbimazole, and propylthiouracil (PTU) treat hyperthyroidism by reducing thyroid hormone production, while levothyroxine treats hypothyroidism by restoring normal metabolism. Propranolol, a beta-blocker, alleviates hyperthyroidism symptoms.

Diabetes management includes oral hypoglycemic agents like sulfonylureas (glibenclamide, gliclazide, glimepiride) to stimulate insulin secretion, metformin to enhance insulin sensitivity, and dapagliflozin to promote glucose excretion. Insulin therapy is essential for type 1 and advanced type 2 diabetes.

For hypoglycemia and pituitary disorders, glucagon injections rapidly increase blood sugar, while diazoxide prevents recurrent hypoglycemia. Dopamine agonists (bromocriptine, cabergoline) reduce prolactin secretion, treating prolactinomas by alleviating symptoms and reducing tumor size.

## Corticosteroid preparations

Corticosteroids are vital for managing inflammatory, autoimmune conditions, and adrenal insufficiency. Commonly used corticosteroids include betamethasone, dexamethasone, hydrocortisone, methylprednisolone, prednisolone, and triamcinolone acetonide, available in various forms such as tablets and injections. These medications mimic cortisol, reducing inflammation, suppressing the immune system, and regulating metabolism by binding to glucocorticoid receptors. They are effective for conditions like asthma, rheumatoid arthritis, lupus, and inflammatory bowel disease. Fludrocortisone, which mimics aldosterone, is used in Addison’s disease to regulate sodium and water balance and maintain blood pressure.

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| **Betamethasone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Oral Tablets: 0.5 mg, 0.6 mg  Oral Solution: 0.6 mg/5 ml  Injection: 4 mg/ml, 6 mg/ml, 9 mg/ml  Topical Cream/Ointment: 0.05%, 0.1%  Topical Lotion: 0.1% |
| Indications | Adrenocortical insufficiency, hypersensitivity reactions including anaphylactic shock, inflammatory bowel disease, asthma, perineal trauma, joint inflammation, seborrheic dermatitis, allergic reactions, inflammatory conditions, autoimmune disorders, congenital adrenal hyperplasia, severe asthma, rheumatic disorders, dermatologic conditions, gastrointestinal disorders, respiratory diseases, shock, cerebral edema, organ transplantation, neoplastic diseases. |
| Dose and Administration | **Adrenal insufficiency:**  **Adult:** Oral or IM, 0.6–7.2 mg/day in divided doses, depending on severity.  **Child:** 0.0175–0.25 mg/kg/day in divided doses, depending on severity and clinical response.  **Congenital adrenal hyperplasia**  **Adult:** 0.6–7.2 mg/day, adjusted based on response.  **Child:** 0.0175–0.25 mg/kg/day, adjusted based on response.  **Acute adrenal crisis**  **Adult:** IM or IV, 4–20 mg initially, followed by lower doses based on clinical response.  **Child:** Initial IV or IM dose, 0.025–0.1 mg/kg/day, followed by lower doses based on clinical response.  Maximum dose:  **Adult: 7**.2 mg/day.  **Child:** 0.25 mg/kg/day. |
| Contraindications | Systemic infection (unless life-threatening specific antimicrobial therapy given); live virus vaccines |
| Drug interactions | Calcitriol, clioquinol, clotrimazole, fusidic acid, salicylic acid, neomycin |
| Side effects | Hiccups, edema, myocardial rupture (following recent myocardial infarction), stevens-Johnson syndrome |
| Cautions | Prolonged treatment, elderly, child and adolescents, pregnancy, lactation, diabetes, hypertension, psychosis, osteoporosis, gastric ulceration |
| Storage condition | Store below 30°C. Protect from light. |
| **Dexamethasone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Oral Tablets: 0.5 mg, 0.75 mg, 1 mg, 1.5 mg, 2 mg, 4 mg, 6 mg  Oral Solution: 0.5 mg/5 ml, 1 mg/ml  Injection: 4 mg/ml, 10 mg/ml  Ophthalmic Solution: 0.1%  Topical Cream/Ointment: 0.05%, 0.1% |
| Indications | Adrenal insufficiency, congenital adrenal hyperplasia, acute adrenal crisis, suppression of ACTH secretion in Cushing's syndrome diagnosis, anti-inflammatory therapy for endocrine disorders. |
| Dose and administration | **Adrenal insufficiency:**  **Adult:** 0.5–9 mg/day orally or intramuscularly, divided based on the severity of the condition.  **Child:** 0.02–0.3 mg/kg/day orally or intramuscularly in divided doses, adjusted according to clinical response.  **Congenital adrenal hyperplasia:**  **Adult:** 0.5–9 mg/day orally or intramuscularly, adjusted based on clinical response.  **Child:** 0.02–0.3 mg/kg/day orally or intramuscularly, adjusted according to clinical response.  **Acute adrenal crisis:**  **Adult**: 4–20 mg initially via IV or IM, followed by maintenance doses based on clinical response.  **Child:** 0.05–0.2 mg/kg/day via IV or IM initially, followed by maintenance doses adjusted based on the patient's condition.  **Maximum dose:**  **Adult**: 9 mg/day  **Child:** 0.3 mg/kg/day |
| Contraindications | Peptic ulcer, osteoporosis, psychoses, congestive heart failure, hypertension, diabetes mellitus, epilepsy, glaucoma, chickenpox, severe herpes zoster, ocular herpes simplex, chronic renal failure, uraemia in elderly persons, tuberculosis (except as adjuncts to treatment with tubercular drugs), live virus vaccines, pregnancy |
| Drug interactions | Barbiturates, carbamazepine, phenytoin, primidone, rifampicin, potassium-depleting diuretics, anticoagulants, antidiabetics, antihypertensives, salicylates, antimuscarinics, somatotropin, somatrem, NSAIDs, carbenoxolone, chloroquine, hydroxychloroquine, mefloquine, antacids, activated charcoal, inhibitors of CYP3A4 |
| Side effects | Weight gain, fluid retention, hypertension, hyperglycemia, increased risk of infections, osteoporosis, muscle weakness, peptic ulcers, mood changes (e.g., depression, euphoria), adrenal suppression, delayed wound healing, glaucoma, cataracts. |
| Cautions | Pre-existing hypertension, diabetes, heart failure, osteoporosis, history of peptic ulcers, increased risk of infections, psychiatric disorders, glaucoma, cataracts, adrenal suppression, active or latent tuberculosis, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C. |
| **Fludrocortisone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Tablet: 0.1mg (acetate) |
| Indications | Adrenocortical insufficiency (Addison’s disease), congenital adrenal hyperplasia, orthostatic hypotension |
| Dose and administration | **Adrenocortical insufficiency (Addison's disease):**  **Adult:**  Oral: 0.05 mg to 0.2 mg per day.  Injection: 1-2 mg IM or IV daily in divided doses based on severity.  Maintenance dose: Adjust based on clinical response and electrolyte levels.  **Child:**  Oral: 0.05 mg to 0.2 mg per day.  Injection: 0.05-0.2 mg/kg IM or IV daily in divided doses.  Maintenance dose: Adjust based on clinical response and electrolyte levels.  **Congenital adrenal hyperplasia:**  **Adult:**  Oral: 0.05 mg to 0.2 mg per day.  Injection: 1-2 mg IM or IV daily in divided doses based on response.  Maintenance dose: Adjust based on clinical response and electrolyte levels.  **Child:**  Oral: 0.05 mg to 0.2 mg per day.  Injection: 0.05-0.2 mg/kg IM or IV daily in divided doses.  Maintenance dose: Adjust based on clinical response and electrolyte levels.  **Orthostatic hypotension:**  **Adult:**  Oral: 0.1 mg to 0.2 mg per day.  Injection: 1-2 mg IM or IV in divided doses, as needed.  Maintenance dose: Adjust based on clinical response and blood pressure levels. |
| Contraindications | Hypersensitivity to the drug, congestive heart failure, systemic fungal infections. |
| Drug interactions | BCG, desmopressin, leflunomide, antacids, aprepitant, mifepristone, phenytoin, rifampicin, warfarin |
| Side effects | Sodium and water retention, edema, hypokalemia, hypertension, bruising, impaired wound healing, petechiae, drug-induced myopathy, muscle weakness, vertigo, headache, irregular periods, peptic ulcer disease, swollen abdomen. |
| Cautions | Abrupt withdrawal, electrolyte imbalance, hypertension, diabetes, edema, renal impairment, seizure disorders, osteoporosis, active infections |
| Storage condition | Store below 30°C. |
| **Hydrocortisone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Oral Tablets: 5 mg, 10 mg, 20 mg  Oral Suspension: 5 mg/5 ml  Injection: 100 mg/ml, 250 mg/ml, 500 mg/ml  Topical Cream/Ointment: 0.5%, 1%, 2.5% |
| Indications | Adrenal insufficiency (primary and secondary), congenital adrenal hyperplasia, adrenal crisis. |
| Dose and administration | **Adrenal insufficiency (maintenance therapy):**  **Adult:** 15–30 mg/day orally in divided doses (2/3 in the morning and 1/3 in the afternoon).  Maximum dose: 40 mg/day.  **Child:** 8–10 mg/m²/day orally in divided doses.  Maximum dose: 15 mg/m²/day.  **Congenital adrenal hyperplasia:**  **Adult:** 10–20 mg/m²/day orally in divided doses.  Maximum dose: 30 mg/m²/day.  **Child:** 10–20 mg/m²/day orally in divided doses.  Maximum dose: 25 mg/m²/day.  **Adrenal crisis**  **Adult:** 100 mg IV every 6–8 hours.  Maximum dose: 400 mg/day IV in emergencies.  **Child:** 1–2 mg/kg IV every 6–8 hours.  Maximum dose: 6 mg/kg/day IV in emergencies.  **Secondary adrenal insufficiency:**  **Adult:** 15–30 mg/day orally in divided doses (2/3 in the morning and 1/3 in the afternoon).  **Child:** 8–10 mg/m²/day orally in divided doses.  **Thyroid storm:**  **Adult:** 100 mg IV every 8 hours until improvement, then taper.  **Child:** 1–2 mg/kg IV every 8 hours until improvement, then taper.  **Hypopituitarism:**  **Adult:** 15–30 mg/day orally in divided doses (2/3 in the morning and 1/3 in the afternoon).  **Child:** 8–10 mg/m²/day orally in divided doses.  **Adrenalectomy (pre- and postoperative management):**  **Adult:** 100 mg IV every 6–8 hours during and after surgery, then taper gradually.  **Child:** 1–2 mg/kg IV every 6–8 hours, taper gradually post-surgery.  *Note: Doses should be adjusted based on the patient’s clinical response, and monitoring of serum electrolytes, glucose levels, and symptoms is recommended during treatment.* |
| Contraindications | Systemic infection (unless specific therapy given); live virus vaccines in patients receiving immunosuppressive doses. |
| Drug interactions | Acetylsalicylic acid, amiloride, amphotericin B, atenolol, calcium salts, carbamazepine, contraceptives, digoxin, enalapril, erythromycin, furosemide, glibenclamide, hydralazine, ibuprofen, insulins, metformin, methotrexate, nifedipine, phenobarbital, phenytoin, propranolol, rifampicin, ritonavir, salbutamol, spironolactone, influenza vaccine, live vaccines, warfarin |
| Side effects | Weight gain, fluid retention, hypertension, hyperglycemia, increased risk of infections, osteoporosis, muscle weakness, peptic ulcers, gastrointestinal discomfort, mood swings, anxiety, depression, adrenal suppression, delayed wound healing, cataracts, glaucoma. |
| Cautions | Weight gain, fluid retention, hypertension, hyperglycemia, increased risk of infections, osteoporosis, muscle weakness, peptic ulcers, GI discomfort, mood swings, anxiety, depression, adrenal suppression, delayed wound healing, cataracts, glaucoma. |
| Storage condition | Store below 300C. Protect from freezing. |
| **Methylprednisolone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection: 40 mg/ml, 80 mg/ml in 1ml and 2ml ampoules |
| Indications | Adrenocortical insufficiency, hypersensitivity reactions including anaphylactic shock, inflammatory bowel disease, asthma, perineal trauma, joint inflammation, seborrheic dermatitis, allergic reactions, inflammatory conditions, autoimmune disorders, congenital adrenal hyperplasia, severe asthma, rheumatic disorders, dermatologic conditions, gastrointestinal disorders, respiratory diseases, shock, cerebral edema, organ transplantation, neoplastic diseases. |
| Dose and administration | **Adrenal crisis (acute):**  **Adult:** 40 mg to 250 mg IV or IM, repeated every 4 to 6 hours as needed. Maximum dose: 1 g/day.  **Child:** 1 mg to 2 mg/kg IV or IM, repeated every 4 to 6 hours as needed. Maximum dose: 60 mg/dose.  **Secondary adrenal insufficiency:**  **Adult:** 4 mg to 48 mg/day IV in divided doses.  **Child:** 0.5 mg to 2 mg/kg/day IV in divided doses.  **Hypopituitarism:**  **Adult:** 4 mg to 48 mg/day IV in divided doses.  **Child:** 0.5 mg to 2 mg/kg/day IV in divided doses.  **Adrenalectomy (postoperative):**  **Adult:** 40 mg to 250 mg IV every 6 to 8 hours, then taper as needed.  **Child:** 1 mg to 2 mg/kg IV every 6 to 8 hours, then taper as needed.  Maximum doses  **Adult:** 1 g/day IV.  **Child:** 60 mg/dose IV. |
| Contraindications | Hypersensitivity to the drug, systemic fungal infection (unless specific antimicrobial therapy given), live virus vaccines in those receiving immunosuppressive doses (serum antibody response diminishes) |
| Drug interactions | Refer under other corticosteroids above |
| Side effects | Adrenal suppression, confusion, delusions, dyslipidemia, muscle weakness, schizophrenia, suicidal ideation, withdrawal syndrome, myocardial rupture (following recent myocardial infarction), Kaposi’s sarcoma |
| Cautions | Refer under other corticosteroids above |
| Storage condition | Store below 30°C. Protect from light. |
| **Prednisolone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Tablet: 5mg  Injection (Sodium Phosphate): 10mg/ml, 25mg/ml in 2ml ampoule |
| Indications | Severe allergies, chronic urticaria (hives), allergic rhinitis, asthma, chronic obstructive pulmonary disease (COPD), inflammatory bowel disease (Crohn’s disease, ulcerative colitis), rheumatoid arthritis, systemic lupus erythematosus (SLE), psoriatic arthritis, acute gouty arthritis, autoimmune hepatitis, multiple sclerosis, myasthenia gravis, autoimmune hemolytic anemia, Addison's disease, secondary adrenal insufficiency, severe psoriasis, severe eczema, dermatitis, idiopathic thrombocytopenic purpura (ITP), leukaemia, lymphoma, part of chemotherapy regimens for certain cancers, uveitis, iritis, allergic conjunctivitis, acute exacerbations of multiple sclerosis, cerebral edema associated with brain tumours or neurosurgery, nephrotic syndrome, sarcoidosis, prevention and treatment of organ transplant rejection. |
| Dose and administration | **Thyroiditis (subacute thyroiditis):**  **Adult:** 20 mg to 40 mg per day orally for 1-2 weeks, followed by tapering based on clinical response.  **Child:** 0.5 mg to 2 mg/kg/day orally in divided doses, tapering based on clinical response.  **Hypercalcemia of malignancy:**  **Adult:** 30 mg to 60 mg per day orally in divided doses until the hypercalcemia resolves, then taper based on clinical response.  **Child:** 1 mg to 2 mg/kg/day orally in divided doses. Maximum dose (Adult and Child): Up to 60 mg/day.  **Primary hyperaldosteronism (Pre-treatment before surgery)**  **Adult:** 10 mg to 30 mg per day orally for 1-2 weeks before surgery, then taper postoperatively based on clinical response.  **Child:** Use under specialist advice, dosing individualized based on weight and clinical condition.  **Cushing’s syndrome (management before surgery or long-term):**  **Adult:** 20 mg to 40 mg per day orally in divided doses, adjusted based on clinical response and cortisol levels.  **Child:** 0.5 mg to 2 mg/kg/day orally, adjusted based on clinical response.  **Glucocorticoid replacement in HPA Axis suppression:**  **Adult:** 5 mg to 20 mg per day orally, divided into morning and afternoon doses. Adjust based on clinical response and serum cortisol levels.  **Child:** 0.14 mg to 2 mg/kg/day orally in divided doses, adjusted based on clinical response. |
| Contraindications | Systemic infection (unless life-threatening or specific antimicrobial therapy given), live virus vaccines in those receiving immunosuppressive doses (serum antibody response diminished), blood clotting disorders, intra-articular fracture, osteoporosis, unstable joint |
| Drug interactions | Refer under other corticosteroids above. |
| Side effects | Refer under other Corticosteroids above. |
| Cautions | Refer under other Corticosteroids above. |
| Storage condition | Store below 30°C. Protect from light. |
| **Triamcinolone Acetonide** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection: 10mg/ml, 40mg/ml in vial,  Topical Cream/Ointment: 0.025%, 0.1%, 0.5%, |
| Indications | Allergic reactions, inflammatory conditions, autoimmune disorders, dermatologic conditions, joint and soft tissue injections. |
| Dose and administration | **Adrenal insufficiency, secondary adrenal insufficiency: Parenteral:**  **Adult:** 5 mg to 60 mg IM or intra-articularly, depending on the severity of the condition and clinical need.  Frequency: Typically, every 1 to 4 weeks, adjusted based on response and clinical need.  **Child:** 0.11 mg to 1.6 mg/kg IM or intra-articularly, depending on severity and clinical need.  Frequency: Typically, every 1 to 4 weeks, adjusted based on response and clinical need.  **Adrenal Insufficiency with Skin Manifestations, Topical:**  **Adult and Child:** Apply a thin layer to the affected area 2 to 4 times daily. Use as directed by a healthcare provider, typically for a short duration to minimize side effects. |
| Contraindications | Refer under other corticosteroids. |
| Drug interactions | Refer under other corticosteroids. |
| Side effects | Local irritation at the site of application or injection, dry skin, itching, redness; systemic effects such as adrenal suppression, increased susceptibility to infection, osteoporosis, cataracts, glaucoma, hyperglycemia |
| Cautions | High dosage, chronic therapy |
| Storage condition | Store below 30°C. Protect from light. |

## Thyroid hormone and anti-thyroid medicines

Thyroid hormone and anti-thyroid medications are vital in managing thyroid disorders, which can significantly impact metabolism and overall health. Lugol’s solution contains iodine, which inhibits the release of thyroid hormones, making it useful in preoperative preparation for thyroidectomy. Anti-thyroid drugs like carbimazole and propylthiouracil (PTU) inhibit thyroid peroxidase, an enzyme essential for thyroid hormone synthesis, thereby reducing thyroid hormone levels in hyperthyroidism. Levothyroxine, a synthetic form of thyroxine (T4), is used to treat hypothyroidism by supplementing low levels of thyroid hormone, thus normalizing metabolic processes. Propranolol, a non-selective beta-blocker, alleviates symptoms of hyperthyroidism such as tachycardia and tremors by blocking the effects of excessive thyroid hormones on the cardiovascular system, providing symptomatic relief.

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| **Carbimazole** | |
| Pharmacological class | **Imidazole** |
| Dosage form | Tablet : 5 mg, 10 mg, 20 mg |
| Indications | Hyperthyroidism, Graves' disease, preparation for thyroid surgery, thyrotoxic crisis (thyroid storm). |
| Dose and Administration | **Hyperthyroidism:**  **Adult:**  Initial dose: 20 mg to 60 mg per day orally in divided doses.  Maintenance dose: 5 mg to 15 mg per day once euthyroid state is achieved.  **Child:**  Initial dose: 0.5 mg/kg/day orally in divided doses.  Maintenance dose: Adjust based on clinical response and thyroid function tests.  **Graves' Disease:**  **Adult:**  Initial dose: 20 mg to 60 mg per day orally in divided doses until euthyroid, then reduce to 5 mg to 15 mg per day.  **Child:**  Initial dose: 0.5 mg/kg/day orally in divided doses.  Maintenance Dose: Adjust based on clinical response and thyroid function tests.  **Preparation for thyroid surgery:**  **Adult:** 20 mg to 60 mg per day orally in divided doses for 6 to 8 weeks before surgery.  **Child:** 0.5 mg/kg/day orally in divided doses, adjusted based on clinical response and thyroid function tests.  **Thyrotoxic crisis (thyroid storm):**  **Adult:** 60 mg to 80 mg per day orally in divided doses.  **Child:** 1 mg/kg/day orally in divided doses, adjusted based on clinical response and thyroid function tests. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Oral anticoagulants and heparin |
| Side effects | Pruritus, skin rashes, non-specific gastrointestinal disturbances, headache, mild arthralgia, urticaria, alopecia, drug-induced agranulocytosis, cholestatic hepatitis with jaundice, blood dyscrasias, and "drug-fever" reactions. |
| Cautions | Hepatic impairment, tracheal obstruction, bone marrow suppression, pregnancy, breastfeeding |
| Storage condition | Store below 30°C. Protect from light. |
| **Levothyroxine** | |
| Pharmacological class | Thyroid preparation |
| Dosage form | Tablet : 0.025mg, 0.05mg, 0.1 mg |
| Indications | Primary hypothyroidism, secondary (pituitary) hypothyroidism, tertiary (hypothalamic) hypothyroidism, subclinical hypothyroidism, goiter, thyroid cancer (as part of thyroid hormone suppression therapy). |
| Dose and administration | **Primary Hypothyroidism, Secondary (Pituitary), Hypothyroidism, Tertiary (Hypothalamic) Hypothyroidism**  **Adult:** Initially 50 mcg to 100 mcg per day orally.  **Severe Hypothyroidism:** Start with 12.5 mcg to 25 mcg per day orally.  Maintenance dose: 100 mcg to 200 mcg per day, adjusted based on thyroid function tests.  **Child:**  **Neonates and Infants (0-3 months):** 10 mcg to 15 mcg/kg/day orally.  **Infants (3-6 months):** 8 mcg to 10 mcg/kg/day orally.  **Child (6 months - 1 year):** 6 mcg to 8 mcg/kg/day orally.  **Child (1-5 years):** 5 mcg to 6 mcg/kg/day orally.  **Child (6-12 years):** 4 mcg to 5 mcg/kg/day orally.  **Child (Over 12 years):** 2 mcg to 3 mcg/kg/day orally.  **Maintenance dose: Adjust based on thyroid function tests.**  **Subclinical Hypothyroidism**  **Adult:** 25 mcg to 75 mcg per day orally, adjusted based on thyroid function tests.  **Child:** As per age and weight, adjusted based on thyroid function tests.  **Goiter:**  **Adult:** 100 mcg to 200 mcg per day orally.  Maintenance dose: Adjust based on thyroid function tests.  **Child:** As per age and weight, adjusted based on thyroid function tests.  **Thyroid Cancer (as part of thyroid hormone suppression therapy)**  **Adult:** 2 mcg/kg/day orally, typically 150 mcg to 300 mcg per day.  Maintenance dose: Adjust based on thyroid function tests.  **Child:** As per age and weight, adjusted based on thyroid function tests.  **Elderly and Cardiac Patients**  **Adult:** 12.5 mcg to 25 mcg per day orally.  Maintenance dose: 75 mcg to 125 mcg per day, adjusted based on clinical response and thyroid function tests. |
| Contraindications | Thyrotoxicosis, concurrent use of cholestyramine or colestipol, sympathomimetics |
| Drug interactions | Warfarin |
| Side effects | Headache, sleep problems (insomnia), nervousness, irritability, fever, hot flashes, sweating, changes in menstrual periods, appetite changes, weight changes, chest pain, irregular heartbeats, shortness of breath, tremors, leg cramps, headache, nervousness, irritability, severe allergic reactions (rash, itching/swelling, severe dizziness, trouble breathing). Seek immediate medical attention if serious side effects occur. |
| Cautions | Cardiovascular disorders (myocardial insufficiency or ECG evidence of myocardial infarction), hypopituitarism or predisposition to adrenal insufficiency elderly, long-standing hypothyroidism, diabetes and mellitus, pregnancy, breastfeeding |
| Storage condition | Store below 30°C. Protect from light. |
| **Lugol’s solution (Iodine + Potassium Iodide)** | |
| Pharmacological class | **Antithyroid agent and iodine supplement** |
| Dosage form | Solution: 130 mg total iodine/ml (typically contains 5% iodine and 10% potassium iodide). |
| Indications | Hyperthyroidism, preparation for thyroid surgery, thyroid storm, iodine deficiency, radiation emergency (to block radioactive iodine uptake), antiseptic use. |
| Dose and administration | **Hyperthyroidism and Preparation for Thyroid Surgery:**  **Adult:** 0.1 ml to 0.3 ml (8 to 24 drops) orally three times daily for 10 days before surgery.  **Child:** 0.05 ml to 0.15 ml (4 to 12 drops) orally three times daily for 10 days before surgery.  **Thyroid storm:**  **Adult:** 0.1 ml (8 drops) orally every 6 to 8 hours.  **Child:** 0.05 ml (4 drops) orally every 6 to 8 hours.  **Iodine deficiency:**  **Adult:** 0.05 ml (4 drops) orally daily.  **Child:** 0.025 ml (2 drops) orally daily.  **Radiation emergency (to block radioactive iodine uptake):**  **Adult:** 0.1 ml (8 drops) orally daily.  **Child:** 0.05 ml (4 drops) orally daily. |
| Contraindications | Pulmonary edema, hyperthyroidism, severe renal impairment, pregnancy, breastfeeding |
| Drug interactions | Sodium iodide (iodine-131), enalapril |
| Side effects | Hypersensitivity reactions including coryza-like symptoms, headache, lacrimation, conjunctivitis, pain in salivary glands, laryngitis, bronchitis, rashes, on prolonged treatment (depression, insomnia, impotence; goiter in infants of mothers taking iodides). |
| Cautions | Pre-existing thyroid disorders (hyperthyroidism or hypothyroidism), iodine sensitivity, dermatitis herpetiformis, hypocomplementemic vasculitis, renal impairment, pregnancy, breastfeeding, prolonged use (may lead to iodine toxicity or thyroid dysfunction). |
| Storage condition | Store below 30°C. Protect from light. |
| **Methimazole** | |
| Pharmacological class | **Imidazole** |
| Dosage form | Tablet : 5 mg, 10 mg |
| Indications | Hyperthyroidism, Graves' disease, preparation for thyroid surgery, thyroid storm. |
| Dose and administration | **Hyperthyroidism:**  **Adult, initially:**  **Mild:** 15 mg per day (5 mg three times a day).  **Moderate:** 30 mg to 40 mg per day divided into three doses.  **Severe:** 60 mg per day divided into three doses.  Maintenance dose: 5 mg to 15 mg per day once euthyroid state is achieved.  **Child:** 0.4 mg/kg/day divided into three doses.  Maintenance dose: 0.2 mg/kg/day divided into two or three doses, adjusted based on clinical response and thyroid function tests.  **Graves' Disease:**  **Adult:** 15 mg to 60 mg per day divided into three doses until euthyroid state is achieved, then maintain on 5 mg to 15 mg per day.  **Child:** 0.4 mg/kg/day divided into three doses. Adjust based on clinical response and thyroid function tests.  **Preparation for Thyroid Surgery:**  **Adult:** 15 mg to 60 mg per day divided into three doses for several weeks before surgery.  **Child:** 0.4 mg/kg/day divided into three doses. Adjust based on clinical response and thyroid function tests.  **Thyroid Storm:**  **Adult:** 20 mg every 4 to 6 hours orally.  **Child:** 0.2 mg/kg every 4 to 6 hours orally. Adjust based on clinical response and thyroid function tests. |
| Contraindications | Hypersensitivity to the drug, hematologic disorders, renal failure, history of acute pancreatitis. |
| Drug interactions | Digoxin, theophylline, warfarin, beta-blockers |
| Side effects | Nausea, vomiting, upset stomach, headache, dizziness, drowsiness, numbness or tingly feeling, rash, itching, skin discoloration, muscle or joint pain. |
| Cautions | Hepatic impairment, bone marrow suppression, signs of agranulocytosis such as sore throat and fever, pregnancy, breastfeeding |
| Storage condition | **Store below 30°C. Protect from heat, moisture, and light.** |
| **Propranolol** | |
| Pharmacological class | **Beta blocker** |
| Dosage form | Tablet : 10 mg, 20 mg, 40 mg  Oral Extended-Release Capsule : 60 mg, 80 mg, 120 mg, 160 mg  Injection : 1 mg/ml |
| Indications | Hypertension, angina pectoris, arrhythmias, myocardial infarction, migraine prophylaxis, essential tremor, pheochromocytoma (adjunctive treatment), hyperthyroidism (symptomatic relief), anxiety, hypertrophic subaortic stenosis, portal hypertension. |
| Dose and administration | **Tachyarrhythmia:**  **Adult:**  Oral: 10 to 30 mg/dose every 6-8 hours.  IV: 1 to 3 mg/dose slow IV push; repeat every 2-5 minutes up to a total of 5 mg; titrate initial dose to desired response or 0.5 to 1 mg over 1 minute; may repeat, if necessary, up to a total maximum dose of 0.1 mg/kg.  **Thyroid storm:**  **Adult**  Oral: 60-80 mg every 4 hours; may consider the use of an intravenous shorter-acting beta-blocker (i.e., esmolol).  IV: 0.5-1 mg administered over 10 minutes every 3 hours.  **Child:** 0.5 mg to 1 mg/kg/day orally in divided doses every 6-8 hours, titrate dosage upward every 3-7 days based on clinical response. Maximum dose: Do not exceed 16 mg/kg/day or 60 mg/day.  **Thyrotoxicosis:**  **Adult, Oral:** 10-40 mg/dose every 6-8 hours; may also consider administering extended or sustained release formulations.  **Child: Initially** 0.5 to 1 mg/kg/day in divided doses every 6-8 hours; titrate dosage upward every 3-7 days; usual dose: 2-6 mg/kg/day; higher doses may be needed; do not exceed 16 mg/kg/day or 60 mg/day. |
| Contraindications | Hypersensitivity to propranolol or other beta-blockers, uncompensated congestive heart failure (unless the failure is due to tachyarrhythmia being treated with propranolol), cardiogenic shock, severe sinus bradycardia or heart block greater than first-degree (except in patients with a functioning artificial pacemaker), severe hyperactive airway disease (asthma or COPD). |
| Drug interactions | Chlorpromazine, phenothiazines, thioxanthenes, lidocaine, cimetidine, hepatic enzyme inducers (barbiturates, phenytoin, rifampicin), non-steroidal anti-inflammatory agents, digoxin, verapamil, neuromuscular blocking agents, anesthetic agents, insulin or oral antidiabetic agents |
| Side effects | Heart failure, heart block, hypotension, bronchospasm, fatigue and coldness of the extremities, headache, depression, dizziness, confusion, sleep disturbances, dry mouth, nausea, vomiting, diarrhea, impotence, or decreased libido. |
| Cautions | Peripheral arterial insufficiency, first-degree AV block, major surgery, renal and hepatic impairment, diabetes, myasthenia gravis, abrupt withdrawal, ischemic heart disease, pregnancy, neonate |
| Storage condition | Store below 30°C. |
| **Propyl Thiouracil (PTU)** | |
| Pharmacological class | Antithyroid agent |
| Dosage form | Tablet : 50 mg, 100 mg |
| Indications | Hyperthyroidism, Graves' disease, preparation for thyroid surgery, thyroid storm. |
| Dose and administration | **Hyperthyroidism:**  **Adult:** 300 mg to 450 mg per day orally in divided doses every 8 hours until the patient becomes euthyroid. Once euthyroid, reduce to a maintenance dose of 100 mg to 150 mg per day.  **Child:** 5 mg to 7 mg/kg/day orally in divided doses every 8 hours. Adjust based on clinical response and thyroid function tests.  **Graves' Disease:**  **Adult:** 300 mg to 450 mg per day orally in divided doses every 8 hours until euthyroid state is achieved, then maintain on 100 mg to 150 mg per day.  **Child:** 5 mg to 7 mg/kg/day orally in divided doses every 8 hours. Adjust based on clinical response and thyroid function tests.  **Preparation for Thyroid Surgery:**  **Adult:** 300 mg to 450 mg per day orally in divided doses every 8 hours for several weeks before surgery.  **Child:** 5 mg to 7 mg/kg/day orally in divided doses every 8 hours. Adjust based on clinical response and thyroid function tests.  **Thyroid Storm:**  **Adult:** 200 mg every 4 to 6 hours orally.  **Child:** 5 mg to 7 mg/kg/day orally in divided doses every 4 to 6 hours. Adjust based on clinical response and thyroid function tests. |
| Contraindications | Hypersensitivity to the drug, hepatic impairment. |
| Drug interactions | Sodium iodide (iodine-131), warfarin |
| Side effects | Nausea, mild GI disturbances, headache, rashes, pruritus, arthralgia, alopecia, bone marrow suppression, urticaria, leucopenia, cutaneous vasculitis, thrombocytopenia, aplastic anemia, hepatitis, lupus erythematosus-like syndromes. |
| Cautions | Hepatic and renal impairment, pregnancy, breastfeeding |
| Storage condition | Store below 30°C. |

## Medicines used for diabetes mellitus

The management of diabetes involves both oral hypoglycemic agents and insulin therapy. Oral medications such as glibenclamide, gliclazide, glimepiride, metformin, and dapagliflozin help control blood sugar levels in type 2 diabetes. Sulfonylureas (glibenclamide, gliclazide, glimepiride) stimulate insulin release from pancreatic beta cells, while metformin increases insulin sensitivity and reduces hepatic glucose production. Dapagliflozin, an SGLT2 inhibitor, promotes glucose excretion via the urine. Insulin therapy (short-acting, intermediate-acting, and long-acting insulin analogues) is essential for type 1 diabetes and advanced type 2 diabetes to regulate blood sugar effectively.

**Oral hypoglycemic agents**

Oral hypoglycemic agents are used to manage blood glucose levels in type 2 diabetes. Medications like glibenclamide, gliclazide, glimepiride, and metformin improve insulin sensitivity, stimulate insulin secretion, and reduce liver glucose production. SGLT2 inhibitors such as dapagliflozin increase glucose excretion via the urine. These agents are vital for achieving glycaemic control and preventing diabetes-related complications.

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| **Canagliflozin** | |
| Pharmacological class | Sodium-glucose co-transporter 2 (SGLT2) inhibitor |
| Dosage form | Tablet: 100mg, 300mg |
| Indications | Type 2 diabetes mellitus as monotherapy (if metformin inappropriate) in combination with insulin or other antidiabetic drugs (if existing treatment fails to achieve adequate glycaemic control), reduction of risk of cardiovascular events in adults with type 2 diabetes and established cardiovascular disease, reduction of risk of end-stage kidney disease, doubling of serum creatinine, cardiovascular disease risk reduction and hospitalization for heart failure in adults with type 2 diabetes and diabetic nephropathy with albuminuria. |
| Dose and Administration | **Type 2 diabetes mellitus:**  **Adult:**  Initial dose: 100 mg once daily, taken before the first meal of the day.  Maintenance dose: May increase to 300 mg once daily for additional glycemic control if needed and tolerated.  **Cardiovascular and renal indications:**  **Adult:**  Initial dose: 100 mg once daily, taken before the first meal of the day.  Maintenance dose: May increase to 300 mg once daily for additional benefits in cardiovascular and renal outcomes if tolerated.  **Reduction of risk of cardiovascular events:**  **Adult:** 100 mg to 300 mg once daily, depending on the patient's response and tolerance, taken before the first meal of the day.  **Reduction of risk of end-stage kidney disease and other renal outcomes:**  **Adult:** 100 mg to 300 mg once daily, depending on the patient's response and tolerance, taken before the first meal of the day. |
| Contraindications | Hypersensitivity to the drug, diabetic ketoacidosis, severe renal impairment (eGFR <30 ml/min/1.73 m²), patients on dialysis, type 1 diabetes mellitus |
| Drug interactions | Alcohol, diuretics, insulin and insulin secretagogues, UGT inducers (e.g., rifampin, phenytoin) |
| Side effects | Balanoposthitis, constipation, dyslipidaemia (increased LDL cholesterol), hypoglycemia (in combination with insulin or sulfonylurea), increased risk of infection, Urinary tract infections, genital mycotic infections, increased urination, thirst, hypotension, hyperkalemia, urinary disorders, urosepsis |
| Cautions | Hepatic impairment, renal impairment, ketoacidosis, dehydration, history of fractures, volume depletion, elderly patients, elevated haematocrit, hypotension, pregnancy, breast feeding |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Dapagliflozin** | |
| Pharmacological class | Sodium-glucose co-transporter 2 (SGLT2) inhibitor |
| Dosage form | Tablet: 5mg, 10mg |
| Indications | Type 2 diabetes mellitus, heart failure with reduced ejection fraction, chronic kidney disease (CKD). |
| Dose and administration | **Type 2 diabetes mellitus:**  **Adult:**  Initial dose: 5 mg once daily in the morning, with or without food.  Maintenance dose: May increase to 10 mg once daily if additional glycemic control is needed and the patient is tolerating the initial dose well.  **Heart failure with reduced ejection fraction:**  **Adult:** 10 mg once daily, with or without food.  **CKD:**  **Adult:** 10 mg once daily, with or without food. |
| Contraindications | Refer to Contraindications to Canagliflozin |
| Drug interactions | Refer to Drug Interactions with Canagliflozin |
| Side effects | Urinary tract infections, genital mycotic infections, nasopharyngitis, hypotension, increased urination, dyslipidemia, back pain |
| Cautions | Refer to cautions to Canagliflozin |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Empagliflozin** | |
| Pharmacological class | Sodium-glucose co-transporter 2 (SGLT2) inhibitor |
| Dosage form | Tablet: 10mg, 25mg |
| Indications | Type 2 diabetes mellitus, heart failure with reduced ejection fraction, reduction of cardiovascular death in adults with type 2 diabetes and established cardiovascular disease. |
| Dose and administration | **Type 2 diabetes mellitus:**  **Adult:**  Initial dose: 10 mg once daily in the morning, with or without food.  Maintenance dose: May increase to 25 mg once daily if additional glycemic control is needed and the patient is tolerating the initial dose well.  **Heart failure with reduced ejection fraction:**  **Adult:** 10 mg once daily, with or without food.  **Reduction of cardiovascular death:**  **Adult:** 10 mg once daily, with or without food. |
| Contraindications | Refer to contraindications to Canagliflozin |
| Drug interactions | Refer to drug interactions with Canagliflozin |
| Side effects | Refer to side effects from Canagliflozin |
| Cautions | Refer to cautions to Canagliflozin |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Glibenclamide** | |
| Pharmacological class | Sulfonylurea |
| Dosage form | Oral Tablets: 1.25 mg, 2.5 mg, 5 mg |
| Indications | Type 2 diabetes mellitus |
| Dose and administration | **Adult:**  Initial dose: 2.5 mg to 5 mg once daily with breakfast or the first main meal. For elderly or sensitive patients, start with 1.25 mg once daily.  Maintenance dose: Adjust based on blood glucose response, typically 1.25 mg to 20 mg per day. If the dose exceeds 10 mg per day, divide into two doses.  Maximum dose: 20 mg per day. |
| Contraindications | Type 1 diabetes mellitus, diabetic ketoacidosis, diabetic coma or pre-coma, severe renal and hepatic impairment. |
| Drug interactions | NSAIDs (e.g., azapropazone, phenylbutazone), antibacterial agents, antifungals, uricosurics |
| Side effects | Hypoglycemia, nausea, heartburn, vomiting, diarrhea, abdominal pain, weight gain, bloating, abdominal fullness, skin reactions (rash, hives, itching, photosensitivity). |
| Cautions | Hypersensitivity to the drug, severe renal or hepatic impairment, elderly patients, conditions that predispose to hypoglycemia (e.g., adrenal insufficiency), porphyria, stress-related states, pregnancy. |
| Storage condition | Store below 30°C. Protect from sunlight. |
| **Gliclazide** | |
| Pharmacological class | Sulfonylurea |
| Dosage form | Tablet: 30 mg, 60 mg, 80 mg  Oral modified-release tablet: 30 mg, 60 mg |
| Indications | Type 2 diabetes mellitus |
| Dose and administration | **Adult:**  **Immediate-Release Tablets:**  Initial dose: 40 mg to 80 mg once daily.  Maintenance dose: 40 mg to 320 mg per day. If the dose exceeds 160 mg per day, divide into two doses.  Maximum dose: 320 mg per day.  **Modified-Release Tablets:**  Initial dose: 30 mg once daily.  Maintenance dose: 30 mg to 120 mg once daily.  Maximum dose: 120 mg per day. |
| Contraindications | Acute porphyria |
| Drug interactions | Sulfonamide antibiotics, anticoagulants (e.g., warfarin), antidepressants, aspirin, propranolol |
| Side effects | Hypoglycemia, GI disorders (dyspepsia, nausea), anemia, angioedema, hypersensitivity vasculitis, hyponatremia, severe cutaneous adverse reactions. |
| Cautions | Renal impairment, hepatic impairment, cardiovascular risk, G6PD deficiency, pregnancy, breastfeeding |
| Storage condition | Store below 30°C. Protect from light. |
| **Glimepiride** | |
| Pharmacological class | Sulfonylurea |
| Dosage form | Tablet: 1 mg, 2 mg, 3 mg, 4 mg |
| Indications | Type 2 diabetes mellitus |
| Dose and administration | **Adult:**  Initial dose: 1 mg to 2 mg once daily with breakfast or the first main meal.  Maintenance dose: Adjust based on blood glucose response, typically 1 mg to 4 mg once daily.  Maximum dose: 8 mg per day. |
| Contraindications | Hypersensitivity to the drug, other sulfonylureas or sulfonamides, insulin-dependent diabetes, ketoacidosis (with or without coma), severe renal or hepatic function disorders. |
| Drug interactions | CYP2C8/9 inhibitors, beta blockers, chloramphenicol, cimetidine, fluconazole, salicylates, sulfonamides, tricyclic antidepressants, CYP2C8/9 inducers |
| Side effects | Dizziness, headache, hypoglycaemia, GI discomfort, hypersensitivity vasculitis, nausea, weakness, anorexia, heartburn, vomiting. |
| Cautions | Refer to cautions to Gliclazide |
| Storage condition | Store below 30°C. Protect from light. |
| **Metformin** | |
| Pharmacological class | Biguanide |
| Dosage form | Oral Tablet: 500 mg, 850 mg, 1000 mg  Oral Extended-Release Tablet: 500 mg, 750 mg, 1000 mg |
| Indications | Type 2 diabetes mellitus. |
| Dose and administration | **Adult:**  Immediate-Release Tablets: Start with 500 mg twice daily or 850 mg once daily with meals. Adjust to a maintenance dose of 1.5 g to 2.55 g per day in divided doses. Maximum dose is 2.55 g per day.  Extended-Release Tablets: Start with 500 mg to 1g once daily with the evening meal. Adjust to a maintenance dose of 1.5 g to 2 g once daily. Maximum dose is 2 g per day.  **Child (10 years and older):**  Immediate-Release Tablets: Start with 500 mg twice daily with meals. Adjust to a maintenance dose of 1 g to 2 g per day in divided doses. Maximum dose is 2 g per day.  Extended-Release Tablets: Start with 500 mg once daily with the evening meal. Adjust based on clinical response. Maximum dose is 2 g per day. |
| Contraindications | Predisposition to lactic acidosis, renal or hepatic impairment, heart failure, severe infections or trauma, dehydration, ketoacidosis, use of general anesthesia, alcohol dependence, pregnancy, use of iodine-containing X-ray contrast media. |
| Drug interactions | Alcohol, cimetidine, furosemide, vitamin B12 |
| Side effects | GI disturbances (nausea, vomiting, diarrhea, abdominal discomfort), metallic taste, decreased appetite, decreased or malabsorption of vitamin B12, lactic acidosis (symptoms include malaise, myalgia, respiratory distress, increased somnolence, and abdominal pain) |
| Cautions | Renal impairment, lactic acidosis, severe infection, trauma, surgery, pregnancy, breastfeeding |
| Storage condition | Store below 30°C. |

**Insulin**

Insulin therapy is crucial for individuals with type 1 diabetes and those with advanced type 2 diabetes. Insulin preparations include short-acting, intermediate-acting, and long-acting analogues, each with specific onset and duration of action profiles. These medicines are adminstered through injections and are essential for regulating blood glucose levels, preventing hyperglycemia, and managing acute diabetic complications. Proper insulin management requires individualized dosing and regular monitoring.

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| **Long-acting Insulin (e.g., Insulin Glargine, Insulin Detemir)** | |
| Pharmacological class | Long-acting insulin |
| Dosage form | **Insulin Glargine:**  Injection: 100 units/ml (U-100) in 10 ml vials, 3 ml prefilled pens  Injection: 300 units/ml (U-300) in 1.5 ml prefilled pens  **Insulin Detemir:**  Injection: 100 units/ml (U-100) in 10 ml vials, 3 ml prefilled pens |
| Indications | Type 1 diabetes mellitus, type 2 diabetes mellitus requiring insulin |
| Dose and Administration | **Type 1 DM**  **Adult:** For insulin-naive, SC injection: 1/3 of individual insulin requirements, of which daily insulin requirements are estimated at 0.1-0.2 units/kg. The remaining 2/3 of daily insulin dose is used on short-acting, premeal insulin.  **Child < 2 years:** Safety and efficacy not established  **Child 2-17 years:** By SC injection, approx. 1/3 of individual insulin requirements, of which daily insulin requirements are estimated at 0.1-0.2 units/kg. The remaining 2/3 of daily insulin dose is used on short-acting, premeal insulin.  **Type 2 diabetes mellitus:**  **Adult:** SC injection: 10 units or 0.1–0.2 units/kg once daily with the evening meal or divided into a twice daily regimen and titrate accordingly. |
| Contraindications | Hypersensitivity to the drug or any of long acting insulins. |
| Drug interactions | Alcohol, beta-blockers, thiazolidinediones, corticosteroids |
| Side effects | Hypoglycemia, injection site reactions (e.g., pain, redness, swelling), weight gain, allergic reactions (e.g., rash, itching, swelling, severe dizziness, trouble breathing). |
| Cautions | Hypoglycemia, renal impairment, hepatic impairment, illness and stress, lipodystrophy |
| Storage condition | Store in a refrigerator (2-8°C). Do not freeze. Once in use, can be kept at room temperature (up to 25°C) for up to 28 days. |
| **NPH Insulin (Neutral Protamine Hagedorn)** | |
| Pharmacological class | Intermediate-acting insulin |
| Dosage form | Injection: 40 IU/ml in 10 ml vial; 100 IU/ml in 10 ml vial; 100 IU/ml in 3 ml cartridge or pre-filled pen (as compound insulin zinc suspension or isophane insulin). |
| Indications | Type 1 diabetes mellitus, type 2 diabetes mellitus requiring insulin |
| Dose and administration | **Type 1 diabetes mellitus**  **NPH with pre-breakfast and pre-dinner regular insulin**  **Adult:** Mixed NPH and regular insulin (70/30; 70% NPH & 30% regular insulin), administered twice daily before breakfast and before dinner.  **Twice daily NPH injections only**  **Adult:** Administer NPH insulin before breakfast and before bedtime.  **Total insulin dose (type 1 diabetes mellitus)**  Initiation dose: 0.2 to 0.4 units/kg/day.  Maintenance dose: Highly variable, roughly 0.6 to 0.7 units/kg/day based on individual response and blood glucose monitoring.  **Type 2 diabetes mellitus requiring insulin -** dosing basal insulin in type 2 diabetes  **As an add-on therapy to metformin**  **Adult:** Starting dose of NPH 10 units at bedtime. Higher doses may be initiated for higher blood glucose levels. Adjust by increasing 2-4 units every 3-7 days based on self-monitoring of blood sugar.  **As a replacement for oral agents**  **Adult:** Starting dose of NPH 15-20 units at bedtime. For doses exceeding 20 units, divide approximately 2/3 in the morning and 1/3 in the evening. Adjust by increasing 2-4 units every 3-7 days with self-monitoring of blood sugar. |
| Contraindications | Hypersensitivity to the drug or any of its components. |
| Drug interactions | Alcohol, beta-blockers, thiazolidinediones, corticosteroids |
| Side effects | Hypoglycemia, weight gain, injection site reactions, lipodystrophy, allergic reactions. |
| Cautions | Severe hypoglycemia, similar injection sites |
| Storage condition | Store in a refrigerator (2-8°C). Do not freeze. Once in use, can be kept at room temperature (up to 25°C) for up to 28 days. |
| **Regular insulin** | |
| Pharmacological class | Short-acting insulin |
| Dosage form | Injection: 40 IU/ml in 10 ml vial; 100 IU/ml in 10 ml vial; 100 IU/ml in 3 ml cartridge or pre-filled pen. |
| Indications | Type 1 diabetes mellitus, type 2 diabetes mellitus requiring insulin, diabetic Ketoacidosis (DKA) and Hyperglycaemic Hyperosmolar State (HHS) |
| Dose and administration | **Type 1 diabetes mellitus:**  NPH with premeal regular insulin  **Adult:** NPH before breakfast and at bedtime, plus regular insulin three times daily before breakfast, lunch, and dinner.  **Type 2 diabetes mellitus requiring insulin:**  Dosing prandial regular insulin  Starting dose: Regular insulin 4 units before the largest meal of the day.  Dose increment: Increase by 1-2 units every 2-3 days based on self-monitoring of the next pre-meal blood glucose.  **Diabetic Ketoacidosis (DKA) and Hyperglycaemic Hyperosmolar State (HHS)**  Initial dose: 10 units IV and 10 units IM, stat.  Continuous infusion (if available): 0.1 units/kg per hour by continuous IV infusion.  Without continuous infusion: 5 units IM every hour.  Transition to SC insulin: Once the patient can take oral feeding and acidosis has improved, reduce regular insulin to 2-3 units hourly (or 5 units every 2 hours), or reduce continuous infusion to 0.05 units/kg per hour. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Alcohol, beta-blockers, thiazolidinediones, corticosteroids |
| Side effects | Hypoglycemia, weight gain, injection site reactions, lipodystrophy, allergic reactions. |
| Cautions | Severe hypoglycemia, similar injection sites |
| Storage condition | Store in a refrigerator (2-8°C). Do not freeze. Once in use, can be kept at room temperature (up to 25°C) for up to 28 days. |

## Medicines for the management of hypoglycaemia

Managing hypoglycaemia is crucial for diabetes patients, as low blood sugar levels can be life-threatening. Glucagon injections are used in emergencies to rapidly increase blood sugar levels by stimulating the liver to release glucose. Diazoxide, available in oral liquid and tablet forms, inhibits insulin release from the pancreas, preventing recurrent hypoglycaemia and providing a long-term solution for managing low blood sugar in conditions such as insulinoma or hyperinsulinism.

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| **Diazoxide** | |
| Pharmacological class | A **potassium channel activator** (for hypoglycemia) and a **vasodilator** (for hypertension). |
| Dosage form | Oral liquid: 50 mg/ml  Tablet/Capsule: 25 mg, 50 mg |
| Indications | Severe hypoglycemia due to insulinoma or hyperinsulinism  Hypertensive emergencies |
| Dose and Administration | **Severe hypoglycemia:**  **Adult:** 3-8 mg/kg/day in divided doses every 8 or 12 hours.  **Child:** 5-15 mg/kg/day in divided doses every 8 or 12 hours.  **Hypertensive emergencies:**  **Adult:** 1-3 mg/kg given intravenously over 30 minutes. Repeat as necessary. |
| Contraindications | Pheochromocytoma, hypersensitivity to diazoxide. |
| Drug interactions | Anticoagulants, beta-blockers |
| Side effects | Abdominal pain, albuminuria, reduced appetite (long-term use), Nausea, vomiting, hyperglycemia, fluid retention, hypokalemia, hypotension, arrhythmia, cardiomegaly, diabetic hyperosmolar coma, hypersensitivity reactions. |
| Cautions | Fluid retention and edema, heart failure, aortic stenosis, arteriovenous shunt, impaired cerebral circulation, electrolyte imbalance: hypotension, hyperuricemia, insulinoma, glucagonoma, hepatic impairment (cautious up titration should be done, if indicated), renal impairment (dose reduction) |
| Storage condition | Store below 300C. Protect from light. |
| **Glucagon** | |
| Pharmacological class | Hormone (Hyperglycaemic agent) |
| Dosage form | Injection:1mg/ml |
| Indications | Diabetic hypoglycemia, radiological examination of the gastrointestinal tract, diagnosis of pheochromocytoma |
| Dose and administration | **Severe hypoglycemia:**  **Adult and child over 8 years** (or body weight over 25 kg): 1 mg by SC, IM, or IV route.  **Child under 8 years** (or body weight under 25 kg): 500 µg, if no response within 10 minutes, IV glucose must be given.  **As diagnostic aid in GI examination:** Adult: 1-2 mg by IM or 0.2-2 mg by IV injection.  **Diagnosis of pheochromocytoma:** Adult: 1 mg IV |
| Contraindications | Hypersensitivity to the drug, pheochromocytoma or glucagon-secreting tumors, use in neonates or child |
| Drug interactions | Anticoagulants, beta-blockers, anticholinergics |
| Side effects | Nausea, vomiting, transient changes in blood pressure, tachycardia, severe allergic reactions |
| Cautions | Insulinoma, glucagonoma, pheochromocytoma, prolonged fasting or malnutrition, adrenal insufficiency, chronic hypoglycemia, alcohol-induced hypoglycemia, pregnancy, breastfeeding |
| Storage condition | Store in a refrigerator (2-8°C). Do not freeze. Protect from light. Once reconstituted, use immediately. |

## Medicines used for the disorders of the pituitary hormone system

Pituitary disorders can lead to significant hormonal imbalances, requiring specific treatments to manage these conditions. Bromocriptine and its alternative cabergoline are dopamine agonists used to treat conditions like prolactinomas, which are pituitary tumours that produce excess prolactin. These medications work by inhibiting prolactin secretion, thereby reducing tumour size and alleviating symptoms like galactorrhoea and infertility.

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| **Bromocriptine** | |
| Pharmacological class | Dopamine receptor agonist |
| Dosage form | Tablet: 2.5 mg  Capsule: 5 mg |
| Indications | Treatment of Parkinson’s disease, prevention of lactation, suppression of lactation, hypogonadism, galactorrhea, infertility, acromegaly, prolactinoma |
| Dose and Administration | **Parkinsonism:**  **Adult:** 1.25 mg twice daily, increased by 2.5 mg/day at 2-to-4-week intervals; usual dose range 30-90 mg/day in 3 divided doses.  **Prevention of lactation:**  **Adult:** Initially 2.5 mg daily for 1 day, then 2.5 mg twice daily for 14 days.  **Suppression of lactation:**  **Adult:** Initially 2.5 mg daily for 2-3 days, then 2.5 mg twice daily for 14 days.  **Hypogonadism / Galactorrhea / Infertility:**  **Adult:** Initially 1-1.25 mg daily at bedtime, increased gradually; usual dose 7.5 mg daily in divided doses, up to 30 mg daily if necessary.  **Acromegaly:**  **Adult:** Initially 1-1.25 mg daily at bedtime, increased to 5 mg every 6 hours, increased gradually.  **Child:**  Initial dose: 1.25 mg once daily with food.  Maintenance dose: Increase gradually by 1.25 mg to 2.5 mg every 3 to 7 days as tolerated. Typical maintenance dose ranges from 5 mg to 20 mg per day in divided doses.  **Prolactinoma:**  **Adult:** Initially 1-1.25 mg daily at bedtime, increased to 5 mg every 6 hours, increased gradually; up to 30 mg daily if necessary.  **Amenorrhea and infertility associated with hyperprolactinemia:**  Initial dose: 1.25 mg to 2.5 mg once daily with food.  Maintenance dose: Increase gradually by 2.5 mg every 3 to 7 days as tolerated. Typical maintenance dose ranges from 2.5 mg to 15 mg per day in divided doses.  **Child:**  **Hyperprolactinemia:**  Initial dose: 1.25 mg once daily with food.  Maintenance dose: Increase gradually by 1.25 mg to 2.5 mg every 3 to 7 days as tolerated. Typical maintenance dose ranges from 2.5 mg to 10 mg per day in divided doses. |
| Contraindications | Hypersensitivity to the drug or other ergot alkaloids, ischemic heart disease, toxemia of pregnancy, hypertension in postpartum women or puerperium. |
| Drug interactions | Azole antifungals, clarithromycin, erythromycin, protease inhibitors, antihypertensive agents, levodopa |
| Side effects | Nausea, constipation, headache, drowsiness, nasal congestion, vomiting, postural hypotension, fatigue, dizziness, dyskinesia, dry oral, leg cramps, constrictive pericarditis, pericardial effusion, pleural effusion, retroperitoneal fibrosis, hair loss, allergic skin reactions. |
| Cautions | Porphyria, hepatic impairment, cardiovascular disease, hypotension, serious mental disorders, Raynaud's syndrome |
| Storage condition | Store below 300C. Protect from light. |
| **Cabergoline** | |
| Pharmacological class | Dopamine receptor agonist |
| Dosage form | Tablet: 0.5 mg |
| Indications | Hyperprolactinemia (including prolactin-secreting adenomas and idiopathic or post-traumatic hyperprolactinemia), |
| Dose and administration | **Prevention of lactation:**  **Adult:** 1 mg as a single dose on the first day postpartum.  **Suppression of established lactation:**  **Adult:** 250 mcg every 12 hours for 2 days.  **Hyperprolactinemic disorders:**  **Adult:** Initially 500 mcg once weekly, increased in steps of 500 mcg every month until optimal therapeutic response is reached; usual dose 0.25-2 mg once weekly, maximum 4.5 mg per week. |
| Contraindications | Cardiac valvulopathy, history of pericardial fibrotic disorders, history of pulmonary fibrotic disorders, history of retroperitoneal fibrotic disorders, puerperal psychosis. |
| Drug interactions | Antipsychotics, macrolide antibiotics, antihypertensive agents, levodopa |
| Side effects | Nausea, vomiting, dizziness, headache, hypotension, angina pectoris, asthenia, cardiac valvulopathy, confusion, constipation, drowsiness, dyspepsia, dyspnea, gastritis, hallucinations, edema, pericardial effusion, pericarditis, sexual dysfunction, sleep disorders, vertigo. |
| Cautions | Cardiac valvulopathy (a history of valvular heart disease), fibrotic complications (e.g., pulmonary, retroperitoneal), orthostatic hypotension, psychiatric disorders (hallucinations and psychotic behaviours), hepatic impairment, peptic ulcers, raynaud’s syndrome, postpartum hypertension, pre-eclampsia, cardiovascular disease |
| Storage condition | Store below 300C. Protect from light. |

# Medicines Used for Reproductive Health and Perinatal Care

## Contraceptives

Contraceptives play a crucial role in reproductive health and perinatal care, providing individuals and couples with options to prevent unplanned pregnancies. Contraceptives provide protection against unintended pregnancies, which can have significant medical, social, and economic consequences. They encompass various methods, including oral hormonal contraceptives, injectable hormonal contraceptives, contraceptive devices and barriers, and implantable contraceptives. Choosing the right contraceptive method involves considering factors such as effectiveness, convenience, and individual preferences.

**Oral hormonal contraceptives**

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| **Ethinylestradiol + Levonorgestrel (D-Norgestrel)** | |
| Pharmacological class | Combined oral contraceptives |
| Dosage form | **Tablet**: 0.15mg + 0.03mg, 0.25mg + 0.05mg, 0.5mg + 0.05mg, 0.3mg + 0.03mg;  0.05mg + 0.03mg (6tablets)  0.075mg + 0.04mg (5tablets)  0.125mg + 0.03mg (10tablets) |
| Indications | Contraception, menstrual symptoms, endometriosis |
| Dose and Administration | **Contraception, oral (21-day regimen):**  1 tablet daily for 21 days, subsequent courses repeated after a 7-day interval (during which withdrawal bleeding occurs)  **Contraception, oral, everyday preparations**:  1 active tablet daily started on day 1 of the cycle, subsequent courses repeated without interval (withdrawal bleeding occurs when inactive tablets are being taken).  *Note: If a woman forgets to take a pill, she should take it as soon as she remembers, and take the next one at the normal time. If the delay with any pill is 24 hours or longer, the pill may not work. She should still continue taking the pill normally but be aware that she will not be protected for the next 7 days and must therefore either not has sex or use another method of contraception, such as a condom.* |
| Contraindications | Pregnancy, arterial thromboembolic disease, deep vein thrombosis or pulmonary embolism (DVT)/PE, thrombogenic valvular disease, migraine with typical focal aura, history of sub-acute bacterial endocarditis, ischemic cerebrovascular disease, liver tumors, or liver disease, history of haemolytic uremic syndrome, estrogen dependent neoplasms, neoplasms of breast or genital tract, undiagnosed abnormal vaginal/uterine bleeding, uncontrolled hypertension, acute viral hepatitis, or severe (decompensated) cirrhosis, diabetes mellitus and over age 35, diabetes mellitus with hypertension, cholestatic jaundice of pregnancy or jaundice with prior pill use. |
| Drug interactions | Rifampicin and rifabutin, ritonavir, tranexamic acid, artemether, betamethasone, bupropion, anti-epileptics, cyclosporine, darunavir, dexamethasone, isotretinoin, octreotide, St. John’s Wort, theophylline, diazepam, levothyroxine, prednisolone, selegiline, warfarin, erythromycin, clarithromycin, atorvastatin, lamotrigine, prednisolone |
| Side effects | Nausea, vomiting, headache/migraine, breast tenderness and hypertrophy, increase in body weight, thrombosis, changes in libido, mood changes including depression, acne, hypertension, impairment of liver function, “spotting” in early cycles, absence of withdrawal bleeding, irritation of contact lenses, photosensitivity reactions and hepatic tumors, vaginal candidiasis and edema. |
| Cautions | Venous thromboembolism, family history of breast cancer, arterial disease, migraine without focal aura, renal or hepatic impairment, hyperprolactinemia, hyperlipidemia, gallbladder disease, history of severe depression, long-term immobilization, sickle-cell disease, inflammatory bowel disease |
| Storage condition | Store below 30°C. |
| **Ethinylestradiol + Norethisterone** | |
| Pharmacological class | Combined oral contraceptives |
| Dosage form | Tablet: 35 mcg + 1 mg |
| Indications | contraception, menstrual symptoms, endometriosis |
| Dose and administration | **Contraception, oral (21-day regimen)**: 1 tablet daily for 21 days, subsequent courses repeated after a 7-day interval (during which withdrawal bleeding occurs)  **Contraception, oral, everyday preparations:** 1 active tablet daily started on day 1 of the cycle, subsequent courses repeated without interval (withdrawal bleeding occurs when inactive tablets are being taken). |
| Contraindications | Refer to ethinylestradiol + levonorgestrel (D-norgestrel) above |
| Drug interactions | Refer to ethinylestradiol + levonorgestrel (D-norgestrel) above |
| Side effects | Refer to ethinylestradiol + levonorgestrel (D-norgestrel) above |
| Cautions | Refer to ethinylestradiol + levonorgestrel (D-norgestrel) above |
| Storage condition | Store below 30°C. Protect from light and moisture. |
| **Leovonorgestrel (D-Nongestrel)** | |
| Pharmacological class | Progestogen-only oral contraceptive |
| Dosage form | Tablet: 0.75mg, 1.5mg  Tablet: 30 mcg |
| Indications | Emergency contraception, oral contraception |
| Dose and administration | **Emergency contraception**: 1.5 mg for 1 dose, taken as soon as possible after coitus, preferably within 12 hours and no later than after 72 hours (may also be used between 72–96 hours after coitus but efficacy decreases with time), alternatively 3 mg for 1 dose, taken as soon as possible after coitus, preferably within 12 hours and no later than after 72 hours.  (**Contraception (progestin only):** 30 mcg daily starting on day 1 of the cycle then continuously, dose is to be taken at the same time each day. |
| Contraindications | Known or suspected pregnancy, presence or history of severe hepatic disease, presence or history of liver tumors (benign or malignant), known or suspected sex- steroid influenced malignancies (e.g. current or history of breast cancer), undiagnosed abnormal vaginal bleeding, severe diabetes with vascular changes, hypersensitivity to the active substance or to any of the excipients. |
| Drug interactions | Rifampicin and rifabutin, ritonavir, tranexamic acid, artemether, betamethasone, bupropion, anti-epileptics, cyclosporine, darunavir, dexamethasone, isotretinoin, ocreotide, St. John’s Wort, theophylline, diazepam, levothyroxine, prednisolone, selegiline, warfarin, erythromycin, Clarithromycin, atorvastatin, lamotrigine, prednisolone |
| Side effects | Uterine/vaginal bleeding including spotting, menorrhagia and/or metrorrhagia and amenorrhea, nausea, vomiting, headache, dizziness, breast discomfort, depression, skin disorders, disturbances of appetite, weight increase, change in libido, |
| Cautions | Migraines headaches or severe headaches, vision, hearing, or perceptual disturbances, phrombophlebitis or thromboembolic symptoms, major surgery or prolonged immobilization, jaundice, hepatitis, or whole-body itching, multiple risk factors for cardiovascular disease. |
| Storage condition | Store below 30° C. Protect from light. |
| **Norethindrone** | |
| Pharmacological class | Progestogen-only oral contraceptive |
| Dosage form | Tablet: 0.35mg; |
| Indications | Contraception, amenorrhea or uterine bleeding, endometriosis |
| Dose and administration | **Adult:**  **Contraception**: oral  0.35mg daily, dose to be taken at same time each day, starting on day 1 of cycle then continuously.  **Endometriosis**:  Ora: 10–15 mg daily for 4–6 months or longer, to be started on day 5 of cycle; increased to 20–25 mg daily if required, dose only increased if spotting occurs and reduced once bleeding has stopped  **Amenorrhea or uterine bleeding:**  Oral: 2.5–10 mg daily for 5–10 days. |
| Contraindications | Hypersensitivity to the drug, known or suspected pregnancy, known or suspected carcinoma of the breast, undiagnosed abnormal genital bleeding, benign or malignant liver tumors and acute liver disease |
| Drug interactions | Anticonvulsants such as phenytoin, carbamazepine, and barbiturates, rifampin, griseofulvin, modafinil, ritonavir, St. John's wort, nelfinavir, nevirapine |
| Side effects | Edema, weakness, anorexia, amenorrhea, change in menstrual flow, Spotting, headaches, tender breasts, nausea and dizziness, dizziness, headache, nervousness, somnolence, galactorrhea, abdominal pain, nausea, vomiting, cholestatic jaundice, acne, hirsutism, and weight gain. |
| Cautions | Family history of breast cancer and or DVT/PE, current/history of depression, endometriosis, diabetic mellitus, hypertension, bone mineral density changes, renal/hepatic impairment, systemic lupus errythromatos (SLE); ectopic pregnancy. Cigarette smoking, migraine, proptosis, diplopia, or other visual disturbances. |
| Storage condition | Store below30oC. |

**Injectable Hormonal contraceptives**

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| **Estradiol cypionate + medroxyprogesterone acetate** | |
| Pharmacological class | Injectable combined hormonal contraceptive |
| Dosage form | Injection: 5 mg + 25 mg. |
| Indications | Contraception |
| Dose and Administration | Administered once at 28-day intervals |
| Contraindications | Undiagnosed abnormal genital bleeding, known, suspected, or history of breast cancer, known or suspected estrogen- or progesterone-dependent neoplasia, active DVT, PE, active arterial thromboembolic disease (e.g., stroke, myocardial infraction), known anaphylactic reaction or angioedema, known or suspected pregnancy |
| Drug interactions | Rifampin/rifabutin, anticonvulsants, griseofulvin, nevirapine, St john’s wart, mifepristone, ritonavir, saquinavir, voriconazole, warfarin, levothyroxine, corticosteroids and theophylline. |
| Side effects | Menstrual irregularities (irregular, increase, decrease, spotting), headache, increased weight, amenorrhea, injection site reactions, vaginal candidiasis, abdominal pain, urinary tract infections, acne, depression, decreased libido, nausea, back pain, breast pain/tenderness, fatigue, anxiety, irritability, dizziness |
| Cautions | History of DVT, cardio vascular diseases (CVDs), liver diseases, breast and reproductive cancers, migraine, diabetes, gallbladder disease, renal impairment, hypertension, smoking, visual disturbances |
| Storage condition | Store between 20oC and 30oC. Protect from light. |
| **Medroxyprogesterone acetate (provera)** | |
| Pharmacological class | Injectable hormonal contraceptive |
| Dosage form | Injection (IM): 150mg/ml in 1ml vial  Injection (SC): 104mg/ml in 1ml vial |
| Indications | Contraception, long acting |
| Dose and administration | **Deep IM injection**, 150 mg within the first 7 days of cycle or within the first 5 days after parturition (delay until 6 weeks after parturition if breastfeeding), repeated every 3 months.  **SC injection**: 104 mg every 3 months), repeated every 3 months. |
| Contraindications | Pregnancy, known, suspected, or history of breast cancer, undiagnosed vaginal bleeding, known or suspected estrogen or progesterone-dependent neoplasia, active liver disease, severe arterial disease, active DVT, PE, active arterial thromboembolic disease (eg, stroke, MI) and known anaphylactic reaction or angioedema. |
| Drug interactions | Tranexamic acid, azole antifungals, macrolides, anti-epileptics, protease inhibitors and non-nucleoside reverse transcriptase inhibitors, dexamethasone, griseofulvin, isotretinoin, prednisolone, rifampicin, rifabutin, and St. John’s Wort. |
| Side effects | Menstrual irregularities, delayed return to fertility, reduction in bone mineral density, weight gain, depression, anaphylaxis, injection-site reactions, acne, abdominal pain, headache and nervousness. |
| Cautions | Liver disease, thromboembolic or coronary vascular disease, diabetes mellitus, asthma, hypertension, renal disease, epilepsy, migraine, porphyria, systemic lupus erythematosus, and hepatic hemangiomas. |
| Storage condition | Store between 20oC and 30oC. Protect from light. |
| **Norethisterone enantate** | |
| Pharmacological class | Progestin only contraceptive |
| Dosage form | Oily solution: 200 mg/ml in 1 ml ampoule. |
| Indications | Contraception, long acting |
| Dose and administration | **Deep intramuscular injection (into the gluteal muscle**): 200 mg within 5 days of cycle or immediately after parturition; repeated after 2 months. If interval between injections is greater than 2 months and 14 days, exclude pregnancy before next injection. |
| Contraindications | Hypersensitivity to the drug, pregnancy; breast or endometrial cancer, severe liver disease (Dubin-Johnson or Rotor’s syndromes); history of jaundice, active thromboembolic disease, severe diabetes with vascular changes, undiagnosed vaginal bleeding, porphyria, hepatitis. |
| Drug interactions | Tranexamic acid, azole antifungals, macrolides, anti-epileptics, protease inhibitors and non-nucleoside reverse transcriptase inhibitors, dexamethasone, griseofulvin, isotretinoin, prednisolone, rifampicin, rifabutin, and St. John’s Wort. |
| Side effects | Uterine / vaginal bleeding including spotting, amenorrhoea (short lasting), hypersensitivity reaction, dizziness, headache, weight gain, skin disorder, nausea and injection site reaction. |
| Cautions | History of ectopic pregnancy, tobacco smoking, migraine, liver dysfunction, diabetes mellitus, history of depression, cardiac and renal disease, interactions, vaginal bleeding, blood clots, seizures and unilateral fallopian tube. |
| Storage condition | Store between 20 to 30 0C, protect from light. |

**Contraceptive devices and barriers**

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| **Male Condoms** | |
| Pharmacological class | Barrier Contraceptive |
| Dosage form | - |
| Indications | To prevent pregnancy at times when oral contraceptives or intrauterine devices may not be effective or are contraindicated or as an adjuvant to the periodic abstinence (rhythm) method of contraception and for prevention of sexually transmitted infections (STIs). |
| Dose and Administration | * Make sure the penis is fully erect. * Open the packet carefully so you do not damage the condom. * Hold the tip of the condom to squeeze out any air. * Roll the condom all the way down to the base of the penis. * Keep the condom on until you finish having sex |
| Contraindications | Sensitivity to latex condom |
| Drug interactions | Oil based lubricants such as petroleum jelly, baby oil and certain lotions can degrade latex condoms |
| Side effects | Burning, stinging, warmth, itching, other irritation of the skin, penis, rectum or contact dermatitis. |
| Cautions | Breakage |
| Storage condition | Store below 30OC. protect from light. |
| **Female condom** | |
| Pharmacological class | Barrier Contraceptive |
| Dosage form | - |
| Indication | To prevent pregnancy and STIs (including HIV) during vaginal intercourse for women whose partners don't use latex male condom. |
| Dose and administration | * Hold the inner ring and insert the condom into the vagina. * Put a finger into the condom and push it as far into the vagina as possible. Make sure the outer ring stays outside the vagina. * During sex, make sure the penis goes inside the condom. * After sex, twist the outer ring a few times to prevent semen leaking out when you remove the condom. |
| Contraindication | Can't be used with diaphragms, cervical caps or sponges. |
| Drug interactions | There is no significant interaction. |
| Side effects | Burning, stinging, warmth, itching, other irritation of the skin, rectum, or vagina, vaginal dryness or malodor, allergic vaginitis and contact dermatitis. |
| Caution | Persons must be sufficiently counselled regarding the need for consistent and correct use of condoms if they are to be effective in preventing pregnancy. Condoms should be completely unrolled into the vagina before any genital contact occurs and remain intact throughout intercourse |
| Storage condition | Store below 30OC. Protect from light. |
| **Levonorgestrel-releasing intrauterine system** | |
| Pharmacological class | Progestin based contraceptive with device |
| Dosage form | Intrauterine with reservoir containing 52mg of levonorestrel |
| Indications | Contraception |
| Dose and administration | **Contraception**: To be inserted into uterine cavity, within 7 days of onset of menstruation or immediately after 1st trimester abortion. If insertion occurs >7 days after menstrual bleeding has started, a barrier method of contraception must be used for 7 days unless the patient abstains from sexual intercourse. It releases 20 micrograms of levonorgestrel/day over 5 years. May be removed and replaced with a new unit at any time during menstrual cycle. |
| Contraindications | Pregnancy, active/history of pelvic inflammatory disease (PID), uterine anomalies or fibroids, abnormal uterine bleeding of unknown cause, cervitis, vaginitis, known breast cancer, active viral hepatitis, severe liver disease, liver tumors. |
| Drug interactions | Tranexamic acid, azole antifungals, macrolides, anti-epileptics, protease inhibitors and non-nucleoside reverse transcriptase inhibitors, dexamethasone, griseofulvin, isotretinoin, prednisolone, rifampicin, rifabutin, and St. John’s Wort. |
| Side effects | Menstrual irregularities, headache, dizziness, lower abdominal pain, weight gain, acne, nausea, mood changes, breast tenderness, and loss of libido. Uterine perforation during insertion |
| Cautions | History of thromboembolism, migraine without aura, depression, gallbladder disease, diabetes mellitus, elevated cholesterol or triglycerides, breast nodules, breastfeeding (until weaning or for the first and less 6 months after birth), Infections, pain or cramping |
| Storage condition | Store below 30OC. Protect from light and moisture. |
| **Copper T380A** | |
| Pharmacological class | Intrauterine device (IUD), non-hormonal contraceptive |
| Dosage form | - |
| Indications | For prevention of pregnancy |
| Dose and administration | The device is inserted into the uterine cavity via the cervical canal. Provides contraception for up to 10 years |
| Contraindications | Pregnancy, active pelvic inflammatory disease (PID), postpartum endometritis or infected abortion in the past 3 months, known or suspected uterine or cervical cancer, unexplained vaginal bleeding, uterine abnormalities (e.g., fibroids) that distort the uterine cavity, wilson's disease or copper allergy, active sexually transmitted infections (STIs) such as mucopurulent cervicitis |
| Drug interactions | There are no known drug interactions |
| Side effects | Uterine or cervical perforation, displacement, pelvic infection may be exacerbated, some pain on insertion, occasional bleeding, seizures and vasovagal attack, lower abdominal pain, anaemia, back pain; device complications; menstrual cycle irregularities; pelvic inflammatory disease, uterine injuries and allergy. |
| Cautions | Anemia, heavy menses, history of PID, diabetes, valvular heart disease, endometriosis, epilepsy, severe primary dysmenorrhoea |
| Storage condition | Store below 30OC. Protect from light. |

**Implantable contraceptives**

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| **Etonogestrel-releasing implant** | |
| Pharmacological class | Progestin-only contraceptive |
| Dosage form | Single-rod shaped etonogestrel-releasing implant; containing 68 mg of etonogestrel. |
| Indications | Contraception (long term) |
| Dose and Administration | **Subdermal implantation**: 1 implant inserted during first 5 days of cycle. It must be removed no later than by the end of the third year. |
| Contraindications | Pregnancy, thromboembolic disorders, unexplained vaginal bleeding, breast cancer, active viral hepatitis, severe liver disease, liver tumors, Allergic reaction to any of the components |
| Drug interactions | Barbiturates, azole antifungals, carbamazepine, phenytoin, primidone, rifampicin, ritonavir, efavirenz, nevirapine felbamate, griseofulvin, oxcarbazepine, topiramate, St. John's Wort, clarithromycin, erythromycin and diltiazem. |
| Side effects | Amenorrhea, oligomenorrhea, dysmenorrhea, headache, vaginitis, weight gain, acne, breast pain, abdominal pain, upper respiratory tract infection, leucorrhea, depression, seizure, nervousness and pharyngitis. |
| Cautions | History of DVT/PE, current/history of depression, endometriosis, DM, HTN, bone mineral density changes, renal/hepatic impairment, SLE, migraine, asthma, epilepsy, ectopic pregnancy and thrombotic and other vascular events. |
| Storage condition | Store below 30OC. Protect from light. Do not freeze |
| **Levonorgestrel-releasing implant** | |
| Pharmacological class | Progestin-only contraceptive (long term) |
| Dosage form | Two-rod levonorgestrel-releasing implant; each rod containing 75 mg of levonorgestrel (150 mg total). |
| Indications | Long-term contraception, for up to 5 years |
| Dose and administration | Insert 2 implants of 75 mg each; insert in non-dominant upper arm 6–8 cm above the elbow within the first 7 days of the menstrual cycle or immediately following first- or second-trimester abortion or delivery, use additional non-hormonal contraception if inserted at other time during menstrual cycle or later than 21 days after delivery |
| Contraindications | Known or suspected pregnancy, current or past history of thromboembolic disorders, liver tumors, benign or malignant, or active liver disease, undiagnosed abnormal genital bleeding, Known or suspected breast cancer or other progestin-sensitive cancer, Allergic reaction to any components of the implant |
| Drug interactions | Barbiturates, bosentan, carbamazepine, phenytoin, primidone, rifampicin, and HIV/HCV medication like ritonavir, efavirenz, boceprevir, nevirapine and possibly also felbamate, griseofulvin, oxcarbazepine, topiramate and products containing the herbal remedy St. John's Wort, ketoconazole, itraconazole, clarithromycin) or moderate (e.g. fluconazole, diltiazem, erythromycin |
| Side effects | Irregular menstrual bleeding or spotting, Amenorrhea (absence of menstruation), Headache, Weight gain, Breast tenderness, Acne, whitish discharge from the vagina, whitish discharge from the vagina (leukorrhea) |
| Cautions | History of thromboembolism, elevated blood pressure, depression, gallbladder disease, diabetes mellitus, elevated cholesterol or triglycerides, breast nodules, breastfeeding (until weaning or for the frst and less 6 months after birth), decreased bone density, breastfeeding, insertion and removal complications (pain, edema, bruising scarring and infection), ectopic pregnancies |
| Storage condition | Store at between 15°C and 30°C |

## Ovulation inducers

Ovulation inducers are medications used to stimulate ovulation in women with ovulatory dysfunction or infertility issues. These medications are commonly prescribed as part of fertility treatments to help regulate ovulation and improve the chances of achieving pregnancy. These medication acts as an anti-estrogen by binding to estrogen receptors in the hypothalamus, thereby blocking the negative feedback effect of estrogen on the release of gonadotropin-releasing hormone (GnRH); which in turn stimulates the pituitary gland to produce more follicle-stimulating hormone (FSH) and luteinizing hormone (LH). This increased hormonal activity triggers the ovaries to mature and release eggs. Two primary ovulation inducers include clomiphene citrate and letrozole.

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| **Clomifene citrate** | |
| Pharmacological class | Ovulatory stimulant, selective estrogen receptor modulator |
| Dosage form | Tablet : 50mg |
| Indications | Anovulatory infertility or ovulatory failure |
| Dose and Administration | 50 mg once daily for 5 days, to be started at any time if no recent uterine bleeding or on or around the 5th day of cycle if progestogen-induced bleeding is planned or if spontaneous uterine bleeding occurs, then 100 mg once daily if required for 5 days, this second course to be given at least 30 days after the first course, only in the absence of ovulation. |
| Contraindications | Hepatic disease, ovarian cysts, hormone dependent tumors or uterine bleeding of undetermined cause, pregnancy, visual disorders |
| Drug interactions | Estrogenic agents, rifampicin, phenytoin, phenobarbital, tamoxifen, raloxifene |
| Side effects | Abdominal distension, breast tenderness, mood alterations, nausea, visual disturbances (discontinue and initiate ophthalmological examination), angioedema, cataract, cerebral thrombosis, depression, disorientation, fatigue, headache, hot flush, hypertriglyceridemia, insomnia, jaundice cholestatic, menstrual cycle irregularities, neoplasms, nervous system disorders, optic neuritis, ovarian and fallopian tube disorders, palpitations, pancreatitis, psychosis, seizure, skin reactions, stroke, syncope, tachycardia, uterine disorders, vertigo, vomiting |
| Cautions | Ectopic pregnancy, ovarian hyperstimulation syndrome, polycystic ovary syndrome, uterine fibroid, breastfeeding |
| Storage condition | Store below 30° C. |
| **Letrozole** | |
| Pharmacological class | Ovulatory stimulant, aromatase inhibitor |
| Dosage form | Tablet : 2.5mg |
| Indications | Ovulation induction in anovulatory females with polycystic ovary syndrome |
| Dose and administration | Oral: 2.5 mg – 5 mg daily for 5 days |
| Contraindications | Pregnancy, lactation, known hypersensitivity to letrozole |
| Drug interactions | Ceritinib, clarithromycin, methadone, Estrogen-containing medications, Tamoxifen |
| Side effects | Edema, sweating, hot flashes, arthralgia, hypercholesterolemia, constipation, diarrhea, loss of appetite, nausea, vomiting, asthenia, dizziness, headache, insomnia, somnolence, dyspnea, fatigue, heart failure, MI, pancytopenia, thromboembolic disorder, decreased bone density, bone fracture, pleural effusion, pulmonary embolism |
| Cautions | Hypercholesterolemia, cirrhosis, severe hepatic impairment, and osteoporosis |
| Storage condition | Store between 20°C and 30°C. |

## Uterotonics

Uterotonics are a class of medications used to induce or augment uterine contractions. They are commonly used in obstetrics and gynaecology for various purposes, including induction or augmentation of labor, prevention and treatment of postpartum hemorrhage, and management of incomplete abortion. The most common uterotonic agents include oxytocin, ergometrine, and prostaglandins (such as misoprostol), which work by stimulating the smooth muscle cells in the uterus, leading to increased frequency and intensity of contractions.

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| **Carbetocin** | |
| Pharmacological class | Uterotonic agent (long-acting oxytocin analog) |
| Dosage form | Injection (heat stable): 100 mcg/ml |
| Indications | Prevention of uterine atony and postpartum hemorrhage after caesarean section |
| Dose and Administration | **Prevention of uterine atony after caesarean section**, **slow IV injection**: 100 mcg for 1 dose, to be given over 1 minute; administer as soon as possible after delivery, preferably before removal of placenta.  *Note: carbetocin is intended for single use only and no further doses should be administered.* |
| Contraindications | Hypersensitivity to the drug, eclampsia/epilepsy, pre-eclampsia, hepatic impairment, renal impairment |
| Drug interactions | Alfuzosin, barbiturates, antihypertensive agents, carboprost, tromethamine, dinoprostone, duloxetine, misoprostol, nitroprusside, sildenafl, epoprostenol, sympathomimetics |
| Side effects | Chest pain, chills, dizziness, dyspnea, feeling hot, flushing, headache, hypotension, nausea, pain, pruritus, taste metallic, tremor, vomiting, Hyperhidrosis, tachycardia, hypertension, anaphylaxis, uterine hyperstimulation, uterine rupture. |
| Cautions | Asthma, cardiovascular diseases, hyponatremia, migraine. |
| Storage condition | Store below 30°C. |
| **Ergometrine** | |
| Pharmacological class | Uterotonic agent |
| Dosage form | Injection : 0.2mg/ml |
| Indications | Prevention and treatment of postpartum hemorrhage, excessive uterine bleeding |
| Dose and administration | **Prevention and treatment of postpartum hemorrhage (PPH), IM injection**: 200 mcg when the anterior shoulder is delivered or immediately after birth  **Excessive uterine bleeding, by slow IV injection**: 250–500 mcg when the anterior shoulder is delivered or immediately after birth |
| Contraindications | Vascular disease, severe cardiac disease especially angina pectoris, severe hypertension, severe renal and hepatic impairment, sepsis, eclampsia, any suspicion of retained placenta, severe or persistent sepsis, first and second stages of labor |
| Drug interactions | Sympathomimetics, beta-blockers, methoxamine, ketamine, macrolides, protease inhibitors, anti-epileptics, antifungals (azoles), dronedarone, diltiazem, verapamil, sumatriptan, rifampicin, bromocriptine, efavirenz, nevirapine, imatinib, St. John’s Wort, grape juice, lamivudine, abacavir, nitroglycerine |
| Side effects | Nausea, vomiting, headache, dizziness, tinnitus, abdominal pain, chest pain, palpitations, dyspnea, bradycardia, transient hypertension, vasoconstriction, stroke, MI and pulmonary edema. |
| Cautions | Hepatic impairment, renal impairment, multiple pregnancy, porphyria, hypercholesterolemia, osteoporosis, angina or myocardial infarction calcium deficiency, convulsions and gangrene. |
| Storage condition | Store below between 2-8°C. Protect from light. |
| **Misoprostol** |
| Pharmacological class | Urotonic agent, Synthetic prostaglandin E1 analogue |
| Dosage form | Vaginal Tablet : 0.025mg |  |
| Indications | Cervical ripening and labor induction |
| Dose and administration | **Induction of labor**: Initially 25 mcg vaginally, repeated after 6 hours if necessary; if still no response, increase to 50 mcg every 6 hours for up to 4 doses |
| Contraindications | Placenta praevia or unexplained vaginal bleeding during pregnancy, ruptured membranes, major cephalo-pelvic disproportion or fetal malpresentation, history of caesarean section or major uterine surgery, untreated pelvic infection, fetal distress, grand multiparas and multiple pregnancy, history of difficult or traumatic delivery. |
| Drug interactions | Magnesium-containing antacids, oxytocic agents, NSAIDs |
| Side effects | Chills, constipation, diarrhea, dizziness, fever, flatulence, gastrointestinal discomfort, headache, nausea, skin reactions, vomiting, hemorrhage, menstrual cycle irregularities, postmenopausal hemorrhage, uterine cramp |
| Cautions | Hypotension, active pelvic infection |
| Storage condition | Store below 30°C. |
| **Misoprostol + Mifepristone** | |
| Pharmacological class | Prostaglandin E1 analog + antiprogestogen |
| Dosage form | Tablet : 200mcg + 200mg |
| Indications | Medical termination of intrauterine pregnancy of up to 63 days gestation, |
| Dose and administration | Oral: Mifepristone 200 mg as a single dose, followed 24–48 hours later (unless abortion already complete) by misoprostol 800 mcg orally, buccally, or vaginally. |
| Contraindications | Uncontrolled severe asthma, suspected ectopic pregnancy (use other specific means of termination), chronic adrenal failure, porphyria. |
| Drug interactions | Magnesium-containing antacids, NSAIDs, alprazolam, amiodarone, amlodipine, anticoagulants (e.g., warfarin), aprepitant, aripiprazole, artemether lumefantrine, atorvastatin, bromocriptine, corticosteroids, hormonal contraceptives, ketamine, midazolam, nimodipine, oxytocin, salmetrol, quetiapine, quinidine, grapefruit juice |
| Side effects | Nausea, vomiting, GI cramps, uterine contractions, vaginal bleeding, pain, dizziness, diarrhea, fever, weakness, chills, hypersensitivity reactions including rash, urticaria, and facial oedema, septic shock, infection, breast tenderness, endometritis. |
| Cautions | Asthma, hemorrhagic disorders and anticoagulant therapy, prosthetic heart valve or history of endocarditis, smokers aged over 35 years, adrenal suppression, hepatic or renal impairment, breastfeeding. |
| Storage condition | Store between 20°C and 30°C. |
| **Oxytocin** | |
| Pharmacological class | Uterotonic Agent |
| Dosage form | Injection : 10unit/ml |
| Indications | Induction of labor, prevention and treatment of postpartum hemorrhage (PPH) |
| Dose and administration | **Induction of labor**, **by IV infusion**: Low dose regimen  **For primigravida:**  5 units in 1000ml N/S to run at 20drops/min (2mU/min), double the drop every 20 minutes until adequate contraction is achieved to maximum of 80 drops/minute, if adequate contraction could not be achieved with the maximum dose add 5 units to the same bag and start the drop from 40/minute, if there is no adequate contraction with this dose add 5 units more to the same bag to a maximum dosage of 64mU/min.  **For Multigravida:** Use half of the dose for primigravida women.  High dose regimen:  Start with 6mU/min and increase the dosage by 6mU/min every 15 minutes until adequate contraction is achieved to maximum of 64mU/min for primigravida and 32mU/min for multigravida.  **Prevention of PPH, by IM injection**: 10 IU when the anterior shoulder is delivered or immediately after birth  **Prevention of PPH, by slow IV injection**: 5 IU when the anterior shoulder is delivered or immediately after birth  **Treatment of PPH**: By slow IV injection 5–10 IU, or by IM injection 10 IU, followed in severe cases by a total of 40 IU by IV infusion, at a rate of 0.02–0.04 IU/min, which should be started after the placenta is delivered |
| Contraindications | Hypersensitivity to the drug, hypertonic uterine contractions, mechanical obstruction to delivery, fetal distress, oxytocin-resistant uterine inertia, severe preeclampsia toxemia, or severe cardiovascular disease, major cephalopelvic disproportion |
| Drug interactions | Dinoprostone, sympathomimetics, ephedrine (nasal and systemic), carboprost tromethamine, misoprostol, succinylcholine. |
| Side effects | Uterine spasm, and uterine hyperstimulation, may cause fetal distress, asphyxia and death, hypertonicity, tetanic contractions, soft tissue damage, or uterine rupture, water intoxication and hyponatremia, nausea, vomiting, arrhythmias, rash and anaphylactoid reactions |
| Cautions | Pregnancy associated hypertension or cardiac disease, age over 35 years, history of low-uterine segment caesarean section, fetal death or meconium-stained amniotic fluid, water intoxication, hyponatremia, caudal block anesthesia |
| Storage condition | Store between 2°C and 8°C. Do not freeze |

## Antioxytocics (Tocolytics)

Antioxytocics, or tocolytics, are medications used to delay premature labor and prevent preterm birth by inhibiting uterine contractions. They target various pathways involved in uterine contraction, including calcium channels, prostaglandins, and oxytocin receptors. By interfering with these different mechanisms, they help to relax the uterine muscle and delay the onset of preterm labor, providing valuable time for the fetus to mature and potentially improve outcomes. Because tocolytic therapy is generally effective for up to 48 hours, only women with fetuses that would benefit from a 48-hour delay in delivery should receive tocolytic treatment

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| **Nifedipine** | |
| Pharmacological class | Calcium channel blocker, tocolytic |
| Dosage form | Tablet : 10mg |
| Indications | To prevent preterm labor and delay delivery |
| Dose and Administration | **Immediate release:** Initial dose of 20-30mg, followed by three further doses of 20mg every 30 minutes if contractions continue. Maintenance dose is 20-40mg orally four hourly for 48 hours (no more than 180mg/24 hours) |
| Contraindications | Refer to nifedipine under antihypertensive medicines |
| Drug interactions | Refer to nifedipine under antihypertensive medicines |
| Side effects | Refer to nifedipine under antihypertensive medicines |
| Cautions | Refer to nifedipine under antihypertensive medicines |
| Storage condition | Store between 20°C and 30°C. Protect from moisture and light. |

## Other medicines administered to the mother

Different drugs are administered to the pregnant mother including antifibrinolytic agent, opioid analgesic, corticosteroids, prostaglandins and topical estrogen replacement in addition to the conventional agents. Antifibrinolytic agent used to control and prevent postpartum hemorrhage by inhibiting the breakdown of blood clots. An opioid analgesic used to provide pain relief during labor and delivery. In addition, prostaglandin is used for cervical ripening and induction of labor, particularly in cases of post-term pregnancy or when labor is not progressing naturally. Corticosteroids administered to pregnant women at risk of preterm birth to accelerate fetal lung maturation and reduce the risk of respiratory distress syndrome in the newborn. Furthermore, a topical estrogen replacement therapy used to treat vaginal atrophy and dryness, a common issue in postmenopausal women, including those who have recently given birth.

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| **Betamethasone** | |
| Pharmacological class | corticosteroid |
| Dosage form | Injectable suspension: 4mg/ml |
| Indications | Reduction of neonatal morbidity and mortality from preterm delivery to accelerate fetal lung maturation |
| Dose and Administration | **IM**: 12 mg every 24 hours for 2 doses, usually administered between 24 and 34 weeks of gestation |
| Contraindications | Hypersensitivity to the drug, systemic fungal infections, |
| Drug interactions | NSAIDs, warfarin, artemether, desmopressin, disulfram, praziquantel, live/attenuated vaccines (e.g. rotavirus vaccine, amiodarone, dronedarone, enoxacin, fentanyl, flumequine, nifedipine, fluroquinolones, pancuronium, phenobarbital and vecuronium. |
| Side effects | Body fluid retention, hyperglycemia, weight gain, mood swings, insomnia, infections, adrenal suppression. |
| Cautions | Cerebral malaria, cirrhosis, concomitant use with live vaccines, GI disorders, hypertension, myasthenia gravis, renal insufficiency, tuberclusosis (TB), peptic ulcer disease (PUD), infections, latent or active amoebiasis, premature rupture of membranes. |
| Storage condition | Store below 300C. |
| **Dexamethasone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection: 4mg/ml in 1 ml or 2 ml ampule |
| Indications | Reduction of neonatal morbidity and mortality from preterm delivery to accelerate fetal lung maturation between 24 and 34 weeks of gestation. |
| Dose and administration | IM: 6 mg every 12 hours for 4 doses (total 24 mg); first dose may be administered even if ability to give second dose is unlikely based on clinical scenario |
| Contraindications | Hypersensitivity to the drug, sulphites, systemic fungal infections |
| Drug interactions | Refer to betamethasone above |
| Side effects | Refer to betamethasone above |
| Cautions | Refer to betamethasone above |
| Storage condition | Store below 30 0C. |
| **Dinoprostone (Prostaglandin E2)** | |
| Pharmacological class | Prostaglandin, oxytocic agent |
| Dosage form | Vaginal tablet: 3mg |
| Indications | Cervical ripening and induction of labor at term |
| Dose and administration | Insert 3 mg of tablet high into posterior fornix of the vagina followed by 3 mg after 6–8 hours if labor is not established; maximum 6 mg/24 hours. |
| Contraindications | Hypersensitivity to the drug or other prostaglandin analogue, fetal distress, unexplained vaginal bleeding during this pregnancy, acute pelvic inflammatory disease, uterine fibroids, cervical stenosis, history of cesarean section or major uterine surgery, cephalopelvic disproportion, foetal malpresentation is present, fetal distress, placenta praevia, unexplained vaginal bleeding. |
| Drug interactions | Oxytocin, ergometrine, ephedrine, carbetocin, carboprost tromethamine, NSAIDs |
| Side effects | Vomiting, diarrhea, nausea, fever, headache, bradycardia, back pain, bronchospasm, cardiac arrhythmia, chills, cough, dizziness, dyspnea, flushing, hot flushes, hypotension, shivering, syncope, tightness of the chest, vasomotor and vasovagal reactions, wheezing, uterine rupture, fetal distress |
| Cautions | Cervicitis, infected endocervical lesions, acute vaginitis, compromised (scarred) uterus or asthma, glaucoma, hypertension or hypotension, epilepsy, diabetes mellitus, anemia, jaundice, cardiovascular, renal, or hepatic disease. |
| Storage condition | Store in a refrigerator at 2 to 8 0C. |
| **Estradiol** | |
| Pharmacological class | Estrogen analogue |
| Dosage form | Vaginal cream: 0.01% |
| Indications | Atrophic vaginitis, atrophic urethritis, moderate to severe dyspareunia |
| Dose and administration | Intravaginal using applicator: 2 to 4 grams daily for 1 to 2 weeks, then 1 to 3 grams 1 to 3 times per week. |
| Contraindications | Hypersensitivity to the drug, undiagnosed abnormal genital bleeding, known estrogen dependent neoplasia, history of VTE/thromboembolic diseases, liver dysfunction, pregnancy |
| Drug interactions | Warfarin, ketoconazole, erythromycin, rifampin, carbamazepine, levothyroxine |
| Side effects | Nausea/vomiting, breast tenderness, headache, sodium and water retention with edema, vaginal discharge, localized irritation |
| Cautions | History of thromboembolic disorders, risk of estrogen dependent tumors, hypertension, liver disorders, migraine |
| Storage condition | Store below 30˚C. Do not freeze. |
| **Magnesium sulphate** | |
| Pharmacological class | Mineral |
| Dosage form | Injection : 50% in 20ml |
| Indications | Prevention and treatment of recurrent seizures in eclampsia; prevention of eclampsia in patients with severe pre-eclampsia |
| Dose and administration | IV injection: Initially 4 g over 5–15 minutes followed either by IV infusion 1 g/hour for at least 24 hours after the last seizure or delivery (whichever occurs later) or  Deep IM injection: 5 g into each buttock, then 5 g every 4 hours into alternate buttocks for at least 24 hours after the last seizure or delivery (whichever occurs later); recurrence of seizures may require an additional IV injection of 2 g (4 g if body weight over 70 kg). |
| Contraindications | Hypersensitivity to the drug, myocardial damage, diabetic coma, heart block, hypermagnesemia, hypercalcemia, myasthenia gravis and severely impaired renal function |
| Drug interactions | Alcuronium, nifedipine, suxamethonium, vecuronium, respiratory depressants |
| Side effects | Nausea, vomiting, thirst, flushing of skin, hypotension, arrhythmias, coma, respiratory depression, drowsiness, confusion, loss of tendon reflexes and muscle weakness |
| Cautions | Myasthenia gravis, hepatic impairment, renal impairment |
| Storage condition | Store below 30˚C. Do not freeze. |
| **Pethidine hydrochloride** | |
| Pharmacological class | Opioid analgesic |
| Dosage form | Injection: 50mg/ml in 1 ml and 2 ml ampule |
| Indications | Obstetric analgesia during labor |
| Dose and administration | 50-100 mg IM/SC when contractions become regular, repeated q1-3hr PRN maximum 400 mg per day |
| Contraindications | Hypersensitivity to the drug, acute or severe bronchial asthma, significant respiratory depression, known or suspected gastrointestinal obstruction (paralytic ileus), severe hepatic impairment |
| Drug interactions | Serotonergic drugs (e.g., linezolid), olanzapine, phenelzine, procarbazine, selegiline, amitriptyline, amoxapine, benzhydrocodone/acetaminophen, buprenorphine, buspirone, calcium/magnesium/potassium/sodium oxybates cimetidine, citalopram, clomipramine, clonidine, fentanyl, fluoxetine, imipramine, paroxetine, sertraline, St John's Wort |
| Side effects | Agitation, angina, bradycardia, cardiac arrest, coma, constipation, dizziness, dry oral, dysphoria, euphoria, faintness, hypotension, mental clouding or depression, nausea, nervousness, palpitation, physical and psychological dependence, pruritus, urticaria, QT-interval prolongation, respiratory/circulatory depression, restlessness, sedation, seizures, sweating, flushing, warmness of face/neck/upper thorax, syncope, urinary retention, visual disturbances, vomiting, weakness |
| Cautions | Renal or hepatic impairment, elderly, history of substance use, mental health disorders, addiction, abuse, respiratory depression, neonatal opioid withdrawal syndrome |
| Storage condition | Store below 30oC. |
| **Tranexamic acid** | |
| Pharmacological class | Antifibrinolytic |
| Dosage form | Injection: 100mg/ml in 10ml ampule |
| Indications | Hemorrhage in women with PPH |
| Dose and administration | Administer at a fixed dose of 1 g in 10 ml (100 mg/ml) IV at 1 ml per minute (i.e., administered over 10 minutes), with a second dose of 1 g IV if bleeding continues after 30 minutes  Use tranexamic acid injection within 3 hours and as early as possible after onset of PPH |
| Contraindications | Hypersensitivity to the drug, known thromboembolic event during pregnancy, history of coagulopathy, active intravascular clotting, convulsions |
| Drug interactions | Anti-inhibitor coagulant complex, estrogen derivatives, factor IX complex, hormonal contraceptives, tretinoin, chlorpromazine |
| Side effects | Allergic dermatitis, dizziness, hypotension, nausea, vomiting, diarrhea, headache, respiratory problems, abdominal and musculoskeletal pain, |
| Cautions | Thromboembolic events, renal impairment, renal impairment, pregnancy |
| Storage condition | Store between 20°C to 25°C. Do not freeze |

# Medicines Affecting the Blood

## Antianemics

Antianemics are used to treat [anaemia](https://www.healthdirect.gov.au/anaemia), a condition where [blood test](https://www.healthdirect.gov.au/blood-testing) result shows a low [red blood cell](https://www.healthdirect.gov.au/red-blood-cells) count or low haemoglobin level.  The medicine used to treat anaemia will depend on its cause. The most common type of anaemia is [iron-deficiency](https://www.healthdirect.gov.au/iron-deficiency) anaemia, usually caused by acute or chronic blood loss, from insufficient intake particularly during periods of accelerated growth in children, or in heavily menstruating or pregnant women. Other types of anaemia can be caused by folate deficiency, which is usually treated with [folic acid](https://www.healthdirect.gov.au/medicines/medicinal-product/aht,11132/folic-acid) tablets or [vitamin b12 deficiency](https://www.healthdirect.gov.au/vitamin-b-deficiency) which is usually treated with [hydroxycobalamin](https://www.healthdirect.gov.au/medicines/medicinal-product/aht,21291/hydroxocobalamin). Anaemia caused by chronic kidney disease may need other [treatments](https://kidney.org.au/your-kidneys/living-with-kidney-disease/anaemia) such as erythropoiesis-stimulating agents. These are medicines that send a signal to your body to make more red blood cells.

Before initiating treatment for anaemia, it is essential to determine which type is present. Iron salts may be harmful if given to patients with anaemias other than those due to iron deficiency.

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| **Ferrous gluconate** | |
| Pharmacological class | Iron product |
| Dosage form | Tablets: equivalent to 36 mg elemental iron |
| Indications | Prophylaxis and treatment of iron-deficiency anaemia |
| Dose and Administration | **Prophylaxis of iron-deficiency anaemia by oral using tablets** (elemental Fe 1- 2mg/kg/day):  **Child 6–11 years:** 300–900 mg daily  **Child 12–17 years:** 600 mg daily  **Adult:** 600 mg daily  **Treatment of iron-deficiency anaemia by oral using tablets (**elemental Fe 100- 200mg/day or 3-6mg/kg/day)**:**  **Child 6–11 years:** 300–900 mg daily  **Child 12–17 years:** 1.2–1.8 g daily in divided doses  **Adult:** 1.2–1.8 g daily in divided doses |
| Contraindications | Hypersensitivity to the drug, hemochromatosis, hemosiderosis, haemolytic anaemia and anaemia other than iron-deficiency anaemia |
| Drug interactions | Tetracyclines, antacids, fluoroquinolones, levothyroxine and proton pump inhibitors. |
| Side effects | GI irritation, nausea, stomach cramping, staining of teeth, heartburn, vomiting, constipation, diarrhoea, discoloration of urine and dark stools colour. |
| Cautions | Peptic ulcer, enteritis, or ulcerative colitis, premature infants with vitamin E deficiency and excessive blood transfusions. |
| Storage condition | Store below 30° C. Protect from light and moisture. |
| **Ferrous sulfate** | |
| pharmacological class | Iron product |
| Dosage form | Tablets: equivalent to 60 – 65 mg elemental iron  Oral liquids: equivalent to 25 mg (iron as sulphate)/ml |
| Indications | Prevention and treatment of iron-deficiency anaemias |
| Dose and administration | **Adult:**  **Iron-deficiency anaemia (prophylactic):**  Orally using tablets: Ferrous sulfate 200/325mg PO daily  Orally using oral liquids: 2.4–4.8 ml daily  **Iron-deficiency anaemia (therapeutic):**  Orally using tablets: Ferrous sulfate, 200/325mg PO, TID  Orally using oral liquids: 4 ml 1–2 times a day  **Pediatric:**  **Iron deficiency anaemia,** oral**:**  **Neonate:** 2–4 mg/kg of elemental iron daily, given in 2–3 divided doses  **Infant and child:** 3–6 mg/kg (maximum 200 mg) of elemental iron daily, given in 2–3 divided doses  **Prevention of iron deficiency anaemia (in those at particular risk),** oral**:**  **Child under 5 years:** 1–2 mg/kg (maximum 30 mg) of elemental iron daily  **Child over 5 years:** 30–60 mg of elemental iron daily; folic acid may also be given. |
| Contraindications | Haemochromatosis, hemosiderosis, haemolytic anaemia, patients receiving repeated blood transfusions and parenteral iron therapy. |
| Drug interactions | Calcium salts, antacids, ciprofloxacin, dimercaprol, doxycycline, levodopa, levofloxacin, histamine 2 blockers, PPIs, levothyroxine, methyldopa, ofloxacin, penicillamine and zinc sulphate |
| Side effects | Constipation, diarrhoea, dark stools, nausea, GI irritation, GI haemorrhage and/or perforation, urine discoloration and abdominal pain. |
| Cautions | Should not be administered for longer than 6 months, peptic ulcer, regional enteritis, ulcerative colitis, intestinal strictures and diverticular disease. |
| Storage condition | Store below 30° C. Protect from light and moisture. |
| **Ferrous sulfate + Folic acid** | |
| pharmacological class | Iron product |
| Dosage form | Tablet: equivalent to 60 mg elemental iron + 400 micrograms  Folic acid; equivalent to 60 mg elemental iron + 2.8 mg folic acid.  Capsule: 150mg (as sulphate) + 0.5mg; 60mg + 400 mcg (Pregnant). |
| Indications | Treatment of anaemia and prevention of iron and folic acid deficiencies in pregnancy and pediatrics. |
| Dose and administration | **Adult**  **Treatment of anaemia**, oral:  elemental iron 120 mg + folic acid 400 micrograms daily for 3 months  **Prevention of iron and folate deficiencies in pregnancy**, oral:  Elemental iron 100 mg + folic acid 350–400 micrograms daily throughout pregnancy  **Pediatric:**  **Treatment of anaemia**, oral  **Child under 2 years**: elemental iron 25 mg + folic acid 100–400 micrograms daily for 3 months  **Child 2–12 years:** elemental iron 60 mg + folic acid 400 micrograms daily for 3 months |
| Contraindications | Hemochromatosis, hemosiderosis and haemolytic anaemia |
| Drug interactions | Penicillamine, chloramphenicol, quinolones, bisphosphonates (e.g., alendronate), levodopa, methyldopa, thyroid replacement drugs (e.g., levothyroxine) antacids, histamine 2 blockers, PPIs, and phenytoin. |
| Side effects | Constipation, diarrhoea, stomach cramps, or upset stomach, darkened stools, cough with blood, nausea and vomiting. |
| Cautions | Peptic ulcer, ulcerative colitis and diverticular disease. |
| Storage condition | Store at temperature not exceeding 30°C. Protect from light and moisture. |
| **Folic acid** | |
| pharmacological class | Vitamin B, Anti-anaemic |
| Dosage form | Tablet: 400 micrograms, 800mcg,1 mg; 5 mg |
| Indications | Treatment of megaloblastic anaemia due to folic acid deficiency, prevention of neural tube defect in pregnancy and prophylaxis in chronic haemolytic states in renal dialysis, and in drug induced folate deficiency. |
| Dose and administration | **Adult**  **Folate-deficiency, megaloblastic anaemia, oral**:  5 mg daily for 4 months (in pregnancy continued to term), up to 15mg daily may be necessary in malabsorption states  **Prevention of first occurrence of neural tube defects, oral**:  400 micrograms daily before conception and during the first 12 weeks of pregnancy for at least 4 weeks before conception until 12th week of pregnancy.  **Prevention of recurrence of neural tube defects, oral**:  5 mg daily (reduce to 4 mg daily, if suitable preparation available) for at least 4 weeks before conception until 12th week of pregnancy  **Prophylaxis in chronic haemolytic states, oral**  5 mg every 1–7 days, frequency dependent on underlying disease  **Prophylaxis of folate deficiency in dialysis, oral**  5 mg every 1–7 days  **Prophylaxis of folate deficiency in patients receiving parenteral nutrition, IV infusion**  15 mg 1–2 times a week, usually given by IV infusion in the parenteral nutrition solution  **Pediatric:**  **Folate deficiency, megaloblastic anaemia, oral**:  **Neonate to child 1 year**: Initially 500 micrograms/ kg (maximum 5 mg) once daily for up to 4 months; up to 10 mg once daily may be required in malabsorption states  **Child over 1 year:** 5 mg daily for 4 months; up to 15 mg daily may be required in malabsorption states  **Haemolytic anaemia, oral:**  **Child 1 month–12 years:** 2.5–5 mg once daily  **Prophylaxis of folate deficiency in dialysis**  **Child 1 month–11 years:** 250 micrograms/kg once daily (max. per dose 10 mg)  **Child 12–17 years:** 5–10 mg once daily |
| Contraindications | Refer to folic acid under vitamins and minerals |
| Drug interactions | Refer to folic acid under vitamins and minerals |
| Side effects | Refer to folic acid under vitamins and minerals |
| Cautions | Refer to folic acid under vitamins and minerals |
| Storage condition | Store below 30°C. Protect from light and moisture. |
| **Iron dextran** | |
| Pharmacological class | Iron products, anti-anaemics |
| Dosage form | Injection, 50mg/ml |
| Indications | For the treatment of iron deficiency anaemia. |
| Dose and administration | **Adult:**  Doses calculated according to body weight and iron deficit  IV: 25-100 mg, not to exceed 100 mg (2 ml)/day  IM (deep) :25-100 mg qDay PRN, not to exceed 100 mg (2 ml)/day  The normal recommended dosage schedule is 100-200 mg iron corresponding to 2-4 ml, two or three times a week depending on the haemoglobin level.  **Total dose (mg Fe) –** Hb in g/dl: (Body weight (kg) x (target Hb - actual Hb) (g/dl) x 0.24) + mg iron for iron stores  **Total dose (mg Fe)** – Hb in mmol/l: Body weight in kg x (target Hb in mmol/l – actual Hb in mmol/l) x 3.84 + mg iron for iron stores.  **Pediatric:**  **Age > 4month (<10kg):** 10mg (0.2ml)  **Children:** 10- 20kg: 15mg (0.3ml)  **Children > 20kg and adolescent:** 25mg (0.5ml).  **Test dose:** 10- 2mg (0.2 -0.5ml) administered prior to optimal dose |
| Contraindications | Known hypersensitivity the drug, haemolytic anaemia, haemochromatosis, hemosiderosis, decompensated liver cirrhosis and hepatitis, acute or chronic infection and acute renal failure. |
| Drug interactions | Oral iron preparations |
| Side effects | Acute, severe anaphylactic reactions, haemolysis, arrhythmia, tachycardia, diarrhoea, myalgia, headache, paraesthesia, chest pain, angioedema, sweating, hypotension, brown discoloration of skin, urticaria, arthritis and muscle soreness. |
| Cautions | Severe asthma, eczema or other atopic allergy, pregnancy, systemic lupus erythematosus and rheumatoid arthritis. |
| Storage condition | Store below 30° C. Do not freeze. |
| **Iron sucrose** | |
| Pharmacological class | Iron product |
| Dosage form | Injection: 20 mg/ml in 5ml vials |
| Indications | For the treatment of iron deficiency in active inflammatory bowel disease and in chronic kidney disease when oral iron preparations are ineffective or less effective. |
| Dose and administration | **Adult:**  Complex of ferric hydroxide with sucrose containing 2% (20 mg/ml) of iron  **Hemodialysis-dependent chronic kidney disease:** 100 mg administered during consecutive dialysis sessions; the usual cumulative total dose is 1,000 mg (10 doses); may repeat treatment if clinically indicated.  **Non-dialysis-dependent chronic kidney disease:** 200 mg administered on 5 different occasions within a 14-day period (total cumulative dose: 1,000 mg in 14-day period); may repeat treatment if clinically indicated. **Iron-deficiency anaemia**, by slow IV injection or IV infusion: Doses calculated according to body weight and iron deficit.  **Total dose (mg Fe) –** Hb in g/dl: (Body weight (kg) x (target Hb - actual Hb) (g/dl) x 0.24) + mg iron for iron stores  **Total dose (mg Fe)** – Hb in mmol/l: Body weight in kg x (target Hb in mmol/l – actual Hb in mmol/l) x 3.84 + mg iron for iron stores.  For intermittent IV infusion: dilute to a concentration of 1 mg/ml with sodium chloride 0.9%, give at a rate not exceeding 6.67 mg/min.  For slow IV injection: give undiluted at a rate of 1 ml/min, do not exceed 10 ml (200 mg iron) per injection.  **Pediatric:**  **Iron-deficiency anemia in chronic kidney disease (CKD):**  Children >2 yrs and adolescents < 15 yrs: 1mg/kg/dose per dialysis session  Maintenance therapy:  **Hemodialysis-dependent chronic kidney disease IV:** 0.5 mg/kg/dose every 2 weeks for 12 weeks (6 doses) maximum dose 100 mg/dose  **Non-dialysis-dependent chronic kidney disease:** (in combination with erythropoietin therapy): IV: 0.5 mg/kg/dose every 4 weeks for 12 weeks (3 doses); maximum dose: 100 mg/dose; may repeat if clinically indicated.  **Iron-deficiency anemia without chronic kidney disease (CKD):**  Infants, Children, and Adolescents: IV: 2.5 to 7 mg/kg/dose; repeat every 3 to 7 days until patient-specific goals are met  *Note: Should be used immediately after dilution with sterile 0.9% M/V sodium chloride solution.* |
| Contraindications | Hypersensitivity to the drug, hypotension, evidence of iron overload or hereditary disturbances in utilisation of iron |
| Drug interactions | Oral iron preparations |
| Side effects | Hypersensitivity, asthenia, hypotension, hypertension, drowsiness, urine discolouration, cold sweat, confusion, decreased level of consciousness, thrombophlebitis, muscle cramps, nausea, vomiting, strange taste, diarrhoea, constipation, headache, cough, back pain, joint pain, dizziness and swelling of the arms/legs. |
| Cautions | Liver dysfunction, acute or chronic infection, and pregnancy (first trimester). |
| Storage condition | Do not store above 25° C. Do not freeze. |
| **Cyanocobalamin** | |
| Pharmacological class | Vitamin B, anti-anaemic |
| Dosage form | Injection, 1000mcg/ml  Tablets (Film-coated), 1000 mcg  Tablet (sublingual),2500mcg  Nasal spray: 500mcg/spray |
| Indications | Prophylaxis and treatment of macrocytic anaemia associated with vitamin B12 deficiency. |
| Dose and administration | **Nutritional Supplementation**  Recommended daily allowance (RDA)  Adult >19 years: 2.4 mcg  Pregnant women: 2.6 mcg  Breastfeeding women: 2.8 mcg  Dietary supplement: 50 - 6,000 mcg/day  **Treatment of pernicious Anaemia:**  **Adult :**  IM/SC: 100 mcg once daily for 6-7 days, then every other day for 7 doses, then every 3-4 days for 2-3 weeks, then monthly  Alternative parenteral dosing:  IM/SC: 1000 mcg once daily for 7 days, then weekly for 1 month, then monthly  **Pediatric:**  30-50 mcg IM/SC once daily for age 2 weeks for total dose of 1,000 mcg to 5,000 mcg administer concomitantly with 1 mg/day of folic acid for 1 month.  **Vitamin B12 Deficiency:**  **Adult:**  Initial: 30 mcg IM once daily for 5-10 days  Maintenance: 100-200 mcg IM monthly  Nasal dose: 500 mcg once weekly  **Pediatric:**  30-50 mcg IM/SC once daily for &ge2 weeks for total dose of 1,000 mcg to 5,000 mcg administer concomitantly with 1 mg/day of folic acid for 1 month  Maintenance: 100 mcg IM/SC monthly. |
| Contraindications | Refer to cyanocobalamin under vitamins and minerals |
| Drug interactions | Refer to cyanocobalamin under vitamins and minerals |
| Side effects | Refer to cyanocobalamin under vitamins and minerals |
| Cautions | Refer to cyanocobalamin under vitamins and minerals |
| Storage condition | Store below 30ºC. Protected from light and heat. |
| **Hydroxycobalamin (Vitamin B12)** | |
| Pharmacological class | Vitamin B, Anti-anaemics |
| Dosage form | Injection: 1 mg/ml (as acetate, as hydrochloride or as sulphate) in 1 ml ampoule |
| Indications | Used in the treatment and prophylaxis of megaloblastic anaemia due to vitamin B12 deficiency (pernicious anaemia). |
| Dose and administration | **Adult:**  **Megaloblastic anaemia without neurological involvement,** by IM:  Initially 1 mg weekly for 4 weeks, then 1 mg every 2–3 months  **Megaloblastic anaemia with neurological involvement,** by IM:  Initially 1 mg every other day or daily for 1- 2 weeks, then 1mg weekly for 4- weeks, then 1 mg every 2 months.  **Prophylaxis of macrocytic anaemia,** by IM: 1 mg every 2–3 months.  **Pediatric:**  **Megaloblastic anaemia without neurological involvement, by IM injection**:  **Child 1 month–12 years:** initially 250 micrograms–1 mg 3 times weekly for 2 weeks, then 250 micrograms 1 weekly until the blood count is normal, then 1 mg every 3 months if required.  **Child over 12 years:** initially 1 mg weekly for 4weeks, then 1 mg every 3 months.  **Megaloblastic anaemia with neurological involvement, by IM injection:**  **Child 1 month–12 years:** initially 1 mg daily for 7 days or every other day for 7- 14 days, then 1 mg every 2-3 months.  **Prophylaxis of macrocytic anaemias,** by IM injection**:**  **Child:** 1 mg every 2–3 months. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Chloramphenicol: response to hydroxycobalamin reduced. |
| Side effects | Nausea, headache, dizziness, pain at injection site, fever, chills, hot flushes, hypokalaemia during initial treatment, hypersensitivity reactions, hypertension and decrease in lymphocytes. |
| Cautions | Hypokalaemia and acute renal failure. |
| Storage condition | Store below 30° C. Protect from light. |
| **Folinic acid/ Leucovorin** | |
| Pharmacological class | B vitamin, anti-anaemic |
| Dosage form | Tablet: 5mg;15mg; 25 mg (as calcium folinate)  Capsule: 5 mg; 25 mg  Solution for injection: 3 mg/ml in 10 ml ampoule; 7.5 mg/ml in 2 ml ampoule; 10 mg/ml in 5 ml ampoule |
| Indications | To diminish the toxicity and counteract the action of folic acid antagonists such as methotrexate in cytotoxic therapy and in combination with 5-fluorouracil in cytotoxic therapy. |
| Dose and administration | **Antidote to methotrexate (usually started 12 to 24 hours after administration of methotrexate):**  **Adult:**  By IM/IV injection or IV infusion: Up to 120 mg (10mg/m2) in divided doses over 12–24 hours, then 12–15 mg by IM injection, or  Oral: 15 mg every 6 hours for 48–72 hours.  **Pediatric:**  By IM or IV injection or IV infusion: Up to 120 mg (10mg/m2) in divided doses over 12–24 hours, then 12–15 mg by IM injection, or  Oral: 15 mg every 6 hours for 48–72 hours.  **Methotrexate over dosage (started as soon as possible, preferably within 1 hour of administration of methotrexate),** by IV injection or infusion: Dose equal to or higher than that of methotrexate, at rate not exceeding 160 mg/min |
| Contraindications | Vitamin B12 deficiency anaemia and pernicious anaemia. |
| Drug interactions | Phenobarbital, phenytoin, fluorouracil and trimethoprim. |
| Side effects | Allergic reactions, fever, seizures, fainting, diarrhea, nausea, vomiting, wheezing, thrombocytosis, stomatitis and urticaria. |
| Cautions | Undiagnosed anemia, geriatrics, diarrhea and cancer. |
| Storage condition | Store in a refrigerator at 2-8°C. Protect from light. |

## Erythropoietin stimulating agents

Erythropoietin (EPO) is a glycoprotein hormone that is essential to the body's erythropoietin (RH) production. EPO is a crucial oxygen-carrying molecule that is mostly produced by the kidneys in reaction to low blood oxygen levels. It helps to keep tissues and organs supplied with enough oxygen. Epoetins are used to treat anaemia associated with erythropoietin deficiency in chronic renal failure, to increase the yield of autologous blood in normal individuals and to shorten the period of symptomatic anaemia in patients receiving cytotoxic chemotherapy.

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| **Darbepoetin alfa** | |
| Pharmacological class | Erythropoietin Stimulating Agent |
| Dosage form | Injection, 10mcg/0.4ml,15mcg/0.375ml, 20mcg/0.5ml, 25mcg/0.42ml, 40mcg/0.4ml, 60mcg/0.3ml,100mcg/0.5ml, 150mcg/0.3ml, 200mcg/0.4ml, 300mcg/0.6ml and 500mcg/1Ml |
| Indications | Anaemia with chronic renal failure including patients on dialysis and patients not on dialysis and symptomatic anaemia in adult cancer patients with non-myeloid malignancies receiving chemotherapy. |
| Dose and Administration | **Adult:**  **Symptomatic anaemia associated with chronic renal failure in patients on dialysis:**  By IV/SC: initially 0.45microgram/kg once weekly, dose to be adjusted according to response by approximately 25% at intervals of at least 4 weeks.  Maintenance dose to be given once weekly or once every 2 weeks, reduce dose by approximately 25% if rise in haemoglobin concentration exceeds 2 g/100 ml over 4 weeks or if haemoglobin concentration exceeds 12 g/100 ml; if haemoglobin concentration continues to rise, despite dose reduction, suspend treatment until haemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose. When changing route give same dose then adjust according to weekly or fortnightly haemoglobin measurements, adjust doses not more frequently than every 2 weeks during maintenance treatment.  **Symptomatic anaemia associated with chronic renal failure in patients not on dialysis:**  By IV/SC: Initially 0.45microgram/kg once weekly, alternatively initially 0.75microgram/kg every 2 weeks, dose to be adjusted according to response by approximately 25% at intervals of at least 4 weeks.  Maintenance dose can be given once weekly, every 2 weeks, or once a month, subcutaneous route preferred in patients not on haemodialysis, reduce dose by approximately 25% if rise in haemoglobin concentration exceeds 2 g/100 ml over 4 weeks or if haemoglobin concentration exceeds 12 g/100 ml; if haemoglobin concentration continues to rise, despite dose reduction, suspend treatment until haemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose. When changing route give same dose then adjust according to weekly or fortnightly haemoglobin measurements, adjust doses not more frequently than every 2 weeks during maintenance treatment.  **Symptomatic anaemia in adults with non-myeloid malignancies receiving chemotherapy:**  By SC: Initially 6.75 micrograms/kg every 3 weeks, alternatively initially 2.25 micrograms/kg once weekly, if response inadequate after 9 weeks further treatment may not be effective; if adequate response obtained then reduce dose by 25–50%, reduce dose by approximately 25–50% if rise in haemoglobin concentration exceeds 2 g/100 ml over 4 weeks or if haemoglobin concentration exceeds 12 g/100 ml; if haemoglobin concentration continues to rise, despite dose reduction, suspend treatment until haemoglobin concentration decreases and restart at a dose approximately 25% lower than the previous dose. Discontinue approximately 4 weeks after ending chemotherapy. |
| Contraindications | Hypersensitivity to the active substance or to any of the excipients, patients who develop pure red cell aplasia following treatment with any erythropoietin and uncontrolled hypertension. |
| Drug interactions | There are no significant drug interactions |
| Side effects | Serious allergic reactions, fatigue, headache, peripheral oedema, fever, arthralgia, dizziness, hyper/hypotension, diarrhoea, vomiting, dyspnoea, pneumonia, pulmonary embolism, cough and myocardial infraction. |
| Cautions | In patients undergoing coronary artery bypass graft surgery (CABG), orthopaedic procedure; serious cardiovascular disorders, thromboembolic events, epilepsy, known porphyria, sickle cell anaemia and thalassemia. |
| Storage condition | Store in a refrigerator at 2-8°C. Do not freeze or shake |
| **Epoetin alfa** | |
| Pharmacological class | Erythropoietin Stimulating Agent |
| Dosage form | Injection (prefilled syringe), 1 000 IU/0.5 ml, 2 000 IU/1 ml , 3 000 IU/0.3 ml, 4 000 IU/0.4 ml, 5 000 IU/0.5 ml, 6 000 IU/0.6 ml, 7 000 IU/0.7 ml, 8 000 IU/0.8 ml, 9 000 IU/0.9 ml, 10 000 IU/1 ml, 20 000 IU/0.5 ml, 30 000 IU/0.75 ml, 40 000 IU/1 ml |
| Indications | Anaemia due to end stage kidney disease, chemotherapy, major surgery, or other chronic illnesses. |
| Dose and administration | **Adult:**  **Symptomatic anaemia associated with chronic renal failure in patients on haemodialysis:**  By IV/SC injection: Initially 50 units/kg 3 times a week, adjusted in steps of 25 units/kg 3 times a week, dose adjusted according to response at intervals of at least 4 weeks; maintenance 75–300 units/kg once weekly, intravenous route preferred, intravenous injection to be given over 1–5 minutes, subcutaneous injection, maximum 1 ml per injection site.  Maintenance dose can be given as a single dose or in divided doses, reduce dose by approximately 25% if rise in haemoglobin concentration exceeds 2 g/100 ml over 4 weeks or if haemoglobin concentration exceeds 11.5 g/dl; if haemoglobin concentration continues to rise, despite dose reduction, suspend treatment until haemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose.  **Severe symptomatic anaemia of renal origin in adults with renal insufficiency not yet on dialysis:**  By IV/SC injection: Initially 50 units/kg 3 times a week, increased in steps of 25 units/kg 3 times a week, adjusted according to response, dose to be increased at intervals of at least 4 weeks; maintenance 17–33 units/kg 3 times a week (max. per dose 200 units/kg 3 times a week), IV route preferred, intravenous injection to be given over 1–5 minutes, subcutaneous injection, maximum 1 ml per injection site.  Reduce dose by approximately 25% if rise in hemoglobin concentration exceeds 2 g/100 ml over 4 weeks or if hemoglobin concentration exceeds 11.5 g/dl; if hemoglobin concentration continues to rise, despite dose reduction, suspend treatment until hemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose.  **Symptomatic anaemia in adults receiving cancer chemotherapy:** By IV/SC injection: Initially 150 units/kg 3 times a week, alternatively initially 450 units/kg once weekly, increased to 300 units/kg 3 times a week, increased if appropriate rise in haemoglobin (or reticulocyte count) not achieved after 4 weeks; discontinue if inadequate response after 4 weeks at higher dose, subcutaneous injection maximum 1 ml per injection site.  Reduce dose by approximately 25–50% if rise in hemoglobin concentration exceeds 2 g/100 ml over 4 weeks or if hemoglobin concentration exceeds 11.5 g/dl; if hemoglobin concentration continues to rise, despite dose reduction, suspend treatment until hemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose. Discontinue approximately 4 weeks after ending chemotherapy.  **Moderate anaemia (haemoglobin concentration 10–13 g/100 ml) before elective orthopaedic surgery in adults with expected moderate blood loss to reduce exposure to allogeneic blood transfusion or if autologous transfusion unavailable:**  600 units/kg once weekly for 4 doses, given 21-, 14-, and 7 days before surgery and on day of surgery, alternatively 300 units/kg daily for 15 days starting 10 days before surgery, subcutaneous injection maximum 1 ml per injection site.  **Pediatric:**  **Anemia in chronic kidney disease, on dialysis:**  **Initial dose:**  **Infants, Children, and Adolescents** ≤16 years: IV, SubQ: 50 units/kg/dose 3 times weekly.  **Adolescents >16 years:** IV, SubQ: 50 to 100 units/kg/dose 3 times weekly.  **Anemia in chronic kidney disease, NO dialysis:**  **Initial dose:**  **Infants, Children, and Adolescents ≤16 years:** IV, SubQ: 50 units/kg/dose 3 times weekly  **Adolescents >16 years:** IV, SubQ: 50 to 100 units/kg/dose 3 times weekly  **Anemia due to myelosuppressive chemotherapy in cancer patients:**  **Children ≥5 years and Adolescents:**  Initial dose: IV: 600 units/kg/dose once weekly until completion of chemotherapy; titrate dosage to use the minimum effective dose that will maintain a hemoglobin level sufficient to avoid red blood cell transfusions. |
| Contraindications | Hypersensitivity to the drug, patients who develop pure red cell aplasia following treatment with any erythropoietin and uncontrolled hypertension. |
| Drug interactions | There are no significant drug interactions |
| Side effects | Allergic reaction, chills, hypertension, myalgia, stomatitis, vomiting, chest pain, headache, cough, diarrhea, fever, arthralgia, nausea, pain at injection site, peripheral edema, vomiting, seizure, porphyria, and dizziness. |
| Cautions | Hypertension, iron deficiency, folate or B12 deficiency, congestive heart failure (CHF), cardiovascular events, seizure disorder, sickle-cell disease, hemolytic anemia, porphyria and hematologic disorders. |
| Storage condition | Store in a refrigerator at 2-8°C. Do not freeze or shake |
| **Epoetin beta** | |
| Pharmacological class | Erythropoietin Stimulating Agent |
| Dosage form | Injection: 1000 IU/0.5 ml, 2000 IU/0.5 ml, 3000 IU/0.3 ml, 4000 IU/0.4 ml, 5000 IU/0.5 ml, 6000 IU/0.6 ml, 8000 IU/0.8ml, 10 000 IU/1 ml, 20 000 IU/0.5 ml,30 000 IU/1 ml |
| Indications | Anaemia due to end stage kidney disease, chemotherapy, major surgery, or other chronic illnesses. |
| Dose and administration | **Adult:**  **Symptomatic anaemia associated with chronic renal failure:**  By SC injection: initially 20 units/kg 3 times a week for 4 weeks, increased in steps of 20 units/kg 3 times a week, according to response at intervals of 4 weeks, total weekly dose may be divided into daily doses.  Maintenance dose, initially reduce dose by half then adjust according to response at intervals of 1–2 weeks, total weekly maintenance dose may be given as a single dose or in 3 or 7 divided doses.  Reduce dose by approximately 25% if rise in haemoglobin concentration exceeds 2 g/100 ml over 4 weeks or if haemoglobin concentration approaches or exceeds 11.5g/dl; if haemoglobin concentration continues to rise, despite dose reduction, suspend treatment until haemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose; maximum 720 units/kg per week.  By IV injection: Initially 40 units/kg 3 times a week for 4 weeks, then increased to 80 units/kg 3 times a week, then increased in steps of 20 units/kg 3 times a week if required, at intervals of 4 weeks; maintenance dose, initially reduce dose by half then adjust according to response at intervals of 1–2 weeks.  Reduce dose by approximately 25% if rise in haemoglobin concentration exceeds 2 g/100 ml over 4 weeks or if haemoglobin concentration approaches or exceeds 11.5g/dl; if haemoglobin concentration continues to rise, despite dose reduction, suspend treatment until haemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose; maximum 720 units/kg per week.  **Symptomatic anaemia in adults with non-myeloid malignancies receiving chemotherapy:**  By SC injection: Initially 450 units/kg once weekly for 4 weeks, dose to be given weekly as a single dose or in 3–7 divided doses, increase dose after 4 weeks (if a rise in haemoglobin of at least 1g/100 ml not achieved), increased to 900 units/kg once weekly, dose to be given weekly as a single dose or in 3–7 divided doses, if adequate response obtained reduce dose by 25–50%, discontinue treatment if haemoglobin concentration does not increase by at least 1 g/100 ml after 8 weeks of therapy (response unlikely).  Reduce dose by approximately 25–50% if rise in haemoglobin concentration exceeds 2 g/100 ml over 4 weeks or if haemoglobin concentration exceeds 11.5g/dl; if haemoglobin concentration continues to rise, despite dose reduction, suspend treatment until haemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose.  Discontinue approximately 4 weeks after ending chemotherapy; maximum 60 000 units per week. |
| Contraindications | Refer to epoetin alpha |
| Drug interactions | Refer to epoetin alpha |
| Side effects | Refer to epoetin alpha |
| Cautions | Refer to epoetin alpha |
| Storage condition | Store in a refrigerator at 2-8°C. Do not freeze or shake |
| **Epoetin Zeta** | |
| Pharmacological class | Erythropoietin stimulating agent |
| Dosage form | Injection (prefilled syringe), 30 000 IU/0.75 ml |
| Indications | Anaemia due to end stage kidney disease, chemotherapy, major surgery, or other chronic illnesses. |
| Dose and administration | **Adult:**  **Symptomatic anaemia associated with chronic renal failure in patients on haemodialysis:**  By IV/SC injection: Initially 50 units/kg 3 times a week, adjusted according to response, adjusted in steps of 25 units/kg 3 times a week, dose to be adjusted at intervals of at least 4 weeks; maintenance 25–100 units/kg 3 times a week, intravenous injection to be given over 1–5 minutes, if given by subcutaneous injection, a maximum of 1ml can be given per injection site, avoid increasing haemoglobin concentration at a rate exceeding 2 g/100ml over 4 weeks.  **Symptomatic anaemia associated with chronic renal failure in adults on peritoneal dialysis:**  By IV/SC injection: Initially 50 units/kg twice weekly; maintenance 25–50 units/kg twice weekly, intravenous injection to be given over 1–5 minutes, if given by subcutaneous injection, a maximum of 1ml can be given per injection site, avoid increasing haemoglobin concentration at a rate exceeding 2g/100ml over 4 weeks.  **Severe symptomatic anaemia of renal origin in adults with renal insufficiency not yet on dialysis:**  By IV/SC injection: Initially 50 units/kg 3 times a week, adjusted according to response, adjusted in steps of 25 units/kg 3 times a week, dose to be increased at intervals of at least 4 weeks; maintenance 17–33 units/kg 3 times a week (max. per dose 200 units/kg 3 times a week), intravenous injection to be given over 1–5 minutes, if given by subcutaneous injection, a maximum of 1ml can be given per injection site, avoid increasing haemoglobin concentration at a rate exceeding 2g/100 ml over 4 weeks.  **Symptomatic anaemia in adults receiving cancer chemotherapy:**  By SC injection: Initially 150 units/kg 3 times a week, alternatively initially 450 units/kg once weekly, increased to 300 units/kg 3 times a week, only increase dose if appropriate rise in haemoglobin (or reticulocyte count) not achieved after 4 weeks; discontinue if inadequate response after 4 weeks at higher dose,  maximum 1ml per injection site, reduce dose by approximately 25–50% if rise in haemoglobin concentration exceeds 2g/100 ml over 4 weeks or if haemoglobin concentration exceeds 12 g/100ml; if haemoglobin concentration continues to rise, despite dose reduction, suspend treatment until haemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose. Discontinue approximately 4 weeks after ending chemotherapy |
| Contraindications | Hypersensitivity to the drug, patients who develop pure red cell aplasia following treatment with any erythropoietin and uncontrolled hypertension. |
| Drug interactions | There are no significant drug interactions |
| Side effects | Asthenia, dizziness, intracranial haemorrhage and angioedema |
| Cautions | Epilepsy, history of seizures, acute infections and brain metastases, chronic liver failure and thrombotic vascular events. |
| Storage condition | Store in a refrigerator at 2-8°C. Do not freeze or shake |
| **Methoxy polyethylene glycol-epoetin beta** | |
| Pharmacological class | Erythropoietin stimulating agent |
| Dosage form | Injection (pre-filled syringe), 50 micrograms/0.3 ml |
| Indications | Treatment of symptomatic anaemia associated with chronic kidney disease (CKD) in adult patients. |
| Dose and administration | **Adult:**  **Symptomatic anaemia associated with chronic kidney disease in patients on dialysis and not currently treated with erythropoietin:**  By IV or SC: Initially 600 nanograms/kg every 2 weeks, subcutaneous route preferred in patients not on haemodialysis, dose to be adjusted according to response at intervals of at least 1 month, maintenance dose of double the previous fortnightly dose may be given once a month if haemoglobin concentration is above 10 g/100ml, reduce dose by approximately 25% if rate of rise in haemoglobin concentration exceeds 2 g/100 ml in 1 month or if haemoglobin concentration is increasing or approaching 11.5g/dl; if haemoglobin concentration continues to rise, despite dose reduction, suspend treatment until haemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose, dose may be increased by approximately 25% if the rate of rise in haemoglobin concentration is less than 1 g/100 ml over 1 month; further increases of approximately 25% may be made at monthly intervals until the individual target haemoglobin concentration is obtained.  **Symptomatic anaemia associated with chronic kidney disease in patients not on dialysis and not currently treated with erythropoietin:**  By SC: Initially 1.2 micrograms/kg every month, alternatively (by subcutaneous injection or by intravenous injection) initially 600 nanograms/kg every 2 weeks, subcutaneous route preferred in patients not on haemodialysis, dose to be adjusted  according to response at intervals of at least 1 month, patients treated once every 2 weeks may be given a maintenance dose of double the previous fortnightly  dose once a month if haemoglobin concentration is above 10 g/100 ml, reduce dose by approximately 25% if rate of rise in haemoglobin concentration exceeds  2 g/100 ml in 1 month or if haemoglobin concentration is increasing or approaching 11.5g/dl; if haemoglobin concentration continues to rise, despite  dose reduction, suspend treatment until haemoglobin concentration decreases and then restart at a dose approximately 25% lower than the previous dose, dose may be increased by approximately 25% if the rate of rise in haemoglobin concentration is less than 1 g/100 ml over 1 month; further increases of approximately 25% may be made at monthly intervals until the individual target haemoglobin concentration is obtained |
| Contraindications | Hypersensitivity to the drug, patients who develop pure red cell aplasia following treatment with any erythropoietin and uncontrolled hypertension. |
| Drug interactions | There are no significant drug interactions |
| Side effects | Hypertension, hot flush, hypertensive encephalopathy, maculopapular rash, diarrhoea, nasopharyngitis, headache, muscle spasm, fluid overload, back pain, cough, urinary tract infection, pain in extremity, stevens-Johnson syndrome and toxic epidermal necrolysis. |
| Cautions | Bone marrow fibrosis, concurrent infection, haematological disease, haemolysis, inflammatory or traumatic episodes, cardiovascular disease or HTN. |
| Storage condition | Store in a refrigerator at 2-8°C. Do not freeze or shake |

## Medicines affecting coagulation

Medicines affecting coagulation, also known as anticoagulants and antiplatelet drugs, play a crucial role in the prevention and treatment of various cardiovascular and thromboembolic disorders. Coagulation is the process by which blood forms clots to stop bleeding, but abnormalities in this process can lead to dangerous conditions such as thrombosis or embolism. Medicines that affect coagulation are designed to either inhibit clot formation (anticoagulants) or prevent platelet aggregation (antiplatelet drugs), thereby reducing the risk of blood clots and associated complications.

Anticoagulants are medications that inhibit the formation of blood clots, thereby preventing thrombosis (the formation of clots within blood vessels) and reducing the risk of embolism (the movement of clots to other parts of the body where they can cause blockages). These drugs are commonly used in the prevention and treatment of various cardiovascular and thromboembolic disorders.

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| **Apixaban** | |
| Pharmacological class | Anticoagulants: factor Xa inhibitors |
| Dosage form | Tablet: 5mg |
| Indications | Prevention of stroke and systemic embolism in adult patients with non-valvular atrial fibrillation (NVAF), with one or more risk factors, such as prior stroke or transient ischaemic attack (TIA); age ≥ 75 years; hypertension; diabetes mellitus; symptomatic heart failure (NYHA Class ≥ II).  Treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE), and prevention of recurrent DVT and PE in adults. |
| Dose and Administration | **Adult:**  **Prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation (NVAF):**  Oral: 5 mg taken twice daily.  Dose Reduction  Oral: 2.5 mg taken twice daily in patients with NVAF and at least two of the following characteristics: age ≥ 80 years, body weight ≤ 60 kg, or serum creatinine ≥ 1.5 mg/dl (133 micromole/l).  **Treatment of DVT and PE:**  Oral: 10 mg taken twice daily for the first 7 days followed by 5 mg taken orally twice daily.  **prevention of recurrent DVT and PE (VTE):**  Oral: 2.5 mg taken twice daily. Dose for prevention should be initiated following completion of 6 months of treatment with apixaban 5 mg twice daily or with another anticoagulant. |
| Contraindications | Hypersensitivity to the drug, active clinically significant bleeding, hepatic disease associated with coagulopathy, current or recent gastrointestinal ulceration, presence of malignant neoplasms at high risk of bleeding, recent brain or spinal injury, recent brain, spinal or ophthalmic surgery, recent intracranial haemorrhage, known or suspected oesophageal varices, arteriovenous malformations, vascular aneurysms or major intraspinal or intracerebral vascular abnormalities, and concomitant treatment with any other anticoagulant agent. |
| Drug interactions | Azole-anti-fungals (ketoconazole, itraconazole, voriconazole), HIV protease inhibitors (e.g. ritonavir), nonsteroidal anti-inflammatory (NSAIDs), selective serotonin reuptake inhibitors (SSRIs), and serotonin norepinephrine reuptake inhibitors (SNRIs), and other anticoagulants. |
| Side effects | Anaemia, bleeding from any site, nausea, skin reactions, CNS haemorrhage, epistaxis, hypotension, post procedural hematoma, thrombocytopenia, wound complications, and increase in transaminases. |
| Cautions | Patients with prosthetic heart valves surgery and invasive procedures, active cancer; severe renal impairment, elderly patients and hepatic impairment. |
| Storage condition | Store below 30° C, Protect from light. |
| **Dabigatran** | | |
| Pharmacological class | Anticoagulant; direct thrombin inhibitors | |
| Dosage form | Capsule: 75mg, 150mg | |
| Indications | Prevention of stroke and systemic embolism in adult patients with non-valvular atrial fibrillation (NVAF), with one or more risk factors, such as prior stroke or transient ischemic attack (TIA); age ≥ 75 years; heart failure (NYHA Class ≥ II); diabetes mellitus; hypertension.  Treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE), and prevention of recurrent DVT and PE. | |
| Dose and administration | **Adult:**  **Prevention of stroke and systemic embolism in adult patients with NVAF with one or more risk factors (SPAF):**  Oral: 300 mg taken as one 150 mg capsule twice daily and therapy should be continued long term.  **Treatment of DVT and PE and prevention of recurrent DVT and PE in adults (DVT/PE):**  Oral: 300 mg taken as one 150 mg capsule twice daily following treatment with a parenteral anticoagulant for at least 5 days and the duration of therapy should be individualised based on risk factors.  DOSE REDUCTION RECOMMENDED  **In patients aged ≥ 80 years and patients who receive concomitant verapamil:**  Oral: daily dose of 220 mg taken as one 110 mg capsule twice daily | |
| Contraindications | Active clinically significant bleeding, severe renal impairment, current or recent gastrointestinal ulceration, recent brain or spinal injury, recent brain, spinal or ophthalmic surgery, recent intracranial haemorrhage, known or suspected oesophageal varices, arteriovenous malformations, vascular aneurysms or major intraspinal or intracerebral vascular abnormalities, concomitant treatment with any other anticoagulants, severe hepatic impairment and prosthetic heart valves requiring anticoagulant treatment. | |
| Drug interactions | Ketoconazole, cyclosporine, itraconazole, tacrolimus, verapamil, amiodarone, quinidine, rifampicin, St. John´ s wort, carbamazepine, phenytoin, clarithromycin and digoxin. | |
| Side effects | Anaemia, diarrhoea, gastrointestinal discomfort, haemorrhage, abnormal hepatic function, nausea, dysphagia, gastrointestinal disorders, hyper bilirubinaemia, GI, skin, intracranial haemorrhage, post procedural complications, skin reactions, thrombocytopenia, vomiting, wound complications angioedema, post procedural drainage and epistaxis. | |
| Cautions | Patients with antiphospholipid syndrome, renal insufficiency and active cancer patients. | |
| Storage condition | Store below 30° C. Protect from light and moisture | |
| **Danaparoid sodium** | | |
| Pharmacological class | Anticoagulant | |
| Dosage form | Injection: 750 anti-Xa units/0.6 ml | |
| Indications | Treatment of thromboembolic disease in patients with history of heparin-induced thrombocytopenia and prevention of deep-vein thrombosis in general or orthopedic surgery. | |
| Dose and administration | **Adult:**  **Prevention of deep-vein thrombosis in general or orthopaedic surgery:**  By SC injection: 750 units twice daily for 7–10 days, initiate treatment before operation, with last pre-operative dose 1–4 hours before surgery.  **Treatment of thromboembolic disease in patients with history of heparin-induced thrombocytopenia:**  By IV injection:  **Adult (body weight up to 55 kg):** Initially 1250 units, then (by continuous intravenous infusion) 400 units/hour for 2 hours, then (by continuous intravenous infusion) 300 units/hour for 2 hours, then (by continuous intravenous infusion) 200 units/hour for 5 days  **Adult (body weight 55–89 kg):** Initially 2500 units, then (by continuous intravenous infusion) 400 units/hour for 2 hours, then (by continuous intravenous infusion) 300 units/hour for 2 hours, then (by continuous intravenous infusion) 200 units/hour for 5 days  **Adult (body weight 90 kg and above):** Initially 3750 units, then (by continuous intravenous infusion) 400 units/hour for 2 hours, then (by continuous intravenous infusion) 300 units/hour for 2 hours, then (by continuous intravenous infusion) 200 units/hour for 5 days. | |
| Contraindications | Active peptic ulcer, acute bacterial endocarditis, diabetic retinopathy, epidural anesthesia, haemophilia and other haemorrhagic disorders, recent cerebral haemorrhage, severe uncontrolled hypertension, spinal anesthesia, and thrombocytopenia. | |
| Drug interactions | There are no significant drug interactions | |
| Side effects | Hemorrhage, heparin-induced thrombocytopenia, skin reactions, thrombocytopenia, post procedural hemorrhage, rash and epidural hematoma. | |
| Cautions | Recent bleeding, severe renal and hepatic insufficiency and spinal/epidural anesthesia. | |
| Storage condition | Do not store above 30° C. Do not freeze. | |
| **Dalteparin** | | |
| Pharmacological class | Anticoagulants | |
| Dosage form | Injection: 5000 IU/1 ml, 10,000 IU/1 ml | |
| Indications | Peri- and post-operative surgical thromboprophylaxis, treatment of deep-vein thrombosis and pulmonary embolism. | |
| Dose and administration | **Adult:**  **Treatment of deep-vein thrombosis | pulmonary embolism:**  By SC injection: 200 units/kg daily (max. per dose 18 000 units) until adequate oral anticoagulation with vitamin K antagonist established (at least 5 days of combined treatment is usually required).  **Prophylaxis of deep-vein thrombosis in surgical patients— moderate risk:**  By SC injection: Initially 2500 units for 1 dose, dose to be given 1–2 hours before surgery, then 2500 units every 24 hours  **Prophylaxis of deep-vein thrombosis in surgical patients— high risk:**  By SC injection: Initially 2500 units for 1 dose, dose to be administered 1–2 hours before surgery, followed by 2500 units after 8–12 hours, then 5000 units every 24 hours, alternatively initially 5000 units for 1 dose, dose to be given on the evening before surgery, followed by 5000 units after 24 hours, then 5000 units every 24 hours  **Unstable coronary artery disease (including non-ST segment-elevation myocardial infarction):**  By SC injection: 120 units/kg every 12 hours (max. per dose 10,000 units twice daily) for up to 8 days  **Prophylaxis of venous thromboembolism in medical patients:**  By SC injection: Dose is 5,000 IU once daily. Duration for 14days.  **Patients with solid tumours: Extended treatment of symptomatic venous thromboembolism (VTE) and prevention of its recurrence:**  200 IU/kg total body weight SC once daily for the first 30 day. Total daily dose should not exceed 18,000 IU daily. | |
| Contraindications | Hypersensitivity to the drug, mechanical prosthetic heart valve, heparin or other low molecular weight heparins, heparin induced thrombocytopenia, acute gastroduodenal ulcer, cerebral haemorrhage, acute or sub-acute septic endocarditis; haemorrhagic pericardial effusion and haemorrhagic pleural effusion. | |
| Drug interactions | Aspirin/dipyridamole, GP IIb/IIIa receptor antagonists, Vitamin K antagonists, NSAIDs, thrombolytics, antihistamines, cardiac glycosides, tetracycline and ascorbic acid. | |
| Side effects | Thrombocytopenia, hypersensitivity, hemorrhage, transient elevation of transaminases, hematoma at the injection site, pain at the injection site, epidural hematoma, hypoaldosteronism, intracranial hemorrhage, prosthetic cardiac valve thrombosis. | |
| Cautions | Severe liver or renal failure, uncontrolled hypertension, patients receiving concurrent anticoagulant/antiplatelet agents, thrombocytopenia or defective platelet function, surgery or trauma and haemorrhagic stroke. | |
| Storage condition | Store below 30° C. Protect from light. | |
| **Edoxaban** | | |
| Pharmacological class | Anticoagulants, Factor Xa inhibitor | |
| Dosage form | Tablet: 15mg, 30mg, 60mg | |
| Indications | Prevention of stroke and systemic embolism in adult patients with non-valvular atrial fibrillation (NVAF) with one or more risk factors, such as congestive heart failure, hypertension, age ≥ 75 years, diabetes mellitus, prior stroke or transient ischemic attack (TIA).  Treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE), and for the prevention of recurrent DVT and PE in adults. | |
| Dose and administration | **Adult:**  **Prevention of stroke and systemic embolism:**  Oral: 60 mg once daily and continued for long term in NVAF patients.  **Treatment of DVT, treatment of PE and prevention of recurrent DVT and PE (VTE):**  Oral: 60 mg once daily following initial use of parenteral anticoagulant for at least 5 days.  **For NVAF and VTE:**  Oral: 30 mg once daily in patients with one or more of the following clinical factors:   * Moderate or severe renal impairment (creatinine clearance (CrCl) 15 - 50 ml/min) * Low body weight ≤ 60 kg * Concomitant use of the following P-glycoprotein (P-gp) inhibitors: cyclosporine, erythromycin, or ketoconazole. | |
| Contraindications | Hypersensitivity to the drug, bleeding, clinically significant active bleeding, hepatic disease associated with coagulopathy, current or recent gastrointestinal ulceration, presence of malignant neoplasms at high risk of bleeding, recent brain or spinal injury, recent brain, spinal or ophthalmic surgery, recent intracranial haemorrhage, known or suspected oesophageal varices, arteriovenous malformations, vascular aneurysms or major intraspinal or intracerebral vascular abnormalities, uncontrolled severe hypertension, concomitant treatment with any other anticoagulants, pregnancy and breast-feeding. | |
| Drug interactions | Cyclosporine, erythromycin, ketoconazole, quinidine, verapamil, quinidine, verapamil, amiodarone, clarithromycin, phenytoin, carbamazepine, phenobarbital, St. John's Wort, anticoagulants, antiplatelets, NSAIDs and selective serotonin reuptake inhibitors (SSRIs)/serotonin nerehinephrine reuptake inhibitors (SNRIs). | |
| Side effects | Haemorrhage, abdominal pain, anaemia, dizziness, headache, nausea, skin reactions, CNS, GI, oral/pharyngeal, cutaneous soft tissue, urethral haemorrhage, thrombocytopenia, pericardial haemorrhage and epistaxis. | |
| Cautions | Renal impairment, hepatic impairment, patients with active cancer, and antiphospholipid syndrome. | |
| Storage condition | Store below 30° C. Protect from light. | |
| **Enoxaparin** | | |
| Pharmacological class | Anticoagulant, low molecular weight heparin | |
| Dosage form | Injection: 20 mg/0.2 ml, 40 mg/0.4 ml, 60 mg/0.6 ml, 80 mg/0.8 ml,100 mg/1 ml, 120 mg/0.8 ml, 150 mg/1 ml. | |
| Indications | Prophylaxis of venous thromboembolic disease, thrombus formation in the extra-corporal circulation during haemodialysis.  Treatment of established deep vein thrombosis, unstable angina and non-Q-wave myocardial infarction during the acute stage, in combination with aspirin. | |
| Dose and administration | **Adult:**  **Abdominal surgery and medical patients during acute illness,** SC injection:40 mg once a day with the initial dose given 2 hours prior to surgery.  **Hip or knee replacement surgery,** SC injection: 30mg every 12 hours or 40 mg once daily.  **Prevention of extra corporal thrombus during Haemodialysis:** The recommended dose is 1mg/kg. The effect of this dose is usually sufficient for a 4-hour session; in the event fibrin rings are found, a further dose of 0.5 to 1 mg/kg may be given.  **Treatment of deep vein thrombosis with or without pulmonary embolism,** A dose of 1 mg/kg given subcutaneously every 12 hours. The duration of the treatment should not exceed a period of 10 days.  **Treatment of unstable angina and non-Q-wave myocardial infarction:**  A dose of 1 mg/kg should be given subcutaneously every 12 hours | |
| Contraindications | Hypersensitivity to the drug or other low molecular weight heparins, major clotting disorders, history of thrombocytopenia with enoxaparin or with another heparin, active gastro-intestinal ulcer and acute infective endocarditis | |
| Drug interactions | Salicylates, NSAIDs, ticlopidine, iron dextran, thrombolytic drugs, herbal supplements, such as fish oil, garlic, ginseng, and ginger. | |
| Side effects | Haemorrhage, localized or general allergic reactions, thrombocytopenia, atrial fibrillation, lung oedema, pneumonia, injection site and risk of osteoporosis. | |
| Cautions | Bleeding diathesis, uncontrolled arterial hypertension, a history of recent gastrointestinal ulceration, diabetic retinopathy, spinal/ epidural hematoma, renal dysfunction and haemorrhage. | |
| Storage condition | Store below 30° C. Protect from light. | |
| **Heparin (unfractionated heparin)** | | |
| Pharmacological class | Anticoagulant | |
| Dosage form | Injection: 1000 IU/ml, 5000 IU/ml, 10000 IU/ml, 12500IU/ml, 25000IU/5ml | |
| Indications | Treatment and prophylaxis of deep-vein thrombosis and pulmonary embolism, unstable angina, ischaemic stroke and acute peripheral arterial occlusion. | |
| Dose and administration | **Adult:**  **Treatment of deep-vein thrombosis and pulmonary embolism:**  Loading dose of 5000 IU (80UI/kg) (10,000 IU in severe pulmonary embolism) followed by continuous IV infusion of 18 IU/kg/hour or by SC injection of 15,000 IU every 12 hours, laboratory monitoring is essential, preferably on a daily basis and dose adjusted accordingly.  **Low-body-weight adult:** lower loading dose, then by continuous IV infusion, 15–25 IU/kg/hour or by SC injection, 250 IU/kg every 12 hours.  **Treatment of acute coronary syndrome, by SC:**  Loading dose: 60unit/kg (max. 4000unit), followed by 12unit/kg/hr (1000units/hr)  **Prophylaxis in general surgery, by SC:**  5000 IU for 1 dose, given 2 hours before surgery, then every 8–12 hours for 7 days or until patient is ambulant (monitoring not needed).  **Thromboprophylaxis during pregnancy, by SC:** 5000– 10,000 IU every 12 hours  **Pediatric:**  **Treatment of deep-vein thrombosis and pulmonary embolism, by IV injection:**  **Neonate to Child 1 year:** initially 75 units/kg (50 units/ kg if < 35 weeks corrected age), then by continuous IV infusion, 28 units/kg/hour, adjusted according to APTT or anti-Factor Xa.  **Child 1–12 years:** initially 75 units/kg, then by continuous IV infusion 20 units/kg/hour, adjusted according to APTT or anti-Factor Xa.  By SC injection  **Child 1 month–12 years:** 250 units/kg every 12 hours adjusted according to APTT or anti-Factor Xa.  **Prophylaxis in general surgery, by SC injection:**  **Child 1 month–12 years:** 100 units/kg (maximum 5000 units) twice daily, adjusted according to APTT or anti-Factor Xa. | |
| Contraindications | Hypersensitivity to the drug, haemophilia and other haemorrhagic disorders, heparin induced thrombocytopenia, active ulceration or overt bleeding of the GI, recent cerebral haemorrhage, severe hypertension, severe liver or renal disease, after major trauma or recent surgery (especially to eye or nervous system) and acute bacterial endocarditis. | |
| Drug interactions | NSAIDS (Acetylsalicylic acid, diclofenac, ibuprofen), ACEIs, Glyceryl dinitrate, cephalosporin, apixaban, enoxaparin, clopidogrel. | |
| Side effects | Hyperkalaemia, injection site reactions, haemorrhage, haematuria, thrombocytopenia, immune mediated thrombocytopenia, skin necrosis, hypersensitivity reactions including urticaria, angioedema and anaphylaxis; osteoporosis after prolonged use, alopecia, rebound hyperlipidaemia after withdrawal and priapism. | |
| Cautions | Hepatic impairment and renal failure, spinal or epidural anesthesia, diabetes mellitus, acidosis, and concomitant potassium-sparing drugs. | |
| Storage condition | Do not store above 30° C. | |
| **Nadoparin** | | |
| Pharmacological class | Anticoagulant | |
| Dosage form | Injection, 19 000 IU, 2850 IU anti-Xa/ml | |
| Indications | Peri- and post-operative surgical thromboprophylaxis. | |
| Dose and administration | **Adult:**  **Peri- and postoperative primary prophylaxis of deep vein thrombosis**  By SC injection: 0.3 ml 2 hours prior to the surgery, then 0.3 ml each morning until full mobilisation of the patient, but at least for a duration for 7 days. | |
| Contraindications | Hypersensitivity to the drug, known history of heparin-associated thrombocytopenia, eye haemorrhage, acute gastrointestinal ulcers, cerebral haemorrhage, cerebral aneurysm, Haemorrhagic stroke, acute infectious endocarditis, severe uncontrolled high blood pressure, severe hepatic impairment/renal dysfunction and retinopathy. | |
| Drug interactions | Oral anticoagulants, systemic corticosteroids, dextran, NSAIDS and nitroglycerin. | |
| Side effects | Heparin-induced thrombocytopenia, injection site reactions, elevated serum potassium concentration, allergic reactions with symptoms such as nausea, vomiting, elevated temperature, headache, urticaria, pruritus, dyspnoea, bronchospasm and hypotension | |
| Cautions | Hepatic failure, severe arterial hypertension, previous peptic ulcer, suspected intracranial tumour with haemorrhagic diathesis or other organ, lesions with a bleeding tendency, and chorioretinal vascular disorders | |
| Storage condition | Store below 30° C. Protect from light. | |
| **Rivaroxaban** | | |
| Pharmacological class | Anticoagulants, Factor Xa inhibitor | |
| Dosage form | Tablet: 10 mg, 15 mg, 20mg | |
| Indications | Prevention of venous thromboembolism (VTE) in patients undergoing elective hip or knee replacement surgery.  Treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE), and prevention of recurrent DVT and PE. | |
| Dose and administration | **Adult:**  **Prevention of VTE in adult patients undergoing elective hip or knee replacement surgery:**  Oral: is 10 mg daily and initial dose should be taken 6 to 10 hours after surgery.  **Treatment of DVT, treatment of PE and prevention of recurrent DVT and PE:**  Oral: Day 1–21, 15 mg twice daily, then day 22 onward 20 mg once daily  **Prevention of recurrent DVT and PE, following completion of at least 6 months of therapy for DVT or PE:**  Oral: 10 mg once daily or 20 mg once daily | |
| Contraindications | Hypersensitivity to the drug, current or recent gastrointestinal ulceration, presence of malignant neoplasms, recent brain or spinal injury, recent brain, spinal or ophthalmic surgery, recent intracranial haemorrhage, known or suspected oesophageal varices, arteriovenous malformations, vascular aneurysms or major intraspinal or intracerebral vascular abnormalities, hepatic disease associated with coagulopathy and clinically relevant bleeding risk, pregnancy and breast-feeding. | |
| Drug interactions | Azole-anti-fungal (ketoconazole, itraconazole, voriconazole), HIV protease inhibitors (e.g. ritonavir), NSAIDs, acetylsalicylic acid (ASA) and platelet aggregation inhibitors, selective serotonin reuptake inhibitors (SSRIs), and serotonin norepinephrine reuptake inhibitors (SNRIs), other Anticoagulants. | |
| Side effects | Bleeding, spinal hematoma, allergic reactions including anaphylaxis; anaemia, dizziness, eye haemorrhage, hypotension, tachycardia, increase in transaminase, GI disturbances, fever, peripheral oedema, dizziness and headache. | |
| Cautions | Hepatic or renal disease, blood disorders, bleeding disorders including anaemia, haemophilia and thrombocytopenia, bronchiectasis, pulmonary cavitation, or pulmonary haemorrhage and active cancer. | |
| Storage condition | Store below 30° C. | |
| **Warfarin** | | |
| Pharmacological class | Anticoagulant | |
| Dosage form | Tablet: 0.5mg, 1 mg, 2 mg, 2.5 mg, 3 mg, 5 mg, 7.5 mg (as sodium salt) | |
| Indications | Prophylaxis and treatment of venous thrombosis and pulmonary embolism, cerebral ischaemic attacks, prophylaxis of embolization in rheumatic heart disease and atrial fibrillation and prophylaxis after insertion of prosthetic heart valve. | |
| Dose and administration | **Adult- Prophylaxis and treatment of thromboembolic disorders:**  **Oral:** Start with 5 mg or 10 mg and titrate based on INR on day 3. Initial dose dependent on patient age and bleeding risk. Goal is INR of 2–3 for thrombosis and 2.5–3.5 for patients with mechanical valves.  Usual daily maintenance dose is 5 to 10 mg administered at the same time each day.  **Pediatric:**  **Neonate** (under specialist advice): 200 mcg/ kg as a single dose on day 1, then 100 mcg/kg once daily for the next 3 days.  However, if INR is still below 1.4, continue to use 200 mcg /kg once daily.  If INR is above 3, change to 50 mcg/ kg once daily; if INR is above 3.5, omit dose. Adjust ongoing therapy in accordance with INR.  Usual maintenance 100–300 mcg/kg once daily (may need up to 400 mcg/kg once daily.  **Child 1 month–12 years:** 200 mcg/kg (maximum 10 mg) as a single dose on day 1, then 100 mcg/kg (maximum 5 mg) once daily for the next 3 days.  However, if INR is still below 1.4, continue to use 200 mcg/kg (maximum 10 mg) once daily.  If the INR is above 3, change to 50 mcg/kg (maximum 2.5 mg) once daily; if INR is above 3.5, omit dose. Adjust ongoing therapy in accordance with INR.  Usual maintenance 100–300 mcg/kg once daily (may need up to 400 mcg/ kg once daily | |
| Contraindications | Pregnancy, severe hypertension, CNS haemorrhage, cerebral aneurysms, dissecting aorta, pericarditis and pericardial effusions, bacterial endocarditis, active ulceration or overt bleeding of the GI, GU, or respiratory tract, threatened abortion, eclampsia, and preeclampsia. | |
| Drug interactions | Alcohol, allopurinol, NSAIDs, SSRI and SNRI antidepressants, clopidogrel, azole antifungals, barbiturates, rifampicin, phenytoin, St John's Wort, PPIs, oral contraceptives, cephalosporin, fluoroquinolones, sulphonamides, parenteral anticoagulants, valproic acid, cimetidine and cranberry juice. | |
| Side effects | Haemorrhage, hypersensitivity, rash, alopecia, diarrhoea, unexplained drop in haematocrit, systemic cholesterol micro embolism (‘purple toes syndrome’), skin necrosis, jaundice, hepatic dysfunction, nausea, vomiting and pancreatitis. | |
| Cautions | Hepatic impairment, renal failure, recent surgery, elderly, CHF, malnourished, acute infection or active TB and prolonged vitamin K insufficiencies. | |
| Storage condition | Do not store above 30° C. Protect from light. | |
| **Phytomenadione (Vitamin K1)** | | |
| Pharmacological class | Vitamin k | |
| Dosage form | Injection: 1 mg/ml, 10 mg/ml in ampoule.  Tablet: 10 mg. | |
| Indications | Anticoagulant-induced prothrombin deficiency caused by coumarin derivatives  Prophylaxis and therapy of haemorrhagic disease of the newborn  Hypoprothrombinaemia due to antibacterial therapy  Hypoprothrombinaemia secondary to factors limiting absorption or synthesis of vitamin K such as obstructive jaundice, biliary fistula, sprue, ulcerative colitis,  celiac disease, intestinal resection, cystic fibrosis of the pancreas, and regional  enteritis  Other drug-induced hypoprothrombinaemia where it is definitely shown that the result is due to interference with vitamin K metabolism, e.g., salicylates. | |
| Dose and administration | **Adult:**  **Anticoagulant - induced prothrombin deficiency –caused by coumarins derivatives**  IM or slow IV: 2.5mg - 10 mg or up to 25 mg (rarely 50 mg)  Oral: 2.5mg - 10 mg or up to 25 mg (rarely 50 mg)  **Hypoprothrombinaemia due to other causes (antibiotics, salicylates or other drugs, factors limiting absorption or synthesis)**  IM or slow IV**:** 2.5 mg - 25 mg or more (rarely up to 50mg)  Oral: 2.5mg - 10 mg or up to 25 mg (rarely 50 mg)  **Pediatric:**  **Prophylaxis of haemorrhagic disease of the newborn:** IM  Neonate: 0.5–1 mg as single dose at birth  **Prophylaxis of haemorrhagic disease of the newborn**: oral  Neonate: 2 mg followed by a second dose after 4–7 days and, for breastfed babies, a third dose after 1 month  **Prophylaxis of haemorrhagic disease of the newborn**: IV  Pre-term neonate: 400 micrograms/ kg (maximum 1 mg)  **Haemorrhagic disease of the newborn:** IV  Neonate: 1 mg with further doses if necessary every 8 hours  **Warfarin-induced hypoprothrombinaemia with no or minor bleeding**: IV  **Child 1 month–12 years**:15–30 micrograms/ kg (maximum 1 mg) as a single dose, repeated as necessary  **Warfarin-induced hypoprothrombinaemia: Reversal of anticoagulation or if significant bleeding, treatment of haemorrhage associated with vitamin K deficiency:** IV  **Child 1 month–12 years:** 250–300 micrograms/kg (maximum 10 mg) as a single dose | |
| Contraindications | * pe Hypersensitivity to the drug | |
| Drug interactions | Coumarin anticoagulants | |
| Side effects | Flushing, dyspnoea, bronchospasm; dizziness, hypotension, respiratory or circulatory collapse, injection site reactions, cyanosis and hyperbilirubinemia (in premature neonates). | |
| Cautions | Hepatic impairment and not used an antidote to heparin. | |
| Storage condition | Store below 30°C. Protected from light and do not freeze. | |
| **Protamine sulfate** | | |
| Pharmacological class | Anticoagulant reversal agents, heparin antidote | |
| Dosage form | Injection: 10 mg/ml in 5 ml ampoule | |
| Indications | Antidote to over dosage with heparin. | |
| Dose and administration | **Adult:**  **Over dosage with intravenous injection of unfractionated heparin:**  By IV Injection  Dose to be administered at a rate not exceeding 5 mg/minute, 1mg neutralises 80–100 units heparin when given within 15 minutes; maximum 50 mg.  **Over dosage with intravenous infusion of unfractionated heparin:**  By IV Injection  25–50 mg, to be administered once heparin infusion stopped at a rate not exceeding 5 mg/minute  **Over dosage with subcutaneous injection of unfractionated heparin:**  By IV Injection  Initially 25–50 mg, to be administered at a rate not exceeding 5 mg/minute, 1mg neutralizes 100 units heparin, then (by intravenous infusion), any remaining dose to be administered over 8–16 hours; maximum 50 mg per course  **Over dosage with subcutaneous injection of low molecular weight heparin:**  By IV Injection, or by continuous IV Infusion  Dose to be administered by intermittent intravenous injection at a rate not exceeding 5 mg/minute, 1mg neutralizes approx. 100 units low molecular weight heparin: maximum 50mg | |
| Contraindications | Hypersensitivity to the drug, previous treatment with protamine or protamine insulin, fish allergies, and men who are infertile or who have had a vasectomy. | |
| Drug interactions | Mifepristone, macrolides, barbiturates, sulphonamides, thyroid hormones, quinine and heparin | |
| Side effects | Nausea, vomiting, flushing, hypotension, bradycardia, dyspnoea, allergic reactions including angioedema and anaphylaxis; pulmonary hypertension and pulmonary oedema. | |
| Cautions | Allergy to fish | |
| Storage condition | Store below 30° C. Protect from light and moisture. | |
| **Tranexamic acid** | | |
| Pharmacological class | * a Anti-fibrinolytic agents | |
| Dosage form | Tablet: 500 mg, 650 mg,  Capsule: 250 mg,  Injection: 100 mg/ml in 10 ml ampoule | |
| Indications | Treatment of general and local fibrinolysis, Menorrhagia, Hereditary angioedema, epistaxis  Prevention and treatment of significant haemorrhage following trauma | |
| Dose and administration | **Adult:**  **Local fibrinolysis:**  Oral: 1–1.5 g 2–3 times a day, alternatively15–25 mg/kg 2–3 times a day.  By Slow IV Injection: Initially 0.5–1 g 2–3 times a day, to be administered at a rate not exceeding 100 mg/minute, followed by (by continuous intravenous infusion) 25–50 mg/kg if required, dose to be given over 24 hours.  **General fibrinolysis:**  By Slow Intravenous Injection: 1 g every 6–8 hours, alternatively 15 mg/kg every 6–8 hours, dose to be given at a rate not exceeding 100 mg/minute  **Menorrhagia:**  Oral: 1 g 3 times a day for up to 4 days, to be initiated when menstruation has started; maximum 4 g per day.  **Hereditary angioedema:**  Oral: 1–1.5 g 2–3 times a day, for short-term prophylaxis of hereditary angioedema, tranexamic acid is started several days before planned procedureswhich may trigger an acute attack of hereditary angioedema (e.g. dental work) and continued for 2–5 days afterwards  **Epistaxis:**  Oral: 1-1.5 g 3 times a day for 7 days.  **Prevention and treatment of significant haemorrhage following trauma:**  By Slow IV Injection: Loading dose 1 g to be given over 10 minutes, treatment should commence within 8 hours of injury, followed by (by intravenous infusion) 1 g to be given over 8 hours | |
| Contraindications | Hypersensitivity to the drug, acquired defective colour vision, subarachnoid haemorrhage, active intravascular clotting and convulsions. | |
| Drug interactions | Anticoagulants such as warfarin, heparin; factor XI, estrogens, tretinoin and NSAIDs such as aspirin (high dose), ibuprofen, naproxen | |
| Side effects | Diarrhoea, nausea, vomiting, allergic dermatitis, colour vision changes, hypotension, embolism and thrombosis. | |
| Cautions | Renal impairment, vascular disease, thromboembolism and DIC | |
| Storage condition | Store below 30° C. Protect from light and moisture. | |
| **Desmopressin** | | | |
| Pharmacological class | Non-peptide antidiuretic hormone | | |
| Dosage form | Injection: 4 micrograms/ml (as acetate) in 1 ml ampoule,  Nasal spray: 10 micrograms (as acetate) per dose,  Tablet: 60 mcg, 120 mcg, 240 mcg | | |
| Indications | Management of mild to moderate haemophilia and von Willebrand’s Disease | | |
| Dose and administration | **Adult:**  **Mild to moderate haemophilia and von Willebrand’s disease:**  By Intranasal administration:  **Patient weight <50 kg:** 150 mcg (1 spray) in a single nostril.  **Patient weight ≥50 kg:** 150 mcg (1 spray) in each nostril (total dose: 300 mcg).  By IV Infusion, or By SC Injection: 0.3microgram/kg for 1 dose over 15- 30 min, to be administered immediately 30 min before surgery or after trauma; may be repeated at intervals of 12 hours  **Fibrinolytic response testing:**  By Intranasal:300 micrograms, blood to be sampled after1 hour for fibrinolytic activity, one 150 microgram spray to be administered into each nostril.  By SC/IV Injection: 300 nanograms/kg for 1 dose, blood to be sampled after 20 minutes for fibrinolytic activity. | | |
| Contraindications | Hypersensitivity to the drug, hyponatremia or history of hyponatremia, moderate to severe renal impairment. | | |
| Drug interactions | Tricyclic antidepressants, selective serotonin re-uptake inhibitors, chlorpromazine and carbamazepine, NSAIDs, clofibrate and antihypertensive. | | |
| Side effects | Hyponatremia, headache, nausea, skin and general allergic reactions, conjunctivitis, asthenia and hypertension. | | |
| Cautions | Type IIB von Willebrand disease, in patients with habitual or psychogenic polydipsia, acute myocardial infarction, cerebrovascular thrombosis and pregnancy. | | |
| Storage condition | Store below 30° C. Protect from light and moisture. | | |

# Blood Products of Human Origin and Plasma Substitutes

## Human immunoglobulins

Human immunoglobulins, also known as antibodies, are essential components of the immune system responsible for recognizing and neutralizing foreign invaders such as bacteria, viruses, and toxins. Human immunoglobulins are manufactured from pooled plasma donations from healthy donors using various procedures (enzymatic and/or chemical treatment as well as chromatographic techniques). Immunoglobulin preparations for subcutaneous or intramuscular (SC/IMIG) and intravenous (IVIG) application differ with respect to manufacturing, protein content and tolerance. These immunoglobulin preparations are used therapeutically to treat various immune deficiencies, autoimmune disorders, and certain inflammatory conditions

Overall, human immunoglobulins are vital components of the immune system, providing protection against a wide range of pathogens and contributing to the maintenance of overall health and immunity.

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| **Anti-D immunoglobulin** | |
| Pharmacological class | Human Immunoglobulins |
| Dosage form | Injection: 250 micrograms in single dose vial; 300 micrograms in single dose vial |
| Indications | Prevention of Rh(D) immunisation in Rh(D) negative childbearing age women   * Antenatal prophylaxis   Planned antenatal prophylaxis   * Antenatal prophylaxis following complications of pregnancy * Postnatal prophylaxis   Delivery of a Rh(D) positive (D, Dweak, Dpartial) baby  Immune thrombocytopenia |
| Dose and Administration | **Prevention of Rh(D) immunisation in Rh(D) negative women,** IM:  Antenatal prophylaxis: Administered doses range from 50 – 330 micrograms or 250 - 1650 IU.  **Planned antenatal prophylaxis:**  A single dose (e.g. 250 micrograms or 1250 IU) at 28 - 30 weeks of gestation or two doses at 28 and 34 weeks  **Antenatal prophylaxis following complications of pregnancy:**  A single dose (e.g. 125 micrograms or 625 IU before the 12th week of pregnancy) (e.g. 250 micrograms or 1250 IU after the 12th week of pregnancy) should be administered as soon as possible and within 72 hours and if necessary repeated at 6 – 12-week intervals throughout the pregnancy.  **Postnatal prophylaxis:** administered doses range from 100 – 300 micrograms or 500 – 1500 IU. If the lower dose (100 micrograms or 500 IU) is administered, then testing of the amount of foetal maternal haemorrhage should be performed. Dose should be administered to the mother as soon as possible within 72 hours of delivery of an Rh positive (D, Dweak, Dpartial) infant. If more than 72 hours have elapsed, the product should not be withheld but administered as soon as possible.  **Immune thrombocytopenia (ITP)**  Initial:  Hemoglobin ≥10 g/dL: 50 mcg/kg as a single injection, or can be given as 2 divided doses on separate days.  Hemoglobin 8 to <10 g/dL: 25 to 40 mcg/kg, as a single injection, or can be given as 2 divided doses on separate days.  Hemoglobin <8 g/dL: Alternative treatment should be used.  Maintenance: Note: Dosing frequency determined by clinical response in platelet counts, RBC, hemoglobin, and reticulocyte levels.  Hemoglobin ≥10 g/dL: 50 to 60 mcg/kg  Hemoglobin 8 to <10 g/dL: 25 to 40 mcg/kg  Hemoglobin <8 g/dL: Alternative treatment should be used. |
| Contraindications | Hypersensitivity to the drug and hypersensitivity to human immunoglobulins. |
| Drug interactions | Live attenuated virus vaccines |
| Side effects | Anaemia, renal insufficiency, intravascular haemolysis and fever. |
| Cautions | New-born infant, avoid live vaccines for 3 month and IgA deficiency. |
| Storage condition | Store in a refrigerator (2°C-8°C). Do not freeze |
| **Anti-rabies immunoglobulin** | |
| Pharmacological class | Human Immunoglobulins |
| Dosage form | Injection: 150 IU/ml in vial. |
| Indications | Post-exposure prophylaxis of rabies infection in persons after exposure to scratches, bites or other injuries. |
| Dose and administration | **Adult:**  **Post-exposure prophylaxis of rabies infection in persons after exposure to scratches, bites or other injuries including mucous membrane contamination with infectious tissue, such as saliva, caused by a suspected rabid animal:**  By local infiltration or by IM injection; 20 units/kg (0.133 ml/kg) within 7 days of exposure.  **Pediatrics:**  **Infant, children and adolescent:**  By local infiltration or by IM injection; 20 units/kg (0.133 ml/kg) within 7 days of exposure. |
| Contraindications | There is no absolute contraindication |
| Drug interactions | Rabies immunoglobulins and vaccine must never be combined in the same syringe |
| Side effects | Allergic reactions, fever, numbness, muscle weakness, headache, tachycardia, hypotension and soreness at the site of injection |
| Cautions | Transmissible infectious agents, thrombosis, and risk of haemolysis. |
| Storage condition | Store in a refrigerator (2°C-8°C). Do not freeze. |
| **Anti-tetanus immunoglobulin** | |
| Pharmacological class | Human Immunoglobulins |
| Dosage form | Injection: 250 IU, 500 IU in vial. |
| Indications | Post-exposure prophylaxis and therapy of clinically manifest tetanus. |
| Dose and administration | **Adult:**  **Prophylaxis, IM**: 250 units single dose  **Treatment of active tetanus, IM**: 3000–6000 units  **Pediatric:**  **Prophylaxis, IM:**  **Child <7 years old:** 4 units/kg or 250 units a single dose  **Child over 7 years old**: 250 units single dose  **Treatment, IM:** Child:3000–6000 units |
| Contraindications | Hypersensitivity to the drug and to human immunoglobulins |
| Drug interactions | Live attenuated Virus vaccines and immunosuppressive therapies |
| Side effects | Anaphylactic reaction, hypotension, arthralgia, chest pain, dizziness, dyspnoea, face oedema, oral disorders, tremor, redness, warmth and induration myalgia |
| Cautions | Pregnancy |
| Storage condition | Store in a refrigerator (2°C-8°C). Do not freeze |
| **Hepatitis B Immunoglobulin** | |
| Pharmacological class | Human Immunoglobulins |
| Dosage form | Injection: 1500 - 2000 units /bottle |
| Indications | Prevention of hepatitis B in case of accidental exposure in non-immunised subjects or in subjects who have had no more than a single dose of vaccine  Prevention of hepatitis B in the newborn, of a hepatitis B carrier-mother  In haemodialyzed patients, until vaccination has become effective. |
| Dose and administration | **Prevention of hepatitis B in case of accidental exposure in non-immunised subjects:**  At least 500 IU, depending on the intensity of exposure, as soon as possible after exposure, and preferably within 24 - 72 hours.  **Prevention of hepatitis B in the newborn, of a hepatitis B virus carrier-mother, at birth or as soon as possible after birth:**  30-100 IU/kg may need to be repeated until seroconversion following vaccination.  **Immunoprophylaxis of hepatitis B in haemodialyzed patients:**  8-12 IU/kg with a maximum of 500 IU, every 2 months until seroconversion following vaccination.  **Post-exposure prophylaxis:**  **Infants <12 months**: IM: 0.5 ml as soon as possible after exposure (eg, mother or primary caregiver with acute HBV infection); initiate hepatitis B vaccine series  **Children ≥12 months and Adolescents:** IM: 0.06 ml/kg as soon as possible after exposure (ie, within 24 hours of needle stick, ocular, or mucosal exposure or within 14 days of sexual exposure); repeat at 28 to 30 days after exposure |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Live attenuated virus vaccines. |
| Side effects | Chest pain, dyspnoea, tremor, dizziness, facial oedema, glossitis, buccal ulceration, and arthralgia. |
| Cautions | Immunoglobulin A deficiency and severe thrombocytopenia or any coagulation disorder |
| Storage condition | Store in a refrigerator (2 ºC to 8ºC). Do not freeze. |
| **Normal human immunoglobulin** | |
| Pharmacological class | Human Immunoglobulins |
| Dosage form | Solution for injection: 5% and 10% protein solution (iv use); 15% and 16% protein solution (subcutaneous use); 16% protein solution (IM use) |
| Indications | In primary immunodeficiency syndromes (PID) and secondary immunodeficiency (SID) replacement therapy, treatment of Guillain Barre syndrome and chronic inflammatory demyelinating polyradiculoneuropathy (CIDP) |
| Dose and administration | **Pediatric and adult:**  **Replacement therapy in primary immune deficiencies: IV infusion:**  Initial loading dose, administer until serum IgG level is > 6 g/L  **Replacement therapy in primary immune deficiencies, IV, IM, or SC** (depending on formulation):  Maintenance dose, normally 400–800 mg/kg/month, titrated according to inter current infections or trough serum IgG level. IV doses may be given at 1-, 2-, 3-, or 4-week intervals. SC doses may be given at 1-, 2-, 3-, 4-, or 7-day intervals.  **Kawasaki disease: IV infusion:**  2 g/kg as a single dose, given over 10–12 hours; if signs and symptoms persist, retreatment with a second 2 g/kg infusion should be considered; must be used in combination with acetylsalicylic acid  **Guillain Barre syndrome:**  0.4 g/kg/day over 5 days (possible repeat of dosing in case of relapse).  **Chronic inflammatory demyelinating polyneuropathy (CIDP):**  Starting dose: 2 g/kg divided over 2 to 5 consecutive days  Maintenance doses: 1 g/kg over 1 to 2 consecutive days every 3 weeks. |
| Contraindications | Hypersensitivity to the drug or blood products.  Uncompensated diabetes, other known glucose intolerances, hyperosmolar coma, hyperglycaemia, and hyperlactatemia and patients with selective IgA deficiency who developed antibodies to IgA |
| Drug interactions | Live attenuated virus vaccines, loop diuretics |
| Side effects | Chills, headache, dizziness, fever, vomiting, allergic reactions, nausea, arthralgia, low blood pressure and moderate low back pain, reversible haemolytic reactions, transient cutaneous reactions and thromboembolic reactions. |
| Cautions | Thrombocytopenia, coagulation disorders, elderly and obese patients. |
| Storage condition | Store in a refrigerator (2°C–8°C). Do not freeze. |

## Blood coagulation factors

Blood coagulation factors are a group of proteins that play essential roles in the complex process of blood clotting, also known as haemostasis. The process of blood coagulation involves a cascade of sequential and interdependent reactions that ultimately result in the formation of a stable blood clot.

Disorders affecting blood coagulation factors can lead to bleeding disorders, such as haemophilia and von willebrand disease, or thrombotic disorders, such as deep vein thrombosis and pulmonary embolism. Understanding the roles and interactions of blood coagulation factors is essential for diagnosing and managing these conditions and for developing therapies to regulate hemostasis effectively.

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| **Coagulation factor VIII** | |
| Pharmacological class | Blood coagulation factor |
| Dosage form | Powder for injection: 250 IU, 500 IU, 1000 IU in vial |
| Indications | Control of haemorrhage in haemophilia A, acquired factor VIII deficiency, Von Willebrand’s disease (if the product is not a recombinant) |
| Dose and Administration | **Adult:**  **Haemophilia A,** slow IV infusion:  Administer according to patient’s needs and specific preparation used. For every 1 IU/kg of factor VIII activity administered, factor VIII level should increase by 2 IU/ml (or 2%); calculated dosage should be adjusted to the actual vial size.  Calculation for units required, based on desired increase in factor VIII (% of normal): IU required = body weight (kg) × 0.5IU/kg × desired increase in factor VIII (IU/ml or % of normal)  Note: This calculation assumes the patient’s baseline factor VIII level is < 1%. |
| Contraindications | Hypersensitivity to the drug and emicizumab |
| Drug interactions | Activated prothrombin complex concentrates. |
| Side effects | Arthralgia, rash, chills and fever; headache, urticaria, pseudo thrombocytopenia, elevated ALT, injection site reaction, pyrexia, and diarrhoea. |
| Cautions | Intravascular haemolysis after large or frequently repeated doses in patients with blood groups A, B or AB and possibility of pathogen transmission. |
| Storage condition | Store in a refrigerator at a temperature of 2°C to 8°C). Do not freeze. |
| **Coagulation factor IX** | |
| Pharmacological class | Blood coagulation factor |
| Dosage form | Powder for injection (extended half-life), 250 IU, 500IU, 1000IU |
| Indications | Replacement therapy for factor IX deficiency in haemophilia B or bleeding due to deficiencies of factors II, VII or X as well as IX. |
| Dose and administration | **Adult:**  **Replacement therapy for factor IX deficiency in haemophilia B or bleeding due to deficiencies of factors II, VII or X as well as IX:**  By slow IV infusion: Administer according to patient’s needs and specific preparation used.  Calculation for units required, based on desired increase in factor IX (% of normal):  IU required = body weight (kg) × 1IU/kg × desired increase in factor IX (IU/ml or % of normal)  **Pediatric:**  **Neonate, infant** or **child:**  Number of factor IX IU required = body weight (kg) × desired factor IX level increase (% normal) × 1.4 IU/kg.  **Neonate, infant** or **child:**  Number of factor IX IU required = body weight (kg) × desired factor IX level increase (% normal) × 1 IU/kg.  General guidelines  Minor spontaneous haemorrhage, prophylaxis  Desired levels of factor IX for haemostasis: 15–25%  Initial loading dose to achieve desired level: Up to 20–30 IU/kg  Frequency of dosing: Every 12–24 hours  Duration of treatment: 1–2 days  Moderate haemorrhage  Desired levels of factor IX for haemostasis: 25–50%  Initial loading dose to achieve desired level: 25–50 IU/kg  Frequency of dosing: Every 12–24 hours  Duration of treatment: 2–7 days  Major haemorrhage  Desired levels of factor IX for haemostasis: >50%  Initial loading dose to achieve desired level: 30–50 IU/kg  Frequency of dosing: Every 12–24 hours, depending on half-life and measured factor IX levels (after 3–5 days, maintain at least 20% activity)  Duration of treatment: 7–10 days, depending upon nature of insult  Surgery  Desired levels of factor IX for haemostasis:50–100%  Initial loading dose to achieve desired level:50–100 IU/kg  Frequency of dosing: Every 12–24 hours, depending on half-life and measured factor IX levels  Duration of treatment: 7–10 days, depending upon nature of insult |
| Contraindications | Hypersensitivity to the drug and mouse or hamster protein, fibrinolysis, disseminated intravascular coagulation. |
| Drug interactions | There is no known significant drug interaction. |
| Side effects | Allergic reactions including chills and fever, flushing, headache, nausea, vomiting, urticarial, disseminated intravascular coagulation and thrombosis. |
| Cautions | Liver dysfunction, postoperative period, neonates. |
| Storage condition | Store in a refrigerator at 2°C to 8°C. Do not freeze. |
| **Coagulation factor IX complex** | |
| Pharmacological class | Blood coagulation factor |
| Dosage form | Powder for injection: 500 IU; 1000 IU in vial |
| Indications | Prevention and control of haemorrhagic episodes. |
| Dose and administration | **Adult:**  **Haemophilia B:**  Dose: Number of Factor IX IU required = body weight (kg) x desired increase in plasma Factor IX (%) x 1.2 IU/kg  **Management of bleeding:**  Minor: Single dose of 25-35 IU/kg IV x 1 dose; may repeat dose after 24 hr  Moderate: 40-55 IU/kg/day IV x 2 days or until adequate wound healing  Major: 60-70 IU/kg/day IV x 2-3 days or until adequate wound healing  **Management of surgical procedures:**  Minor: 50-60 IU/kg IV on day of surgery, decrease to 25-55 IU/kg/day during initial postop period (i.e., 1st to 2nd week)  Major: 70-95 IU/kg IV on day of surgery, decrease to 35-70 IU/kg/day during initial postop period (i.e., 1st to 2nd week), THEN 25-35 IU/kg/day late postop period (i.e., 3rd week onwards). |
| Contraindications | Hypersensitivity to the drug, known allergy to heparin or history of heparin-induced thrombocytopenia. |
| Drug interactions | Oral tranexamic acid. |
| Side effects | Disseminated intravascular coagulation, anaphylactic reactions, headache, tachycardia, dyspnoea, bronchospasm, wheezing, cough, angioedema, facial oedema, rash, pruritus and infusion site reactions. |
| Cautions | Risk of transmitting infectious agents (e.g., viruses), in patients with thromboembolic events such as DVT, PE or thrombotic stroke. |
| Storage condition | Store in a refrigerator (2°C to 8°C). Do not freeze. |

## Plasma substitutes

Plasma substitutes, also known as plasma expanders or volume expanders, are solutions administered intravenously to increase the volume of circulating blood plasma. They serve as alternatives to blood transfusions in situations where there is a need to expand blood volume, such as in cases of hypovolemia (low blood volume) or shock, without the necessity of administering whole blood or blood components.

Plasma substitutes are primarily used to maintain adequate blood pressure and tissue perfusion, thereby preventing organ damage and promoting recovery. They are particularly valuable in emergency situations, trauma care, surgery, and certain medical conditions where rapid volume expansion is crucial.

The choice of plasma substitute depends on various factors, including the clinical scenario, patient's condition, volume status, electrolyte balance, and underlying comorbidities. However, it's essential to consider potential adverse effects and contraindications associated with each type of plasma expander, such as allergic reactions, coagulopathy, renal impairment, and tissue oedema.

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| **Albumin** | |
| Pharmacological class | [Volume expanders](https://www.drugs.com/drug-class/plasma-expanders.html) |
| Dosage form | Solution: 20% |
| Indications | Restoration and maintenance of circulating blood volume where volume deficiency has been demonstrated, and use of a colloid is appropriate. |
| Dose and Administration | **Adult:**  **Adult respiratory distress syndrome:25% albumin:**  IV: 25 g over 30 minutes (in combination with furosemide); may repeat at 8 hours (if necessary) for 3 days; titrate to fluid loss and normalization of serum total protein.  **Cirrhotic ascites, therapeutic large volume paracentesis (adjunctive agent): 25% albumin:**  IV: 6 to 8 g for every liter removed or 50 g total for paracentesis >5 L. Note: Administer at the time of or soon after the procedure to avoid postparacentesis complications (eg, hypovolemia, hyponatremia, kidney impairment).  **Hypovolemia:**  IV: Initial: 12.5 to 25 g (250 to 500 ml); repeat after 15 to 30 minutes as needed (if hemodynamic stability is not achieved). Note: In patients with sepsis or septic shock, may consider after inadequate response to large volumes of crystalloid therapy.  **Ovarian hyperstimulation syndrome (treatment):**  25% albumin: IV: 50 to 100 g over 4 hours; repeat at 4 to 12 hours intervals as needed.  **Plasma exchange, therapeutic: 5% albumin:** IV: Titrate dose to plasma volume removed during procedure. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | There is no known significant drug interaction. |
| Side effects | Hypersensitivity, generalised or localised allergic reactions, anaphylactic shock, non-cardiogenic pulmonary oedema, feeling of burning and tingling at the injection site, chills and fever. |
| Cautions | Decompensated cardiac insufficiency, hypertension, esophageal varices, pulmonary oedema, haemorrhagic diathesis, severe anaemia, renal and post-renal anuria. |
| Storage condition | Store below 30°C. Do not freeze. |
| **Dextran (Mw 40,000)** | |
| Pharmacological class | Volume expander |
| Dosage form | Solution: 10%w/v in 5% dextrose |
| Indications | In cases where capillary circulation slows down (shock, burns, fat emboli, pancreatitis, peritonitis and paralytic ileus), arterial and venous circulation failures (gangrene threat, leg ulcers, Raynaud disease, non-haemorrhagic cerebral vessel diseases, and prophylaxis of the thromboembolic events seen after trauma), in vascular surgery and plastic surgery and in open heart surgeries. |
| Dose and administration | **Adult:**  **In cases where capillary circulation slows, such as shock:**  IV infusion: No more than 20ml/kg during first 24hours; then 10ml/kg/day  **In case of Arterial and venous circulation failures:**  500 – 1000 ml /kilogram in the first 24 hours; then 500 ml in the next day and then every other day for at most 2 weeks  **Prophylaxis of the thromboembolic events seen after surgery and trauma:**  IV infusion: 500 – 100 ml (10 – 20 ml/kilogram)  Infusion should be started during the surgery or just after the trauma. The cure may be completed by administering 500 ml more in the next day.  **Vascular surgery and plastic surgery:**  IV infusion: 500 ml (approximately 10 ml/kg) during surgery then 500 ml after the surgery and 500 ml more is administered in the day after the surgery and then every other day for at most two weeks.  **Open-heart surgeries:**  IV infusion: is added to the perfusion liquid about 10 – 20 ml/kilogram.  **Pediatric:**  **Shock,** IV infusion: Initial dose 10ml/kg infused rapidly, no more than 20ml/kg/24hours, then no more than 10ml/kg/day, for not more than 5days |
| Contraindications | Hypersensitivity to the drug, marked hemostatic defects (eg, thrombocytopenia, hyperfibrinogenaemia), marked cardiac decompensation and severe renal disease with oliguria or anuria |
| Drug interactions | Corticoids/steroids and carbenoxolone. |
| Side effects | Anaphylactic reactions, electrolyte disorders, thrombocytopenia, phlebitis, acute renal failure and acidosis. |
| Cautions | Hypertension, congestive heart failure, peripheral or pulmonary oedema, failed kidney functions, preeclampsia condition, aldosteronism and active haemorrhage. |
| Storage condition | Store below 30°C. |
| **Dextran (Mw 70,000)** | |
| Pharmacological class | [Volume Expanders](https://reference.medscape.com/drugs/critical-care#volume-expanders) |
| Dosage form | Solution: 6%w/v in 5% dextrose |
| Indications | It is used in the prophylaxis and treatment of shocks. |
| Dose and administration | **Adult:**  **Shock,** IV infusion:  No more than 20ml/kg during first 24hours; then 10ml/kg/day  **Pediatric:**  **Shock,** IV infusion:  Initial dose 10ml/kg infused rapidly, no more than 20ml/kg/24hours, then no more than 10ml/kg/day, for not more than 5days |
| Contraindications | Hypersensitivity to the drug, thrombocytopenia, hyperfibrinogenaemia, marked cardiac decompensation; renal disease with severe oliguria or anuria, hypervolemia conditions and in severe bleeding diseases |
| Drug interactions | There is no significant interaction seen. |
| Side effects | Thrombocytopenia, venous thrombosis, hypovolemia, anaphylaxis, phlebitis, acute renal failure, acidosis, pulmonary oedema and wheezing |
| Cautions | Congestive conditions, pulmonary oedema, trauma, major surgical patients, liver failure and renal failure. |
| Storage condition | Store below 30°C. |

## Blood and blood components

Blood and its components are vital to the functioning of the human body, serving essential roles in oxygen transport, immune defence, and tissue repair. Blood is composed of various cellular elements suspended in a liquid matrix called plasma. The components of blood can be broadly categorized into cellular components (Red blood cells (erythrocyte), white blood cells (leukocytes), platelets (thrombocytes)) and plasma components (water, plasma proteins, electrolytes).

Blood transfusions involve the administration of whole blood or specific blood components to replace lost blood volume, restore oxygen-carrying capacity, or treat specific deficiencies or disorders. Blood components such as packed red blood cells, platelets, fresh frozen plasma, and cryoprecipitate can be transfused individually based on patient needs

Blood transfusions are commonly used in the treatment of anaemia, acute blood loss, coagulation disorders, and certain medical and surgical conditions. However, they carry risks of transfusion reactions, infection transmission, and immune sensitization, so their use should be carefully considered and monitored

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| **Cryoprecipitate** | |
| Pharmacological class | * Blood component |
| Dosage form | One unit :317-433 ml (39-44 gm)  Injection: frozen liquid in bag or lyophilized powder in vial containing:  - > 50 IU Factor VIII  - > 100 IU vWF  - > 140 mg clottable fibrinogen per unit |
| Indications | Fibrinogen, Factor XIII, Factor VIII, and Von Willebrand Factor Replacement |
| Dose and Administration | **Pediatric and Adult:**  **Fibrinogen Replacement:**  1 unit/5kg patient weight will increase fibrinogen by about 100mg/dl.  Number of bags = 0.2 x weight (kg) to provide about 100mg/dl fibrinogen.  **Factor XIII Replacement:**  1 unit/5kg patient weight will provide 10Units/kg of factor XIII  Number of bags = 0.2 x weight (kg) and dosed every 3-6 weeks.  **Factor VIII Replacement:**  In emergency situations, assume a desired increase of 100% for a loading dose.  TBV (ml) = 70 ml/kg x weight (kg)  PV (ml) = TBV x (1-Hct)  Number of bags = [Desired activity (%) – Current activity (%)] x PV / 80  Dosing should be repeated every 8-12 hours but will vary with each patient.  **Von Willebrand Factor Replacement:**  Dosing of 1 unit/10kg patient weight will usually be enough.  Number of bags = 0.1 x weight (kg)  Repeat dosing may be required every 8-12 hours for up to 3 days followed by once daily dosing. |
| Contraindications | Isolated factor deficiencies of factor VIII, von Willebrand factor, or factor XIII |
| Drug interactions | There is no known significant drug interaction. |
| Side effects | Haemolytic transfusion reactions, febrile non-hemolytic reactions, allergic reactions, septic reactions, transfusion related acute lung injury, circulatory overload, transfusion associated graft versus host disease and post-transfusion purpura. |
| Cautions | Cardiac disease and electrolyte imbalance. |
| Storage condition | Stored at a core temperature of -30°C. |
| **Cryoprecipitate, pathogen-reduced** | |
| Pharmacological class | Blood component |
| Dosage form | Injection: frozen liquid in bag or lyophilized powder in vial containing:  > 50 IU Factor VIII  > 100 IU vWF  > 140 mg clottable fibrinogen per unit |
| Indications | Fibrinogen, Factor XIII, Factor VIII, and Von Willebrand Factor Replacement |
| Dose and administration | **Pediatric and Adult:**  **Fibrinogen Replacement:**  1 unit/5kg patient weight will increase fibrinogen by about 100mg/dl.  Number of bags = 0.2 x weight (kg) to provide about 100mg/dl fibrinogen.  **Factor XIII Replacement:**  1 unit/5kg patient weight will provide 10Units/kg of factor XIII  Number of bags = 0.2 x weight (kg) and dosed every 3-6 weeks.  **Factor VIII Replacement:**  In emergency situations, assume a desired increase of 100% for a loading dose.  TBV (ml) = 70 ml/kg x weight (kg)  PV (ml) = TBV x (1-Hct)  Number of bags = [Desired activity (%) – Current activity (%)] x PV / 80  Dosing should be repeated every 8-12 hours but will vary with each patient.  **Von Willebrand Factor Replacement:**  Dosing of 1 unit/10kg patient weight will usually be enough.  Number of bags = 0.1 x weight (kg)  Repeat dosing may be required every 8-12 hours for up to 3 days followed by once daily dosing. |
| Contraindications | Hypersensitivity reaction to psoralens, neonatal patients treated with phototherapy devices and if recombinant or specific virally inactivated factor preparations are available. |
| Drug interactions | Refer to cryoprecipitate |
| Side effects | Refer to cryoprecipitate |
| Cautions | Refer to cryoprecipitate |
| Storage condition | Stored at a core temperature of -30°C. |
| **Fresh-frozen plasma (FFP)** | |
| Pharmacological class | Blood component |
| Dosage form | One unit: 50-70 ml (80-285 gm) |
| Indications | Correction of congenital or acquired deficiencies of clotting factors, reconstitution of whole blood for exchange transfusions and treatment of Thrombotic Thrombocytopenic Purpura (TTP). |
| Dose and administration | **Management/Prevention of Bleeding:**  IV: 10-20 ml/kg of body weight will increase factor levels by 20-30%.  In adults and large children, dosing is rounded to the nearest number of units  Number of units = Desired dose (ml) / 200 ml/unit  **Coagulation Factors Replacement:**  IV: 10-15 ml/kg initially; this should increase plasma coagulation factors by ~15-25%  **Thrombotic Thrombocytopenic Purpura (TTP):**  IV: 1-1.5 plasma volumes correspond to 40-60 ml/kg |
| Contraindications | History of hypersensitivity to the drug or to plasma-derived products including any plasma protein, IgA deficiency and severe protein S deficiency |
| Drug interactions | There is no significant drug interaction |
| Side effects | Chills, fever, urticaria, transfusion-related acute lung injury (TRALI), viral transmission (hepatitis, HIV, etc.), sepsis, citrate toxicity in neonates, transfusion-associated circulatory overload, anaphylaxis and allergic reactions. |
| Cautions | vitamin K deficiency or warfarin reversal, heart failure, pulmonary oedema and specific protein deficiencies. |
| Storage condition | Store at a temperature -30°C or below. |
| **Platelets** | |
| Pharmacological class | * Bl Blood component |
| Dosage form | One unit: 150- 250 ml (81-102 gm) |
| Indications | For thrombocytopenia or platelet dysfunction to treat active platelet-related bleeding. |
| Dose and administration | **Adult:**  6 whole blood derived platelets, raise the platelet count by 30,000-60,000/uL in a 70 kg patient.  **Pediatric:**  **Neonates and child <10 kg:** Transfusion of 5–10 ml/kg should raise the platelet count by 40–50,000/mm3  **Child >10 kg:** Transfusion of 1 unit of whole blood derived platelets per 10 kg should raise the platelet count by 50,000/mm3.  Transfused platelets have a short life span and will need to be reinfused if platelet count is not achieved |
| Contraindications | Thrombotic thrombocytopenic purpura, haemolytic uremic syndrome and heparin-induced thrombocytopenia, immune thrombocytopenia |
| Drug interactions | There is no significant drug interaction |
| Side effects | Refer Fresh-frozen plasma |
| Cautions | In patients with post transfusion purpura |
| Storage condition | Store at 20°C to 24°C. |
| **Red blood cells** | |
| Pharmacological class | Blood component |
| Dosage form | One unit: 317-433 ml (386-508 gm) |
| Indications | Treatment chronic anaemia and acute and preoperative blood loss |
| Dose and administration | **Adult and pediatric:**  **Treatment of anaemia without active bleeding or haemolysis:**  1 unit increase haemoglobin 1 g/dL in average sized adults: usually given over 1-2 hours but not longer than 4 hours  **Treatment of anaemia with active bleeding or haemolysis:**  transfuse to haemoglobin >10 g/dL  **Use in pregnancy:**  Pregnancy less than 36 weeks gestation.  Hb<5.0 g/dL even without clinical signs of cardiac failure.  Hb between 5.0 – 7.0 g/dL with clinical signs of cardiac failure.  Pregnancy greater than 36 weeks gestation.  Hb<6.0 g/dL even without clinical signs of cardiac failure.  Hb between 6.0– 8.0 g/dL with clinical signs of cardiac failure and or infection.  Elective Caesarian section.  Hb 8.0 – 10.0 g/dL, confrm mother’s blood group and confrm availability of blood in the laboratory or the blood transfusion unit.  Hb <8.0 g/dL cross – match and reserve 2 units of blood. |
| Contraindications | Anaemia that can be corrected with a non-transfusion therapy (e.g., iron therapy) |
| Drug interactions | There is no significant drug interaction |
| Side effects | Haemolytic transfusion reactions, febrile non-haemolytic reactions, allergic reactions including urticaria, anaphylaxis; and septic reactions. |
| Cautions | Cardiac disease, electrolyte imbalance and transfusion reaction. |
| Storage condition | Store between 2°C and 10°C. |
| **Whole blood** | |
| Pharmacological class | Blood component |
| Dosage form | One unit: 450ml (544-638 gm), 350 ml (421- 495gm), 200ml, 100ml |
| Indications | Treatment of severe anaemia and acute haemorrhage. |
| Dose and administration | As whole blood transfusion is limited to acutely haemorrhaging individuals, dosing should be based on the patient’s clinical condition, estimated blood loss, and other measures being used to maintain hemodynamic stability. |
| Contraindications | When component specific therapy is available (i.e., use RBCs to treat anaemia or use FFP to treat coagulopathy). |
| Drug interactions | There are no known significant drug interaction. |
| Side effects | Haemolytic transfusion reactions, febrile non-haemolytic reactions, allergic reactions ranging from urticaria to anaphylaxis, Circulatory Overload and septic reactions. |
| Cautions | Cardiac disease, arrhythmias, hyperkalemia, metabolic alkalosis, heart failure electrolyte imbalance and transfusion reaction. |
| Storage condition | Store at 2°C to 6°C. |

## Anti-platelet medicines

Antiplatelet medicines are a class of medications that work to inhibit platelet activation and aggregation, thereby preventing the formation of blood clots. Antiplatelet medicines are used to reduce the risk of thrombotic events in various clinical settings, including the prevention and treatment of cardiovascular diseases and helping to reduce the risk of thrombotic events and improve patient outcomes. Close monitoring and individualized treatment strategies are essential to ensure the safe and effective use of these medications.

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| **Acetylsalicylic acid** | |
| Pharmacological class | Anti-platelet agent |
| Dosage form | Tablet:81mg, 100 mg |
| Indications | For reducing the risk of vascular mortality in patients with a suspected acute myocardial infarction, unstable angina, transient ischemic attacks (TIA) and for secondary prevention of atherothrombotic cerebral infarction. |
| Dose and Administration | **Adult:**  **Cardiovascular disease (secondary prevention):**  oral: 75 mg daily  **Management of unstable angina and non-ST-segment elevation MI, management of ST-segment elevation MI:**  oral: 300 mg, chewed or dispersed in water followed by 75mg  **Suspected transient ischaemic attack:**  oral: 300 mg once daily until diagnosis established  **secondary prevention of deep-vein thrombosis (in patients who decline continued anticoagulation treatment) | Secondary prevention of pulmonary embolism (in patients who decline continued anticoagulation treatment):**  oral: 75 mg daily, alternatively 150 mg daily  **Management of unstable angina and non-ST-segment elevation myocardial infarction (NSTEMI) | Management of ST-segment elevation myocardial infarction (STEMI):**  Oral: 300 mg, chewed or dispersed in water followed by 75mg  **Acute ischaemic stroke:**  Oral: 300 mg once daily for 14 days, to be initiated 24 hours after thrombolysis or as soon as possible within 48 hours of symptom onset in patients not receiving thrombolysis.  **Atrial fibrillation following a disabling ischaemic stroke (before being considered for anticoagulant treatment):**  Oral: 300 mg once daily for 14 days  **Following disabling ischaemic stroke in patients receiving anticoagulation for a prosthetic heart valve and who are at significant risk of haemorrhagic transformation:**  Oral: 300 mg once daily, anticoagulant treatment stopped for 7 days and to be substituted with aspirin  **Pediatric:**  **prevention of thrombus formation after cardiac surgery:** oral  **Neonate:** 1–5 mg/kg once daily.  **Child 1 month–11 years:** 1–5 mg/kg once daily (max. per dose 75 mg)  **Child 12–17 years:** 75 mg once daily  **Kawasaki disease***:* oral  **Neonate:** Initially 8 mg/kg 4 times a day for 2 weeks or until afebrile, followed by 5 mg/kg once daily for 6–8 weeks; if no evidence of coronary lesions after 8 weeks, discontinue treatment or seek expert advice.  **Child 1 month–11 years:** Initially 7.5–12.5 mg/kg 4 times a day for 2 weeks or until afebrile, then 2–5 mg/kg once daily for 6–8 weeks, if no evidence of coronary lesions after 8 weeks, discontinue treatment or seek expert advice. |
| Contraindications | Hypersensitivity to drug, or other NSAIDs, active peptic ulceration, bleeding disorders, haemophilia, previous peptic ulceration (analgesic dose), active or severe hepatic failure, renal failure, or congestive heart failure and aspirin induced asthma, |
| Drug interactions | Methotrexate, warfarin, fluoxetine, heparin, ibuprofen, acetazolamide, antacids, dexamethasone, enalapril, hydrocortisone, metoclopramide, mifepristone, phenytoin, prednisolone, spironolactone, valproic acid. |
| Side effects | Dyspnoea, rhinitis, severe cutaneous adverse reactions (SCARs), skin reactions, aplastic anaemia, erythema nodosum, gastrointestinal haemorrhage (severe), agranulocytosis, haemorrhagic vasculitis, intracranial haemorrhage, menorrhagia, nausea, thrombocytopenia, vomiting, bronchospasm, urticaria, Steven Johnson’s syndrome and increased bleeding tendencies. |
| Cautions | Uncontrolled hypertension, impaired hepatic, renal function or cardiovascular circulation, a history of bleeding tendencies, significant anaemia and/or hypothrombinaemia, concomitant treatment with anticoagulants and NSAIDs, allergic disease, anaemia, asthma, dehydration, elderly and thyrotoxicosis. |
| Storage condition | Store below 30°C. |
| **Clopidogrel** | |
| Pharmacological class | Antiplatelet agent |
| Dosage form | Tablet: 75 mg; 300 mg |
| Indications | Prevention of atherothrombotic events in percutaneous coronary intervention, peripheral arterial disease or within 35 days of myocardial infarction, or within 6 months of ischaemic stroke, in acute coronary syndrome without ST-segment elevation and in acute myocardial infarction with ST-segment elevation. |
| Dose and administration | **Adult:**  **Prevention of atherothrombotic events in percutaneous coronary intervention (adjunct with aspirin) in patients not already on clopidogrel:**  Oral: Loading dose 300 mg, to be taken prior to the procedure, alternatively loading dose 600 mg.  **Transient ischaemic attack for patients with aspirin hypersensitivity, or those intolerant of aspirin despite the addition of a proton pump inhibitor | Acute ischaemic stroke for patients with aspirin hypersensitivity, or those intolerant of aspirin despite the addition of a proton pump inhibitor:**  Oral: 75 mg once daily  **Prevention of atherothrombotic events in peripheral arterial disease or within 35 days of myocardial infarction, or within 6 months of ischaemic stroke:**  Oral: 75 mg once daily  **Prevention of atherothrombotic events in acute coronary syndrome without ST-segment elevation (given with aspirin):**  Oral: Initially 300 mg, then 75 mg daily for up to 12 months  **Prevention of atherothrombotic events in acute myocardial infarction with ST-segment elevation (given with aspirin):**  Oral: 18–75 years: Initially 300 mg, then 75 mg for at least 4 weeks  Adult 76 years and over: 75 mg daily for at least 4 weeks  **Prevention of atherothrombotic and thromboembolic events in patients with atrial fibrillation and at least one risk factor for a vascular event (with aspirin) and for whom warfarin is unsuitable:**  Oral: 75 mg once daily |
| Contraindications | Hypersensitivity to the drug, active pathologic bleeding (eg, peptic ulcer, intracranial haemorrhage). |
| Drug interactions | Fluconazole, heparin, NSAIDs, fluoxetine, grapefruit juice, pioglitazone, proton pump inhibitors, rosuvastatin, rifampicin and oral anticoagulants, e.g., warfarin. |
| Side effects | Diarrhoea, gastrointestinal discomfort, haemorrhage, skin reactions, acquired haemophilia, agranulocytosis, anaemia, angioedema, arthralgia, arthritis, bone marrow disorders, confusion, fever, glomerulonephritis, gynaecomastia, hallucination, hepatic disorders, hypersensitivity, hypotension, myalgia, neutropenia, pancreatitis, respiratory disorders, severe cutaneous adverse reactions (SCARs), stomatitis, taste altered, ulcerative colitis, vasculitis, vertigo and wound haemorrhage. |
| Cautions | Bleeding or platelet disorders, hepatic impairment, atrial fibrillation and renal failure. |
| Storage condition | Store below 300C. Protect from light |

# Medicines Used for Correcting Fluid, Electrolyte and Acid Base Balance

Maintaining fluid, electrolyte, and acid-base balance is vital for physiological function. Disruptions from dehydration, electrolyte imbalances, or metabolic acidosis/alkalosis require timely intervention using oral or parenteral medications.

Oral medications are used for maintenance and mild to moderate conditions. Calcium carbonate and calcium gluconate prevent or treat calcium deficiencies, Oral Rehydration Salts (ORS) manage dehydration from diarrhea, and ReSoMal is used for rehydration in malnourished individuals. Potassium chloride prevents hypokalemia, sodium bicarbonate treats metabolic acidosis, and sevelamer controls phosphorus levels in chronic kidney disease.

Parenteral medications provide immediate correction in acute care settings. Calcium gluconate injections treat hypocalcemia and hyperkalemia, dextrose injections provide glucose for energy, and Lactated Ringer's solution (Hartmann’s Solution) replaces fluids in surgical and trauma patients. Potassium chloride corrects severe hypokalemia, sodium bicarbonate treats metabolic acidosis, and normal saline (sodium chloride) maintains fluid balance. These medications are crucial for effective patient care.

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| **Calcium carbonate** | |
| Pharmacological class | Mineral supplement |
| Dosage form | Tablet: 500mg |
| Indications | Hypocalcemia, osteoporosis, hypoparathyroidism, osteomalacia, rickets, calcium supplementation, gastroesophageal reflux disease (GERD), dyspepsia. |
| Dose and administration | **Phosphate binding in renal failure and hyperphosphatemia Adult:** dose as required by the individual patient depending on serum phosphate level.  **Infant (1-11 months):** 120 mg 3-4 times a day, dose to be adjusted as necessary, to be taken prior to or with meals.  **Child (1-5 years):** 300 mg 3-4 times a day, dose to be adjusted as necessary, to be taken prior to with meals.  **Child (12-17 years):** 1.25 g 3-4 times a day, dose to be adjusted as necessary, to be taken prior to or with meals.  **Prevention and treatment of Hypocalcemia:**  **Adult:** 1-2 g/day in divided doses with meals. The typical dose is 500 mg to 1g twice daily.  **Infants:** 250 mg to 500 mg/day in divided doses with meals.  **Child (1-10 years):** 800 mg to 1 g/day in divided doses with meals.  **Adolescents:** 1-1.5 g/day in divided doses with meals.  **Osteoporosis:** 1-1.5 g/day in divided doses with meals.  **Osteomalacia/Rickets:**  **Child:** 1-2 g/day in divided doses with meals.  **Hypoparathyroidism:**  **Child:** 1-3 g/day in divided doses with meals.  **GERD and Dyspepsia:** 500 mg to 1500 mg as needed. |
| Contraindications | Diseases and/or conditions resulting in hypercalcemia and/or hypercalciuria, such as hyperparathyroidism, vitamin D overdosage, decalcifying tumours such as plasmacytoma and skeletal metastases, severe renal failure untreated by renal dialysis, osteoporosis due to immobilization, renal calculi (nephrolithiasis). |
| Drug interactions | Thiazide diuretics, tetracyclines, cardiac glycosides, bisphosphonates, quinolone antibiotics, levothyroxine. |
| Side effects | Constipation, bloating, gas, hypercalcemia symptoms (e.g., nausea, vomiting, confusion, fatigue, arrhythmias), hypercalciuria, flatulence, GI discomfort. |
| Cautions | Renal insufficiency, renal calculi, hypercalcemia, kidney stones |
| Storage condition | Store below 300C. Protect from humidity. |
| **Calcium gluconate** | |
| Pharmacological class | Mineral supplement / electrolyte |
| Dosage form | Tablet: 500mg  Injection: 10% in 10ml ampoule |
| Indications | Hypocalcemia or hypocalcemic tetany, hyperkalemia, hypermagnesemia, calcium channel blocker overdose |
| Dose and administration | **Hypocalcemia and calcium deficiency supplementation,** oral:  **Adult:** 1-3 g/day in divided doses with meals.  **Child:** 500 mg to 1 g/day in divided doses with meals.  **Hypocalcemia**, IV:  **Adult:** 1-2 g (10-20 ml of 10% solution) over 10 minutes.  **Child:** 0.5-1 g (5-10 ml of 10% solution) over 10 minutes.  **Hyperkalemia,** IV:  **Adult:** 1-2 g (10-20 ml of 10% solution) over 5-10 minutes; may repeat if necessary.  **Child:** 0.5-1 g (5-10 ml of 10% solution) over 5-10 minutes; may repeat if necessary.  **Hypermagnesemia,** IV:  **Adult:** 1-2 g (10-20 ml of 10% solution) IV over 5-10 minutes.  **Child:** 0.5-1 g (5-10 ml of 10% solution) IV over 5-10 minutes.  **Calcium channel blocker overdose, IV**:  **Adult:** 1-3 g (10-30 ml of 10% solution) IV over 5-10 minutes; may repeat if necessary.  **Child:** 0.5-1 g (5-10 ml of 10% solution) IV over 5-10 minutes; may repeat if necessary. |
| Contraindications | Primary or secondary hypercalcemia, hypercalciuria or calcium renal calculi, sarcoidosis, severe renal failure, hypercalcemia (e.g., in hyperparathyroidism, hypervitaminosis D, neoplastic disease with decalcification of bone, renal insufficiency, immobilization osteoporosis, sarcoidosis, milk-alkali syndrome), patients receiving cardiac glycosides. |
| Drug interactions | Verapamil, calcium or magnesium-containing medications, estrogen, phenytoin, oral tetracyclines, vitamin D, milk and milk products. |
| Side effects | Acute hypercalcaemic syndrome (drowsiness, continuing nausea, vomiting, weakness), calcific renal calculi. |
| Cautions | Hypercalcemia, extravasation, cardiac disease, high vitamin D intake. |
| Storage condition | Store below 30 0C. Protect from moisture. |
| **Dextrose** | |
| Pharmacological class | Carbohydrate (parenteral nutrition and caloric agent) |
| Dosage form | Injection: 5% in 250 ml, 1000 ml  Injection: 10% in 500 ml, 1000 ml  Injection: 40% in 20 ml |
| Indications | Hypoglycemia, dehydration with hypoglycemia, carbohydrate source in parenteral nutrition, hyperkalemia (as part of an insulin-glucose combination), establish presence of gestational diabetes mellitus. |
| Dose and administration | **Hypoglycemia,** oral:  **Adult and Child:** 15-20 g of oral glucose solution. If not available, small sips of dextrose-containing fluids can be used.  **Hypoglycemia,** parenteral:  **Adult:** 10-25 g (20-50 ml of 50% solution) IV bolus. May repeat if necessary.  **Neonate:** 200-500 mg/kg (2-5 ml/kg of 10% solution) IV bolus. May repeat if necessary.  **Infant and Child:** 500-1000 mg/kg (2-4 ml/kg of 25% solution) IV bolus. May repeat if necessary.  **Carbohydrate Source in Parenteral Nutrition:**  **Adult and Child:** Administer as part of a total parenteral nutrition (TPN) regimen. Dose individualized based on caloric requirements and clinical condition.  **Hyperkalemia (with insulin):**  **Adult:** 25 g (50 ml of 50% solution) IV, followed by insulin administration as per protocol.  **Child:** 500mg-1g/kg (2-4 ml/kg of 25% solution) IV, followed by insulin administration as per protocol.  **Establishing presence of gestational diabetes:**  **Adult:** Test dose of 75 g anhydrous glucose to be given to the fasting patient by mouth, with blood glucose concentrations measured at intervals. To be given with 200–300 ml of fluid. |
| Contraindications | Hypersensitivity to the drug, uncompensated diabetes and diabetes insipidus, hyperosmolar coma, hemodilution and extracellular hyperhydration or hypervolemia, hyperglycemia and hyperlactatemia, severe renal insufficiency, uncompensated cardiac failure, general edema, ascitic cirrhosis, known glucose intolerances |
| Drug interactions | Catecholamines, steroids, other substances that affect glycemic control or fluid and/or electrolyte balance |
| Side effects | Venous irritation and thrombophlebitis (especially if hypertonic), fluid and electrolyte disturbances, hyperglycemia, edema or water intoxication |
| Cautions | Pre-existing hyperglycemia, electrolyte imbalance, intracranial hemorrhage, prolonged use, rapid infusion |
| Storage condition | Store below 30C0. Protect from humidity. |
| **Dextrose in normal saline** | |
| Pharmacological class | Carbohydrate (parenteral nutrition and fluid replacement) |
| Dosage form | Injection: 5% dextrose in 500 ml, 1000 ml normal saline  Injection: 10% dextrose in 500 ml, 1000 ml normal saline |
| Indications | Dehydration with hypoglycemia, fluid replacement, electrolyte imbalances, parenteral nutrition support, postoperative fluid management, treatment of mild to moderate hypoglycemia. |
| Dose and administration | **Dehydration with hypoglycaemia:**  **Adult:** 500-1000 ml IV as needed based on clinical condition. Infuse at a rate appropriate for the patient’s fluid and glucose needs.  **Child:** 10-20 ml/kg IV as needed based on clinical condition. Adjust rate according to the child’s fluid and glucose needs.  **Fluid Replacement:**  **Adult:** 500-1000 ml IV over 1-2 hours or as needed based on clinical condition. Adjust rate according to patient’s fluid status and clinical response.  **Child:** 10-20 ml/kg IV over 1-2 hours or as needed based on clinical condition. Adjust rate according to the child’s fluid status and clinical response.  **Postoperative Fluid Management:**  **Adult:** 500-1000 ml IV as needed to maintain hydration and electrolyte balance. Infuse at a rate appropriate for the patient’s needs.  **Child:** 10-20 ml/kg IV as needed to maintain hydration and electrolyte balance. Infuse at a rate appropriate for the child’s needs. |
| Contraindications | Hypersensitivity to the drug and/or sodium chloride. |
| Drug interactions | No known significant interactions |
| Side effects | Hyperglycemia, local irritation at the injection site, phlebitis, and fluid retention, hyperosmolar syndrome, electrolyte imbalances (e.g., hypernatremia, hypokalemia), fluid overload |
| Cautions | Pre-existing hyperglycemia, electrolyte imbalance, fluid overload |
| Storage condition | Store below 30 0C. Protect from humidity. |
| **Lactated Ringer’s (Hartmann’s solution)** | |
| Pharmacological class | Intravenous Fluid and Electrolyte Replenisher |
| Dosage form | Injection: Available in various volumes such as 500 ml and 1000ml  Injectable solution contains: K+ 4mEq, Na+ 130mEq, Ca+ 3mEq, Cl- 110mEq, Lactate 28mEq in 1000ml |
| Indications | Dehydration, electrolyte imbalance, fluid loss due to burns, trauma, or surgery, metabolic acidosis, septic shock |
| Dose and administration | **Dehydration and Fluid Replacement:**  **Adult:** 500-1000 ml IV initially, then adjust based on clinical condition and response. Infuse at a rate appropriate for the patient’s fluid needs.  **Child:** 20-40 ml/kg IV initially, then adjust based on clinical condition and response. Infuse at a rate appropriate for the child’s fluid needs.  **Surgical and Trauma Fluid Loss:**  **Adult:** 500-1000 ml IV initially, then administer as needed to replace ongoing fluid losses. Infuse at a rate to maintain hemodynamic stability.  **Child:** 20-40 ml/kg IV initially, then administer as needed to replace ongoing fluid losses. Infuse at a rate to maintain hemodynamic stability.  **Metabolic Acidosis:**  **Adult:** 500-1000 ml IV, then adjust based on clinical condition and response. Infuse at a rate appropriate for the patient’s needs.  **Child:** 20-40 ml/kg IV, then adjust based on clinical condition and response. Infuse at a rate appropriate for the child’s needs. |
| Contraindications | Hypersensitivity to the drug, hyperkalemia, metabolic alkalosis, liver disease |
| Drug interactions | Potassium-sparing diuretics, ACE inhibitors, ARBs, corticosteroids, digoxin, ceftriaxone |
| Side effects | Hyperkalemia, hypercalcemia, hypernatremia, local site reactions, fluid overload, renal or cardiac impairment |
| Cautions | Impaired renal function, heart failure, hypertension electrolyte imbalances, fluid overload, liver disease |
| Storage condition | Store below 30 0C. Protect from freezing and excessive heat. |
| **Oral Rehydration Salt (ORS)** | |
| Pharmacological class | Electrolyte replacement solution |
| Dosage form | Powder for dilution to make 1000 ml  **Contains:** glucose 13.5 g/L, sodium chloride 2.6 g/L, potassium chloride 1.5 g/L, trisodium citrate dihydrate 2.9 g/L  **Provides:** glucose 75 mmol/L, sodium 75 mEq or mmol/L, chloride 65 mEq or mmol/L, potassium 20 mEq or mmol/L, citrate 10 mmol/L, osmolarity 245 mOsm/L |
| Indications | Dehydration due to diarrhea, vomiting, or other causes, prevention of dehydration in high-risk individuals (e.g., during hot weather, vigorous exercise) |
| Dose and administration | **Mild to Moderate Dehydration:**  **Adult:** Dissolve one ORS packet in 1 liter of clean, boiled, and cooled water. Drink in small sips frequently. Typical intake ranges from 2 to 4 liters over 24 hours, depending on the severity of dehydration and ongoing losses.  **Child:**  **Infants (<1 year):** 50-100 ml of ORS solution per kilogram of body weight over 4-6 hours. Continue breastfeeding alongside ORS if applicable.  **Child (1-10 years):** 50-100 ml of ORS solution per kilogram of body weight over 4-6 hours. Adjust based on ongoing losses and clinical response.  **Older Child and Adolescents:** Similar to adults, typically 2-4 liters over 24 hours, adjusted based on clinical condition.  **Fluid and Electrolyte Loss in Diarrhea:**  **Adult:** 200–400 ml after every loose motion, adjusted according to fluid loss.  **Severe Dehydration (Adult and Child):**  Initial Phase: Seek medical attention immediately. While awaiting medical help, give small sips of ORS solution frequently until medical care is available. |
| Contraindications | Severe dehydration requiring IV fluids, shock, intestinal obstruction, inability to drink (e.g., unconsciousness), persistent vomiting. |
| Drug interactions | Diuretics, ACE inhibitors, potassium supplements, corticosteroids |
| Side effects | Nausea, vomiting, mild bloating or stomach cramps, hypernatremia in cases of improper preparation or overuse, fluid overload (in cases of excessive intake, especially in patients with kidney disease or heart failure) |
| Cautions | Improper preparation, kidney disease, heart failure, severe dehydration or shock, vomiting, electrolyte imbalance |
| Storage condition | Store below 30 C0 in a dry place. |
| **Potassium chloride** | |
| Pharmacological class | Electrolyte replacement |
| Dosage form | Tablet: 8 mEq (600 mg)  Injection, 150mg/ml in 10ml ampoule (20 mEq (1500 mg)) |
| Indications | Hypokalemia, prevention of hypokalemia in patients receiving diuretics or other medications that deplete potassium, electrolyte imbalance |
| Dose and administration | **Hypokalemia treatment,** oral:  **Adult:** 40-100 mEq/day in divided doses. The maximum single oral dose is 20-25 mEq to minimize gastrointestinal irritation.  **Child:** 2-4 mEq/kg/day in divided doses. Do not exceed 1 mEq/kg per dose.  **Prevention of hypokalemia,** oral:  **Adult:** 20-40 mEq/day in divided doses.  **Child:** 1-2 mEq/kg/day in divided doses.  **Hypokalemia Treatment,** parenteral:  **Adult:** 20-40 mEq IV infusion over 1-2 hours. The maximum rate should not exceed 10 mEq/hour in a peripheral line or 20 mEq/hour in a central line.  **Child:** 0.5-1 mEq/kg IV infusion over 1-2 hours. The maximum rate should not exceed 0.5 mEq/kg/hour in a peripheral line.  **Severe hypokalemia,** parenteral:  **Adult:** 40-80 mEq IV infusion, administered in divided doses with close monitoring of serum potassium levels and ECG.  **Child:** Adjust dose based on clinical condition and close monitoring is required. |
| Contraindications | GI tract passage restrictions or delay, esophageal ulceration due to enlarged left atrium, hyperkalemia, renal failure |
| Drug interactions | Anticholinergic agents such as atropine, belladonna, belladonna alkaloids, benztropine, dicyclomine, glycopyrrolate, hyoscyamine, methscopolamine, oxybutynin, procyclidine, scopolamine, solifenacin, tolterodine, trihexyphenidyl, trospium, eplerenone, diuretics, ACEI, ARBS. |
| Side effects | Abdominal pain, GI ulcer, pain at the injection site, phlebitis. hyperkalemia symptoms (e.g., muscle weakness, cardiac arrhythmias, chest pain, shortness of breath). |
| Cautions | Elderly, renal impairment, intestinal stricture, history of peptic ulcer, pre-existing hyperkalemia. |
| Storage condition | Store below 300C. Protect from moisture. |
| **Rehydration Solution for Malnutrition (RESOMAL)** | |
| Pharmacological class | Electrolyte replacement solution |
| Dosage form | Powder for oral dilution - each sachet for 2 liters  **Provides:** glucose 125 mEq/L, sodium 45 mEq/L, potassium 40 mEq/L, chloride 70 mEq/L, with total osmolality 294 mEq/L |
| Indications | Dehydration in severely malnourished individuals, particularly child suffering from severe acute malnutrition (SAM) |
| Dose and administration | **Preparation:**  **Adult and Child:** Dissolve one packet of ReSoMal in 2 liters of clean, boiled, and cooled water. Stir well to ensure complete dissolution.  **Dosage for dehydration:**  **Child (Up to 10 kg):** Give 5 ml/kg every 30 minutes for the first 2 hours (total of 50 ml/kg). Then, give 5-10 ml/kg per hour for the next 4-6 hours.  **Child (Over 10 kg):** Give 5 ml/kg every 30 minutes for the first 2 hours (total of 50 ml/kg). Then, give 5-10 ml/kg per hour for the next 4-6 hours.  **Adult:** Dosage is individualized based on the patient’s needs and clinical condition. Typically, follow similar guidelines as for children, adjusting for body weight. |
| Contraindications | Do not administer to patients with cholera or uncomplicated acute malnutrition; use standard ORS instead. |
| Drug interactions | Diuretics, ACE inhibitors, potassium supplements, corticosteroids |
| Side effects | Hypernatremia, fluid overload, diarrhea, electrolyte imbalances, vomiting |
| Cautions | Renal impairment, heart failure, severe dehydration, careful monitoring of electrolytes, use cautiously in children with edema, avoid in cases of shock or severe dehydration requiring intravenous fluids |
| Storage condition | Store below 300C. |
| **Sevelamer** | |
| Pharmacological class | Phosphate binder |
| Dosage form | Tablet: 800mg, 1200mg, 1600 mg |
| Indications | Hyperphosphatemia in chronic kidney disease (CKD) patients on dialysis |
| Dose and administration | **Adult, Initial dose:**  If serum phosphorus is >5.5 mg/dL but <7.5 mg/dL: 800 mg three times daily with meals.  If serum phosphorus is ≥7.5 mg/dL: 1,600 mg three times daily with meals.  **Adult, Maintenance dose:**  Adjust based on serum phosphorus levels (maintenance dose ranges from 800 mg to 1,600 mg three times daily with meals). |
| Contraindications | Hypersensitivity to the drug, bowel obstruction |
| Drug interactions | Ciprofloxacin, mycophenolate mofetil, levothyroxine, antiepileptic medicines |
| Side effects | Nausea, vomiting, diarrhea, dyspepsia, abdominal pain, flatulence, GI obstruction, perforation, or ileus. |
| Cautions | Swallowing disorders, GI motility disorders, vitamin deficiencies |
| Storage condition | Store below 30 0C. Protect from moisture and light. |
| **Sodium bicarbonate** | |
| Pharmacological class | Alkalinizing agent |
| Dosage form | Tablet: 500mg, 650mg  Injection (concentrated), 8.4% (50meq/50ml) |
| Indications | Metabolic acidosis, hyperkalemia, urine alkalinization, gastric hyperacidity (as an antacid). |
| Dose and administration | **Alkalinization of urine and relief of mild urinary tract discomfort, Oral:**  **Adult:** 3 g every 2 hours until urinary pH exceeds 7, dissolved in water.  **Neonate and Child:** Initially 1–2 mmol/kg daily in divided doses, adjusted according to response.  **Maintenance of alkaline urine:**  **Adult:** 5–10 g daily, dissolved in water.  **Neonate and Child:** Initially 1–2 mmol/kg daily in divided doses, adjusted according to response.  **Chronic acidotic states (e.g., uremic acidosis, renal tubular acidosis), oral:**  **Adult:** 4.8 g daily (57 mmol each of Na+ and HCO3-); higher doses may be required and should be adjusted according to response.  **Neonate and Child:** Initially 1–2 mmol/kg daily in divided doses, adjusted according to response.  **Metabolic acidosis,** parenteral**:**  **Adult:** Dosage individualized based on arterial blood gas analysis and serum electrolytes. Initial dose may be 1 mEq/kg over 1 hour.  **Child:** Same as adult, dosage individualized. Initial dose may be 1 mEq/kg over 1 hour.  **Drug intoxications,** parenteral:  **Adult:** Dosage individualized based on severity and patient condition. Initial dose may be 1-2 mEq/kg.  **Child:** Same as adult, dosage individualized. Initial dose may be 1-2 mEq/kg.  **Severe hyperkalemia,** parenteral:  **Adult:** 50-100 mEq over 5-10 minutes with close monitoring.  **Child:** 1 mEq/kg over 5-10 minutes with close monitoring. |
| Contraindications | Salt-restricted diet, metabolic or respiratory alkalosis, hypocalcemia, hypochlorhydria, hypernatremia, uncontrolled hypertension. |
| Drug interactions | Amphetamine, benzenediamines, dextroamphetamine, digoxin, ketoconazole, ledipasvir, diuretics, ACE inhibitors, ARBs, amantadine, atropine, belladonna alkaloids, benztropine, hyoscyamine, oxybutynin, procyclidine, scopolamine, solifenacin, tolterodine, trihexyphenidyl, chloroquine, mefenamic acid |
| Side effects | Bloating, gas, nausea, local irritation at the injection site, fluid overload, metabolic alkalosis, hypernatremia, hypokalemia, tetany due to hypocalcemia |
| Cautions | Prolonged use, cardiac disease, elderly, respiratory acidosis, alkalosis, sodium load, electrolyte imbalance, renal impairment, hypertension, fluid retention |
| Storage condition | Store below 300C. |
| **Sodium chloride** | |
| Pharmacological class | Electrolyte replacement |
| Dosage form | Tablets: 1 g (17.1 mEq) or 650 mg (11.1 mEq) per tablet  Oral solution: 10% solution  Injection, 0.9% (Normal Saline), 1000 ml  Injection, 0.9% in 500 ml, 3% in 500 ml, 0.45% in 500 ml |
| Indications | Hyponatremia, dehydration, fluid replacement, dilution of medications, wound irrigation |
| Dose and administration | **Hyponatremia and supplementation,** oral:  **Adult**: 1-2 g, one to four times daily, based on the severity of sodium depletion and clinical response.  **Child:** 20-40 mEq/day (1.17-2.34 g) in divided doses. Adjust based on clinical response and serum sodium levels.  **Hyponatremia,** parenteral**:**  **Adult:**  **Mild to moderate:** 0.9% NaCl, 500-1000 ml IV over 1-2 hours, then adjust based on serum sodium levels and clinical condition.  **Severe:** 3% NaCl, 100 ml IV over 10 minutes, repeat as necessary while monitoring serum sodium and neurological status.  **Child:**  **Mild to moderate:** 0.9% NaCl, 10-20 ml/kg IV over 1-2 hours, then adjust based on serum sodium levels and clinical condition.  **Severe:** 3% NaCl, 2-4 ml/kg IV over 10-30 minutes, repeat as necessary while monitoring serum sodium and neurological status.  **Dehydration and fluid replacement,** parenteral:  **Adult:** 0.9% NaCl, 500-1000 ml IV over 1-2 hours or as needed. Adjust based on clinical condition and fluid balance.  **Child:** 0.9% NaCl, 20-30 ml/kg IV over 1-2 hours or as needed. Adjust based on clinical condition and fluid balance. |
| Contraindications | Hypersensitivity to the drug, hypernatremia, severe fluid retention or edema, severe renal impairment, pulmonary edema, uncontrolled hypertension, |
| Drug interactions | Corticosteroids, NSAIDs, lithium, antihypertensives, diuretics. |
| Side effects | Hypernatremia, fluid retention, edema, hypertension, dehydration, metabolic alkalosis. |
| Cautions | Renal impairment, heart failure, liver disease, pulmonary edema, hypertension, elderly patients, electrolyte imbalances. |
| Storage condition | Store below 300C. Protect from light and freezing. |

# Immunomodulators

Immunomodulators are molecules that alter or modulate the immune system to aid the body's response to a sickness or illness. Various immune system components can be impacted by distinct immunomodulators. While some solely target very specific routes, others function extremely broadly. Immunomodulators come in a variety of shapes and sizes. Some might be bigger proteins, like monoclonal antibodies, while others might be very tiny molecules. Immunostimulators and immunosuppressives are the two primary categories of immunomodulators. Immunostimulators are used to strengthen the body's defenses against illnesses such as cancer, infections, or compromised immune systems. Immunosuppressive medications are frequently used to treat autoimmune disorders and stop organ rejection in transplant recipients.

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| **Adalimumab** | |
| Pharmacological class | Recombinant human anti-TNF-α IgG1 monoclonal antibody |
| Dosage form | Injection: 10 mg/0.2 ml, 20 mg/0.4 ml, 40 mg/0.8 ml,40 mg/0.4 ml |
| Indications | Moderate to severe active rheumatoid arthritis, active and progressive psoriatic arthritis, severe active ankylosing spondylitis, inflammatory bowel disease and plaque psoriasis, Crohn disease, uveitis and ulcerative colitis, |
| Dose and Administration | **Rheumatoid arthritis,** by subcutaneous injection:  **Adult:** 40 mg every 2 weeks, then increased if necessary to 40 mg once weekly, alternatively 80 mg every 2 weeks, dose to be increased only in patients receiving adalimumab alone, review treatment if no response within 12 weeks  **Plaque psoriasis,** by subcutaneous injection:  **Adult:** initially 80 mg, then 40 mg every 2 weeks, to be started 1 week after initial dose, review treatment if no response within 16 weeks  **Psoriatic arthritis and Ankylosing spondylitis,** by subcutaneous injection:  **Adult:** 40 mg every 2 weeks, review treatment if no response within 12 weeks.  **Crohn Disease,** by subcutaneous injection:  **Adult:** initially 80 mg, then 40 mg after 2 weeks; maintenance 40 mg every 2 weeks, increased if necessary to 40 mg once weekly, alternatively 80 mg every 2 weeks, review treatment if no response within 12 weeks.  **Ulcerative colitis:**  **Adult:** initially 160 mg, dose can alternatively be given as divided injections over 2 days, then 80 mg after 2 weeks, then maintenance 40 mg every 2 weeks, increased if necessary to 40 mg once weekly, alternatively 80 mg every 2 weeks.  **Uveitis** by subcutaneous injection:  **Adult:** initially 80 mg, then 40 mg after 1 week; maintenance 40 mg every 2 weeks. |
| Contraindications | Hypersensitivity to the drug, moderate or severe heart failure, severe infections, pregnancy, active TB, avoid breastfeeding during treatment and for at least 5 months after last dose. |
| Drug interactions | Azathioprine, etanercept, infliximab, abatacept, anakinra, live vaccines. |
| Side effects | Agranulocytosis, alopecia, anemia, anxiety, arrhythmias, asthma, broken nails, chest pain, coagulation disorder, connective tissue disorders, cough, dehydration, depression, dyspnea, electrolyte imbalance, eye inflammation, fever, flushing, gastrointestinal discomfort, gastrointestinal disorders, hemorrhage, headaches, impaired healing, hyperglycemia, hypersensitivity, hypertension, increased risk of infection, insomnia, leucocytosis, leucopenia, mood altered, muscle spasms, musculoskeletal pain, neoplasms, nerve disorders, neutropenia, edema, renal impairment, seasonal allergy, sensation abnormal, sepsis, skin reactions, sweat changes, thrombocytopenia, vertigo, vision disorders, aortic aneurysm, arterial occlusion, congestive heart failure, deafness, dysphagia, embolism and thrombosis, erectile dysfunction, gallbladder disorders, hepatic disorders, inflammation, lupus erythematosus, meningitis viral, myocardial infarction, nocturia, pancreatitis, respiratory disorders, rhabdomyolysis, sarcoidosis, solid organ neoplasm, stroke, tinnitus, tremor, vasculitis. |
| Cautions | Demyelinating disorders, development of malignancy, active infections, hepatitis B virus, history of malignancy, mild heart failure. |
| Storage condition | Store at 2-8ºC. Protect from light. |
| **Azathioprine** | |
| Pharmacological class | Immunosuppressant |
| Dosage form | Tablet: 25 mg, 50mg  Powder for injection: 50 mg, 100 mg (as sodium salt) in vial. |
| Indications | Suppression of transplant rejection, rheumatoid arthritis, severe acute Crohn’s disease or Maintenance of remission of Crohn’s disease or acute ulcerative colitis, autoimmune diseases, severe refractory eczema, normal or high thiopurine methyltransferase (TPMT) activity, generalized myasthenia gravis |
| Dose and administration | **Severe acute crohn’s disease or maintenance of remission of**  **Crohn’s disease or acute ulcerative colitis:**  **Adult:** 2–2.5 mg/kg po daily, some patients may respond to lower doses  **Rheumatoid arthritis that has not responded to other disease-modifying drugs or severe systemic lupus erythematosus or other connective tissue disorders or polymyositis in cases of corticosteroid resistance,** oral:  **Adult:** initially up to 2.5 mg/kg daily in divided doses, adjusted according to response, rarely more than 3 mg/kg daily; maintenance 1–3 mg/kg daily, consider withdrawal if no improvement within 3 months  **Autoimmune conditions:**  **Adult:** 1–3 mg/kg oral or IV bolus, or IV infusion daily, adjusted according to response, consider withdrawal if no improvement within 3 months, oral administration preferable, if not possible then can be given by IV injection (IV solution very irritant) or by IV infusion  **Suppression of transplant rejection:**  Adult: 1–2.5 mg/kg oral or IV bolus, or IV infusion daily, adjusted according to response, oral administration preferable, if not possible then can be given by IV injection (IV solution very irritant) or by IV infusion  **Severe refractory eczema, normal or high TPMT activity,** oral**:**  **Adult:** 1–3 mg/kg daily  **Severe refractory eczema, intermediate TPMT activity,** oral:  Adult: 0.5–1.5 mg/kg daily  **Generalized myasthenia gravis:**  Adult: Initially 0.5–1 mg/kg oral or IV bolus, or IV infusion daily, then increased to 2–2.5 mg/kg daily, dose is increased over 3–4 weeks, azathioprine is usually started at the same time as the corticosteroid and allows a lower maintenance dose of the corticosteroid to be used, oral administration preferable, if not possible then can be given by IV injection (IV solution very irritant) or by IV infusion |
| Contraindications | Hypersensitivity to the drug or mercaptopurine, absent or very low thiopurine methyltransferase (TPMT) activity |
| Drug interactions | Allopurinol, phenytoin, Sulfamethoxazole + trimethoprim, live vaccines, warfarin, ACEIs |
| Side effects | Bone marrow depression (dose related), increased risk of infection, leucopenia, pancreatitis, thrombocytopenia, anemia, hepatic disorders, hypersensitivity reaction |
| Cautions | Liver disease, renal impairment, genetic deficiency of the enzyme thiopurine methyltransferase (TPMT), bone marrow depression, pregnancy, hepatic and renal impairment |
| Storage condition | Store below 30oC. |
| **Certolizumab pegol** | |
| Pharmacological class | Immunosuppressant, tumour necrosis factor (TNF) inhibitor |
| Dosage form | **For injection**: 200 mg lyophilized powder for reconstitution in a single use vial, with 1 ml of sterile Water for Injection  **Injection**: 200 mg/ml solution in a single-use prefilled syringe |
| Indications | Moderate to severe active rheumatoid arthritis, active and progressive psoriatic arthritis, severe active ankylosing spondylitis, inflammatory bowel disease, plaque psoriasis, crohn disease, ulcerative colitis and uveitis |
| Dose and administration | **Moderate to severe active rheumatoid arthritis, severe, active and progressive rheumatoid arthritis, active psoriatic arthritis; inadequate response to DMARDs (including methotrexate), not previously treated with methotrexate or other DMARDs:**  **Adult**: Loading dose 400 mg subQ every 2 weeks for 3 doses, then maintenance 200 mg every 2 weeks, once clinical response is confirmed, an alternative maintenance dosing of 400mg every 4 weeks can be considered, review treatment if no response within 12 weeks  **Severe active ankylosing spondylitis in patients who have had an inadequate response to, or are intolerant of NSAIDs (initiated by a specialist), severe active axial spondyloarthritis, without radiographic evidence of ankylosing spondylitis but with objective signs of inflammation, in patients who have had an inadequate response to, or are intolerant of NSAIDs:**  **Adult**: loading dose 400 mg subcutaneous every 2 weeks for 3 doses, then maintenance 200 mg every 2 weeks, alternatively maintenance 400 mg every 4 weeks, review treatment if no response within 12 weeks, after at least 1 year of treatment, an alternative maintenance dosing of 200mg every 4 weeks can be considered in patients with sustained remission  **Moderate to severe plaque psoriasis:**  **Adult**: loading dose 400 mg subcutaneous every 2 weeks for 3 doses, then maintenance 200 mg every 2 weeks, an alternative maintenance dosing of 400mg every 2 weeks can be considered in patients with insufficient response, review treatment if no response within 16 weeks |
| Contraindications | Hypersensitivity to the drug, moderate to severe heart failure, pegol and severe active infection (TB). |
| Drug interactions | Live vaccines, azathioprine, cancer chemotherapy, cyclosporine, abatacept, anakinra, abrocitinib, anifrolumab and globulin. |
| Side effects | Injection site reactions, upper respiratory infections, headache, rash, serious infections (e.g., tuberculosis, bacterial sepsis), malignancies, heart failure, hypersensitivity reactions, |
| Cautions | Chronic obstructive pulmonary disease, demyelinating CNS disorders, active infections, elderly, hepatitis B virus, mild heart failure, lymphoma and other malignancies |
| Storage condition | Store in a refrigerator (2°C to 8°C). Do not freeze |
| **Ciclosporin/** **cyclosporine** | | |
| Pharmacological class | Calcineurin inhibitor, immunosuppressant | |
| Dosage form | Capsule: 25 mg  Concentrate for injection: 50 mg/ml in 1 ml ampoule  Oral liquid: 100 mg/Ml | |
| Indications | Severe acute ulcerative colitis refractory to corticosteroid treatment, severe active rheumatoid arthritis, short-term treatment of severe atopic dermatitis where conventional therapy ineffective or inappropriate, severe psoriasis where conventional therapy ineffective or inappropriate, organ transplantation, bone-marrow transplantation or prevention and treatment of graft-versus-host disease, nephrotic syndrome | |
| Dose and administration | **Severe acute ulcerative colitis refractory to corticosteroid treatment:**  By continuous IV infusion  **Adult**: 2 mg/kg, to be given over 24 hours, dose adjusted according to blood-cyclosporine concentration and response  **Severe active rheumatoid arthritis: oral**  **Adult**: initially 1.5 mg/kg twice daily, increased if necessary, up to 2.5 mg/kg twice daily after 6 weeks, dose increases should be made gradually, for maintenance treatment, titrate dose individually to the lowest effective dose according to tolerability, treatment may be required for up to 12 weeks  **Severe active rheumatoid arthritis [in combination with low-dose methotrexate, when methotrexate monotherapy has been ineffective]: oral**  **Adult**: Initially 1.25 mg/kg twice daily, increased, if necessary, up to 2.5 mg/kg twice daily after 6 weeks, dose increases should be made gradually, for maintenance treatment, titrate dose individually to the  lowest effective dose according to tolerability, treatment may be required for up to 12 weeks  **Short-term treatment of severe atopic dermatitis where conventional therapy ineffective or inappropriate: oral**  **Adult**: Initially 1.25 mg/kg twice daily (max. per dose 2.5 mg/kg twice daily) usual maximum duration of 8 weeks but may be used for longer under specialist supervision, if good initial response not achieved  within 2 weeks, increase dose rapidly up to maximum  **Short-term treatment of very severe atopic dermatitis where conventional therapy ineffective or inappropriate: oral**  **Adult**: 2.5 mg/kg twice daily usual maximum duration of 8 weeks but may be used for longer under specialist supervision  **Severe psoriasis where conventional therapy ineffective or inappropriate,** oral:  **Adult**: Initially 1.25 mg/kg twice daily (max. per dose 2.5 mg/kg twice daily), increased gradually to maximum if no improvement within 1-month, initial dose of 2.5 mg/kg twice daily justified if condition requires rapid improvement; discontinue if inadequate response after 3 months at the optimum dose; max. duration of treatment usually 1 year unless other treatments cannot be used.  **Organ transplantation**: oral  **Adult:** 10–15 mg/kg, to be administered 4–12 hours before transplantation, followed by 10–15 mg/kg daily for 1–2 weeks postoperatively, then maintenance 2–6 mg/kg daily, reduce dose gradually to maintenance.  **Bone-marrow transplantation or prevention and treatment**  **of graft-versus-host disease; initially by intravenous infusion,** IV infusion:  **Adult**: 3–5 mg/kg daily, to be administered over 2–6 hours from day before transplantation to 2 weeks postoperatively, alternatively (by oral) initially 12.5–15 mg/kg daily, then (by oral) 12.5 mg/kg daily for 3-6 months and then tailed off (may take up to a year after transplantation)  **Nephrotic syndrome,** oral:  **Adult**: 5 mg/kg daily in 2 divided doses, for maintenance reduce to lowest effective dose according to proteinuria and serum creatinine measurements; discontinue after 3 months if no improvement in glomerulonephritis or glomerulosclerosis (after 6 months in membranous glomerulonephritis) | |
| Contraindications | Hypersensitivity to the drug, malignancy (in non-transplant indications), uncontrolled hypertension (in non-transplant indications), uncontrolled infections (in non-transplant indications). | |
| Drug interactions | Acyclovir, allopurinol, amikacin, amiloride, amphotericin- B, azithromycin, carbamazepine, chloroquine, ciprofloxacin, oral contraceptives, digoxin, doxorubicin, doxycycline, enalapril, erythromycin, etoposide, fluconazole, gentamicin, grapefruit juice, griseofulvin, hydrochlorothiazide, ibuprofen, levofloxacin, levonorgestrel, medroxyprogesterone, methotrexate, metoclopramide, nelfinavir, norethisterone, ofloxacin, phenobarbital, phenytoin, potassium salts, prednisolone, rifampicin, ritonavir, saquinavir, silver sulfadiazine, simvastatin, spironolactone, streptomycin, sulfadiazine, sulfadoxine + pyrimethamine, sulfamethoxazole + trimethoprim, trimethoprim, live vaccines, vancomycin, verapamil | |
| Side effects | Decreased appetite, diarrhea, electrolyte imbalance, eye inflammation, fatigue, fever, flushing, gastrointestinal discomfort, gingival hyperplasia, hair changes, headaches, hepatic disorders, hyperglycaemia, hyperlipidemia, hypertension, hyperuricemia, leucopenia, muscle complaints, nausea, paresthesia, peptic ulcer, renal impairment, seizure, skin reactions, tremor, anaemia, encephalopathy, edema, thrombocytopenia, weight increased | |
| Cautions | Renal impairment, hepatic impairment, hypertension, monitor serum electrolyte (potassium, magnesium, calcium), elderly, active herpes simplex infections, skin infections, uveitis, bechet’s syndrome, lymphoproliferative disorders, malignancy, breastfeeding, pregnancy | |
| Storage condition | Store below 30oc. | |
| **Etanercept** | | |
| Pharmacological class | Immunosuppressant, tumor necrosis factor (TNF) inhibitor | |
| Dosage form | Injectable solution | |
| Indications | Moderate to severe active rheumatoid arthritis, active and progressive psoriatic arthritis, severe active ankylosing spondylitis, inflammatory bowel diseases, plaque psoriasis, uveitis and ulcerative colitis | |
| Dose and administration | **Rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, non-radiographic axial spondyloarthritis:**  **Adult**: 25 mg subcutaneously twice weekly, alternatively 50 mg once weekly, review treatment if no response within 12 weeks of initial dose  **Plaque psoriasis:**  **Adult**: 25 mg subcutaneously twice weekly, alternatively 50 mg once weekly, alternatively 50 mg twice weekly for up to 12 weeks, followed by 25 mg twice weekly, alternatively 50 mg once weekly if required for up to 24 weeks— continuous therapy beyond 24 weeks may be appropriate in some patients, discontinue if no response after 12 weeks | |
| Contraindications | Active infection | |
| Drug interactions | Live vaccines, anakinra, abatacept, cyclophosphamide | |
| Side effects | Infections and injection site reactions, cystitis, cholecystitis, diarrhea, endocarditis, eye inflammation, gastritis, hepatic disorders myositis, neoplasms, respiratory disorders, sepsis, skin ulcers, thrombocytopenia, vasculitis, bone marrow disorders, congestive heart failure, cutaneous lupus erythematosus, demyelination, leucopenia, lupus-like syndrome, nerve disorders, sarcoidosis, seizure, severe cutaneous adverse reactions (SCARs), transverse myelitis, dermatomyositis | |
| Cautions | Development of malignancy, diabetes mellitus, heart failure, hepatitis B virus, hepatitis C infection, tuberculosis (active or latent), blood disorders, history of malignancy, risk of demyelinating disorders, risk of infection (herpes zoster virus). | |
| Storage condition | Store in a refrigerator (2°C to 8°C). Do not freeze. | |
| **Filgrastim (G-CSF)** | | |
| Pharmacological class | Granulocyte colony stimulating factor, immunostimulant | |
| Dosage form | Injection: 300mcg, 600mcg | |
| Indications | Febrile neutropenia in cytotoxic chemotherapy for malignancy, neutropenia and associated sequelae in myeloablative therapy followed by bone marrow transplantation, mobilization of peripheral blood progenitor cells for autologous infusion, mobilization of peripheral blood progenitor cells for autologous infusion, mobilization of peripheral blood progenitor cells in normal donors for allogeneic infusion, severe congenital neutropenia and history of severe or recurrent infections, severe cyclic neutropenia, or idiopathic neutropenia and history of severe or recurrent infections, persistent neutropenia in HIV infection. | |
| Dose and administration | **Reduction in duration of neutropenia and incidence of febrile neutropenia in cytotoxic chemotherapy for malignancy (except chronic myeloid leukaemia and myelodysplastic syndromes),** by subcutaneous injection, or IV infusion:  **Adult:** 5 mcg/kg daily until neutrophil count in normal range, usually for up to 14 days (up to 38 days in acute myeloid leukaemia), to be started at least 24 hours after cytotoxic chemotherapy. Preferably given by subcutaneous injection; if given by intravenous infusion, administer over 30 minutes.  **Reduction in duration of neutropenia and associated sequelae in myeloablative therapy followed by bone marrow transplantation,** by subcutaneous injection, or IV infusion:  **Adult:** 10mcg/kg daily, to be started at least 24 hours following cytotoxic chemotherapy and within 24 hours of bone-marrow infusion, then adjusted according to neutrophil count, doses administered over 30 minutes or 24 hours via intravenous route and over 24 hours via subcutaneous rout  **Mobilization of peripheral blood progenitor cells for autologous infusion, used alone,** by subcutaneous infusion, or by subcutaneous injection:  **Adult:** 10 mcg/kg daily for 5 – 7 days, to be administered over 24 hours if given by subcutaneous infusion  **Mobilization of peripheral blood progenitor cells for autologous infusion, used following adjunctive myelosuppressive chemotherapy - to improve yield,** by subcutaneous injection:  **Adult:** 5mcg/kg daily until neutrophil count in normal range, to be started the day after completing chemotherapy, for timing of leucopheresis.  **Mobilization of peripheral blood progenitor cells in normal donors for allogeneic infusion,** by subcutaneous injection:  **Adult 18–59 years:** 10 mcg/kg daily for 4 – 5 days, for timing of leucopheresis.  **Severe congenital neutropenia and history of severe or recurrent infections (distinguish carefully from other haematological disorders,** by subcutaneous injection:  **Adult:** initially 12 mcg/kg daily, adjusted according to response, can be given in single or divided doses,  **Severe cyclic neutropenia, or idiopathic neutropenia and history of severe or recurrent infections (distinguish carefully from other hematological disorders).**  By subcutaneous injection  **Adult:** initially 5 mcg/kg daily, adjusted according to response, can be given in single or divided doses  **Persistent neutropenia in HIV infection,** by subcutaneous injection:  **Adult:** initially 1 mcg/kg daily, subsequent doses increased as necessary until neutrophil count in normal range, then adjusted to maintain neutrophil count in normal range—consult product literature: maximum 4 mcg/kg per day | |
| Contraindications | Hypersensitivity to the drug, severe congenital neutropenia who develop leukaemia or have evidence of leukemic evolution, | |
| Drug interactions | Lithium, chemotherapy drugs | |
| Side effects | Anaemia, diarrhea, dysuria, hemorrhage, hepatomegaly, hyperuricemia, hypotension, osteoporosis, rash, bone pain, local skin reactions, haemoptysis, severe sickle cell crises | |
| Cautions | Lung diseases, renal impairments, pregnancy and breastfeeding, osteoporotic bone disease, secondary acute myeloid leukaemia | |
| Storage condition | Store at 2 - 80C. | |
| **Golimumab** | | |
| Pharmacological class | Immunosuppressant, tumor necrosis factor (TNF) inhibitor | |
| Dosage form | Injectable solution, 50 mg/0.5 ml, 100 mg/1 ml | |
| Indications | Moderate to severe active rheumatoid arthritis, active and progressive psoriatic arthritis, severe active ankylosing spondylitis, inflammatory bowel diseases, and uveitis | |
| Dose and administration | **Ulcerative colitis:**  **Adult** (body weight up to 80 kg): initially 200 mg subcutaneously, then 100 mg after 2 weeks; maintenance 50 mg every 4 weeks, alternatively maintenance 100 mg every 4 weeks, if inadequate response, review treatment if no response after 4 doses  **Adult** (body weight 80 kg and above): initially 200 mg subcutaneously, then 100 mg after 2 weeks; maintenance 100 mg every 4 weeks, review treatment if no response after 4 doses  **Rheumatoid arthritis, Psoriatic arthritis, Ankylosing spondylitis, non-radiographic axial spondyloarthritis:**  **Adult** **(body weight up to 100 kg):** 50 mg subcutaneously once a month, on the same date each month, review treatment if no response after 3–4 doses  **Adult** **(body weight 100 kg and above)**: initially 50 mg subcutaneously once a month for 3–4 doses, on the same date each month, dose may be increased if inadequate response, increased to 100 mg subcutaneously once a month, review treatment if inadequate response to this higher dose after 3–4 doses. | |
| Contraindications | Moderate or severe heart failure, severe active infection | |
| Drug interactions | Abatacept, anakinra, filgotinib, sarilumab, live vaccines | |
| Side effects | Abscess, alopecia, anemia, asthenia, asthma, bone fracture, chest discomfort, depression, dizziness, fever, gastrointestinal discomfort, gastrointestinal inflammatory disorders, headache, hypersensitivity, hypertension, increased risk of infection, insomnia, malignancies, paresthesia, respiratory disorders, skin reactions, stomatitis, demyelinating disorders | |
| Cautions | Active infection, demyelinating disorders, infection (hepatitis B virus), history or development of malignancy, mild heart failure, dysplasia or carcinoma of the colon, pregnancy, breast feeding, hepatic impairment. | |
| Storage condition | Store in a refrigerator (2°C to 8°C). Do not freeze. | |
| **Infliximab** | | |
| Pharmacological class | Immunosuppressant, tumor necrosis factor (TNF) inhibitor | |
| Dosage form | Injection: 100mg vial | |
| Indications | Moderate to severe active rheumatoid arthritis, active and progressive psoriatic arthritis, severe active ankylosing spondylitis, inflammatory bowel disease, plaque psoriasis, uveitis | |
| Dose and administration | **Severe active Crohn’s disease,** IV infusion:  **Adult:** initially 5 mg/kg, then 5 mg/kg after 2 weeks, then 5 mg/kg after 4 weeks, if condition has responded, then maintenance 5 mg/kg every 8 weeks  **Fistulating Crohn’s disease,** IV infusion:  **Adult:** initially 5 mg/kg, then 5 mg/kg after 2 weeks, followed by 5 mg/kg after 4 weeks, if condition has responded consult product literature for guidance on further doses  **Severe active ulcerative colitis,** IV infusion:  **Adult:** initially 5 mg/kg, then 5 mg/kg after 2 weeks, followed by 5 mg/kg after 4 weeks, then 5 mg/kg every 8 weeks, discontinue if no response 14 weeks after initial dose  **Rheumatoid arthritis (in combination with methotrexate),** IV infusion:  **Adult:** initially 3 mg/kg, then 3 mg/kg after 2 weeks, followed by 3 mg/kg after 4 weeks, then 3 mg/kg every 8 weeks, dose to be increased only if response is inadequate after 12 weeks of initial treatment, increased in steps of 1.5 mg/kg every 8 weeks, increased if necessary up to 7.5 mg/kg every 8 weeks, alternatively increased if necessary to 3 mg/kg every 4 weeks, discontinue if no response by 12 weeks of initial infusion or after dose adjustment  **Ankylosing spondylitis,** IV infusion:  **Adult:** 5 mg/kg, then 5 mg/kg after 2 weeks, followed by 5 mg/kg after 4 weeks, then 5 mg/kg every 6–8 weeks, discontinue if no response by 6 weeks of initial infusion  **Psoriatic arthritis (in combination with methotrexate),** IV infusion:  **Adult:** 5 mg/kg, then 5 mg/kg after 2 weeks, followed by 5 mg/kg after 4 weeks, followed by 5 mg/ kg every 8 weeks  **Plaque psoriasis,** IV infusion:  **Adult:** 5 mg/kg, then 5 mg/kg after 2 weeks, followed by 5 mg/kg after 4 weeks, then 5 mg/kg every 8 weeks, discontinue if no response within 14 weeks of initial infusion | |
| Contraindications | Moderate or severe heart failure, severe infections | |
| Drug interactions | Activated charcoal, fish oils (omega-3 polyunsaturated fatty acids), azathioprine, atorvastatin, esomeprazole, acetaminophen, quetiapine, rivaroxaban, cetirizine. | |
| Side effects | Abscess, alopecia, anaemia, arrhythmias, arthralgia, chest pain, chills, constipation, decreased leucocytes, depression, diarrhea, dizziness, dyspnea, eye inflammation, fatigue, fever, GI discomfort, GI disorders, hemorrhage, headache, hepatic disorders, hyperhidrosis, hypertension, hypotension, increased risk of infection, infusion related reaction, insomnia, lymphadenopathy, myalgia, nausea, neutropenia, edema, pain, palpitations, respiratory disorders, sensation abnormal, sepsis, skin reactions, vasodilation, vertigo, anxiety, cheilitis, cholecystitis, confusion, drowsiness, healing impaired, heart failure, hypersensitivity, lupus-like syndrome, lymphocytosis, memory loss, neoplasms, nerve disorders, pancreatitis, peripheral ischemia, pulmonary edema, seborrhea, seizure, syncope, thrombocytopenia, thrombophlebitis agranulocytosis, circulatory collapse, cyanosis, demyelinating disorders, granuloma, hemolytic anaemia, hepatitis B reactivation, meningitis, pancytopenia, pericardial effusion, sarcoidosis, SCARs, transverse myelitis, vasculitis, vasospasm, dermatomyositis exacerbated, hepatosplenic T-cell lymphoma (increased risk in inflammatory bowel disease), MI, myocardial ischemia, vision loss. | |
| Cautions | Demyelinating disorders, dermatomyositis, development of malignancy, infection (hepatitis B virus), history of colon carcinoma, history of dysplasia, history of malignancy, history of prolonged immunosuppressant or PUVA treatment in patients with psoriasis, mild heart failure, pregnancy, breast feeding | |
| Storage condition | Store refrigerated between 2°C to 8°C. Do not freeze. | |
| **Lenalidomide** | | |
| Pharmacological class | Immunosuppressant, anti-neoplastic, anti-angiogenic, and proerythropoietic properties | |
| Dosage form | Capsule: 5 mg, 10 mg, 15 mg, 25 mg | |
| Indications | Multiple myeloma, myelodysplastic syndrome, mantle cell lymphoma, follicular lymphoma (in combination with rituximab) | |
| Dose and administration | **Newly diagnosed multiple myeloma in patients who have undergone autologous stem cell transplantation,** oral:  **Adult:** 10 mg once daily for 28 consecutive days of repeated 28 -day cycles; increased if tolerated to 15 mg once daily  **Newly diagnosed multiple myeloma in patients not eligible for transplant (in combination with dexamethasone), multiple myeloma in patients who have received at least one prior therapy (in combination with dexamethasone,** oral:  **Adult:** 25 mg once daily for 21 consecutive days of repeated 28 -day cycles, for doses of dexamethasone, and dose adjustments due to side-effects  **Newly diagnosed multiple myeloma in patients not eligible for transplant (in combination with melphalan and prednisone),** oral:  **Adult:** 10 mg once daily for 21 consecutive days of repeated 28 -day cycles for up to 9 cycles, patients who complete 9 cycles or are intolerant to combination therapy should continue treatment with lenalidomide as monotherapy, for doses of melphalan and prednisone  **Newly diagnosed multiple myeloma in patients not eligible for transplant (in combination with bortezomib and dexamethasone),** oral:  **Adult:** 25mg once daily for 14 consecutive days of repeated 21 -day cycles for up to 8 cycles, followed by 25 mg once daily for 21 consecutive days of repeated 28 -day cycles (in combination with dexamethasone alone), for doses of bortezomib and dexamethasone  **Myelodysplastic syndromes,** oral:  **Adult:** 10 mg once daily for 21 consecutive days of repeated28-day cycles  **Mantle cell lymphoma,** oral:  **Adult:** 25 mg once daily for 21 consecutive days of repeated 28-day cycles  **Follicular lymphoma (in combination with rituximab),** oral:  **Adult:** 20 mg once daily for 21 consecutive days of repeated 28 -day cycles for up to 12 cycles, for doses of rituximab | |
| Contraindications | Hypersensitivity to the drug, pregnancy, | |
| Drug interactions | Erythropoietic agents, oral contraceptives, warfarin, digoxin, statins,  alcohol, carbamazepine, doxycycline, fluconazole, vincristine, fluorouracil, Ganciclovir, gemcitabine | |
| Side effects | Anaemia, appetite decreased, arthralgia, asthenia, atrial fibrillation, chills, constipation, cough, decreased leucocytes, dehydration, diarrhea, dizziness, dry oral, dyspnea, electrolyte imbalance, embolism and thrombosis, fever, gastrointestinal discomfort, hemorrhage, headache, heart failure, hyperglycaemia, hypertension, hyperthyroidism, hypotension, hypothyroidism, increased risk of infection, influenza like illness, insomnia, iron overload, lethargy. mood altered, muscle complaints, muscle weakness, myocardial infarction, nausea, neoplasms, neutropenia, night sweats, pain, pancytopenia, paresthesia, peripheral edema, renal failure, respiratory disorders, rhinorrhea, sepsis, skin reactions, taste altered, thrombocytopenia, toothache, tumor flare, vertigo, weight decreased | |
| Cautions | Women of childbearing potential, hematologic disorders, myocardial infarction, renal impairment, avoid blood donation during treatment and for at least 7 days after stopping treatment due to teratogenic risk, high tumor burden, smoking, hypertension, and hyperlipidemia. | |
| Storage condition | Store below 300C. | |
| **Nivolumab** | | |
| Pharmacological class | Immunostimulators | |
| Dosage form | Solution for injection: 10 mg/ml | |
| Indications | Melanoma, renal cell carcinoma, non-small cell lung cancer, malignant pleural mesothelioma, urothelial carcinoma, squamous cell cancer of the head and neck, classical hodgkin lymphoma, gastrointestinal cancer, oesophageal cancer | |
| Dose and administration | **Melanoma, renal cell carcinoma, urothelial carcinoma,** by IV infusion:  **Adults and adolescents (12 years of age and older and weighing at least 50 kg):** 240 mg every 2 weeks over 30 minutes or 480 mg every 4 weeks over 60 minutes or over 30 minutes  Adolescents (12 years of age and older and weighing less than 50 kg):  3 mg/kg every 2 weeks over 30 minutes or 6 mg/kg every 4 weeks over 60 minutes  **Oesophageal or gastro-oesophageal junction cancer (adjuvant treatment),** by IV infusion**:**  **Adult:** 240 mg every 2 weeks over 30 minutes or 480 mg every 4 weeks over 30 minutes for the first 16 weeks, followed by 480 mg every 4 weeks over 30 minutes  **Locally advanced or metastatic non-small cell lung cancer, Classical Hodgkin lymphoma, Squamous cell cancer of the head and neck, Urothelial carcinoma, Oesophageal squamous cell carcinoma,** by IV infusion:  **Adult:** 240 mg every 2 weeks over 30 minutes | |
| Contraindications | Hypersensitivity to the drug. | |
| Drug interactions | Corticosteroids | |
| Side effects | Abdominal pain, alopecia, anaemia, appetite decreased, arrhythmias, arthralgia, arthritis, chest pain, constipation, cough, decreased leucocytes, dehydration, diarrhea, dizziness, dry eye, dry oral, dyspnea, electrolyte imbalance, fatigue, fever, gastrointestinal disorders, hemolytic anaemia, headache, hyperglycaemia, hypersensitivity, hypertension, hyperthyroidism, hypoalbuminemia, hypoglycemia, hypothyroidism, increased risk of infection, inflammation, infusion related reaction, muscle complaints, musculoskeletal discomfort, nausea, nerve disorders, neutropenia, edema, pain, renal impairment, respiratory disorders, skin reactions, stomatitis, thrombocytopenia, thyroiditis, vision blurred, vomiting, weight decreased. Adrenal hypofunction, cardiac inflammation, connective tissue disorders, diabetes mellitus, eosinophilia, eye inflammation, hepatic disorders, hypophysitis, hypopituitarism, metabolic acidosis, pancreatitis, paresis, pericardial disorders, sarcoidosis | |
| Cautions | Pregnancy, hematopoietic stem cell transplant in patients with classical hodgkin lymphoma, rapidly progressing or aggressive disease, peripheral neuropathy, and QT-interval prolongation. | |
| Storage condition | Store at 2 – 80C. Do not freeze. | |
| **Tacrolimus** | | |
| Pharmacological class | Immunosuppressant, calcineurin inhibitor | |
| Dosage form | Tablet: 25mg, 50mg  Capsule (immediate release): 0.5 mg, 0.75 mg, 1 mg; 2 mg, 5 mg  Granules for oral suspension: 0.2 mg, 1 mg | |
| Indications | Prophylaxis of graft rejection following liver, kidney or heart, transplantation | |
| Dose and administration | **Prophylaxis of graft rejection following liver transplantation, starting 12 hours after transplantation,** oral:  **Adult:** initially 100–200 mcg/kg daily in 2 divided doses  **Prophylaxis of graft rejection following kidney transplantation, starting within 24 hours of transplantation,** oral:  **Adult:** initially 200–300 mcg/kg daily in 2 divided doses  **Prophylaxis of graft rejection following heart transplantation following antibody induction, starting within 5 days of transplantation,** oral:  **Adult:** initially 75 mcg/kg daily in 2 divided doses  **Prophylaxis of graft rejection following heart transplantation without antibody induction, starting within 12 hours of transplantation,** oral:  **Adult:** initially 75 mcg/kg orally daily in 2 divided doses | |
| Contraindications | Hypersensitivity to the drug, macrolides, breast feeding | |
| Drug interactions | Ketoconazole, fluconazole, amiodarone, diltiazem, verapamil, ciclosporin, grapefruit, protease inhibitors, clarithromycin, erythromycin, carbamazepine, phenytoin, phenobarbitone, efavirenz, nevirapine, rifampicin | |
| Side effects | Alopecia, anaemia, anxiety, appetite decreased, arrhythmias, ascites, asthenic conditions, bile duct disorders, confusion, consciousness impaired, constipation, coronary artery disease, cough, depression, diabetes mellitus, diarrhea, dizziness, dysgraphia, dyslipidemia, dyspnea, electrolyte imbalance, embolism and thrombosis, eye disorder, febrile disorders, fluid imbalance, GI disorders, hemorrhage, hallucination, headache, hepatic disorders, hyperglycaemia, hyperhidrosis, hypertension, hyperuricemia, hypotension, increased risk of infection, ischemia, joint disorders, leukocytosis, leucopenia, metabolic acidosis, mood altered, muscle spasms, nasal complaints, nausea, nephropathy, nervous system disorder, edema, oral disorders, pain, peripheral neuropathy, peripheral vascular disease, primary transplant dysfunction, psychiatric disorder, renal impairment, renal tubular necrosis, respiratory disorders, seizure, sensation abnormal, skin reactions, sleep disorders, temperature sensation altered, thrombocytopenia, tinnitus, tremor, urinary tract disorder, urine abnormal, vision disorders, weight changes. | |
| Cautions | Infections, lymphoproliferative disorders, malignancies, neurotoxicity, QT-interval prolongation, UV light. | |
| Storage condition | Store below 30oC. | |
| **Thalidomide** | | |
| Pharmacological class | Immunosuppressant and anti-inflammatory activity. | |
| Dosage form | Capsule: 50mg, 100 mg | |
| Indications | Untreated multiple myeloma | |
| Dose and administration | **Untreated multiple myeloma in combination with melphalan and prednisolone.** oral:  **Adult 18–75 years**: 200 mg once daily for 6 –week cycle for a maximum of 12 cycles, dose to be taken at bedtime  **Adult 76 years and over**: 100 mg once daily for 6–week cycle for a maximum of 12 cycles, dose to be taken at bedtime | |
| Contraindications | Hypersensitivity to the drug, male patients unable to follow or comply with the required contraceptive measures, pregnancy and breastfeeding. | |
| Drug interactions | Hypnotics, oral contraceptives, sedatives, beta blockers and anticholinesterase agents, vincristine | |
| Side effects | Neutropenia, leukopenia, anaemia, lymphopenia, thrombocytopenia, confusional state, depression, peripheral neuropathy, tremor, dizziness, paresthesia, dysesthesia, somnolence | |
| Cautions | Women of childbearing potential, hematologic disorders, myocardial infarction, renal impairment, blood donation (for at least 7 days after stopping treatment), high tumour burden, smoking, hypertension, hyperlipidemia, peripheral neuropathy: drugs that cause thromboembolism, bradycardia, myelosuppression. | |
| Storage condition | Store below 300C. | |

# Antineoplastic and Supportive Medicines

Antineoplastics are essential in cancer treatment, targeting rapidly dividing cells to prevent uncontrolled growth and replication. Chemotherapy, a fundamental part of cancer treatment, combines drugs from different classes to maximize efficacy and minimize resistance. Advancements in research and drug development expand the range of chemotherapy options, including anticancer cytotoxic medicines, targeted therapies, hormones, and supportive medicines.

## Cytotoxic agents

Cytotoxic agents are a class of drugs designed to kill or inhibit the growth of rapidly dividing cells, primarily used in the treatment of cancer. They play a crucial role in chemotherapy by targeting the uncontrolled cell proliferation characteristic of tumors. However, because these agents also affect normal cells that divide quickly, such as those in the bone marrow, gastrointestinal tract, and hair follicles, their use can lead to significant side effects. Cytotoxic drugs fall into a number of classes which include alkyting agents, antimetabolites, antibiotics, alkaloids, and topoisomerase inhibitors each with characteristic antitumour activity, sites of action, and toxicity. Alkylating agents add alkyl groups to DNA, preventing cancer cells from dividing, ultimately leading to cell death. Antimetabolites (methotrexate, 5-fluorouracil (5-FU), and gemcitabine) interfere with DNA synthesis by mimicking the structure of essential cellular components. Common examples include. Antitumor antibiotics (doxorubicin, bleomycin, and mitomycin) derived from natural sources, such as bacteria or fungi, and work by inhibiting DNA replication. They bind to DNA strands, causing breaks and preventing cell division. Plant alkaloids interfere with the microtubule structures necessary for cell division, ultimately leading to cell death. Examples include paclitaxel, vincristine, and vinblastine. Topoisomerase inhibitors (etoposide, irinotecan, and topotecan) interfere with the action of topoisomerases, enzymes involved in DNA replication and repair.

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| **Arsenic trioxide** | |
| Pharmacological class | Antineoplastic agent |
| Dosage form | Injection: 1mg/ml in 10ml ampule  Concentrate for solution for infusion: 1 mg/ml, 2 mg/ml |
| Indications | Acute promyelocytic leukemia (APL) |
| Dose and administration | **Newly diagnosed low-risk APL**:  Induction therapy: 0.15 mg/kg/day IV for a maximum of 60 days in combination with tretinoin.  Consolidation therapy: 0.15 mg/kg/day IV for 5 days/week on weeks 1 to 4 of an 8-week cycle for a total of 4 cycles in combination with tretinoin.  **Relapsed or refractory APL**: The treatment course consists of 1 induction cycle and 1 consolidation cycle.  Induction therapy: 0.15 mg/kg/day IV for a maximum of 60 days.  Consolidation therapy: 0.15 mg/kg/day IV for 5 days/week for a total of 5 weeks.  *Note: Consolidation therapy should be initiated 3–6 weeks after completion of induction treatment and only in those patients who achieve a complete bone marrow remission.* |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Antiarrhythmics, amphotericin B. |
| Side effects | Abdominal pain, alveolar haemorrhage, anaemia, arrhythmias, arthralgia, chest pain, chills, diarrhoea, differentiation syndrome, dizziness, dyspnoea, electrolyte imbalance, fatigue, fever, headache, hyperbilirubinaemia, hyperglycaemia, hypotension, hypoxia, increased risk of infection, ketoacidosis, leucocytosis, myalgia, nausea, neutropenia, oedema, pain, pancytopenia, paraesthesia, pericardial effusion, QT interval prolongation, renal failure, respiratory disorders, seizure, skin reactions, thrombocytopenia, vasculitis, vision blurred, vomiting, weight gain. |
| Cautions | Hypokalaemia, hypomagnesaemia, previous treatment with anthracyclines, vitamin B1 deficiency, renal impairment, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C. Protect from light and moisture. |
| **L-Asparaginase** | |
| Pharmacological class | Enzyme |
| Dosage form | Powder for injection: 5000 IU, 10000IU in vial. |
| Indications | Acute lymphoblastic leukemia (ALL), T-cell non-Hodgkin lymphoma. (NHL) |
| Dose and administration | **ALL** or **T-cell NHL**:  **Adult**: 2,500–5,000 IU/m², given IM or IV, usually every 2-3 days. |
| Contraindications | Previous history of serious, pancreatitis, haemorrhage, thrombosis and known coagulopathy. |
| Drug interactions | Methotrexate, vincristine. |
| Side effects | Agitation, anaemia, angioedema, appetite decreased, arthralgia, bronchospasm, coagulation disorders, confusion, depression, diarrhoea, dizziness, drowsiness, dyspnoea, embolism and thrombosis, fatigue, flushing, GI discomfort, haemorrhage, hallucination, hyperglycaemia, hypersensitivity, hypoalbuminaemia, hypoglycaemia, hypotension, increased risk of infection, leucopenia, nausea, neurological effects, oedema, pain, pancreatitis, skin reactions, thrombocytopenia, vomiting, weight decreased. |
| Cautions | Diabetes, hypersensitivity reactions, hypertriglyceridaemia—increased risk of acute pancreatitis. |
| Storage condition | Store between 2-8°C. |
| **Bendamustine** | |
| Pharmacological class | Alkylating agent, nitrogen mustard |
| Dosage form | Injection: 100mg/4ml, 45 mg/0.5 ml; 180 mg/2 ml |
| Indications | Chronic lymphocytic leukemia (CLL), indolent B-cell NHL), and multiple myeloma. |
| Dose and administration | **For CLL and indolent B-cell NHL:** 100-120 mg/m² administered intravenously on days 1 and 2 of a 21- or 28-day cycle.  **For multiple myeloma:** 120 mg/m² administered intravenously on days 1 and 2 of a 21-day cycle. |
| Contraindications | Hypersensitivity to the drug, jaundice, low leucocyte count, low platelet count, major surgery less than 30 days before start of treatment, severe bone marrow suppression, severe hepatic impairment, severe renal impairment (CrCl < 30 ml/min). |
| Drug interactions | Azathioprine, bleomycin, carbimazole, capecitabine, carboplatin, cisplatin, chlorambucil, cyclophosphamide, docetaxel, doxorubicin, epirubicin, ethosuccimide, etoposide, fluorouracil, gemcitabine, ifosfamide, irinotecan, linezolid, methotrexate, mercaptopurine, mycophenolate, olanzapine, oxaliplatin, paclitaxel, rituximab, propylthiouracil, sulphamethoxazole, sulfadiazine, trimethoprim, vincristine, vinblastine, zidovudine, acyclovir, amikacin, amphotericin, bacitracin, capreomycin, carboplatin, cephalexin, cefixime, ceftazidime, ciclosporin, cisplatin, diclofenac, ganciclovir, gentamicin, ibuprofen, gentamicin, indomethacin, meloxicam, methotrexate, oxaliplatin, piroxicam, streptomycin, tacrolimus, trimethoprim, vancomycin, tenofovir disoproxil, zidovudine, zoledronate. |
| Side effects | Alopecia, amenorrhoea, anaemia, angina pectoris, appetite decreased, arrhythmias, cardiac disorder, chills, constipation, decreased leucocytes, dehydration, diarrhoea, dizziness, fatigue, fever, haemorrhage, headache, hepatitis B reactivation, hypersensitivity, hypertension, hypokalaemia, hypotension, increased risk of infection, insomnia, mucositis, nausea, neutropenia, pain, palpitations, respiratory disorders, skin reactions, stomatitis, thrombocytopenia, tumour lysis syndrome, vomiting. |
| Cautions | Cardiac disorders, infections, infusion reactions, liver impairment, renal impairment, pregnancy, breastfeeding. |
| Storage condition | Store in a refrigerator at 2 °C - 8 °C. Allow the vial to reach room temperature (15 °C to 30 °C) prior to use. |
| **Bleomycin** | |
| Pharmacological class | Antineoplastic antibiotic |
| Dosage form | Powder for injection (lyophilized): 15000 IU (as sulphate) in vial  Injection: 15 IU/5ml |
| Indications | Adjunct to surgery and radiotherapy in palliative treatment of Hodgkin lymphoma (HL) and non-Hodgkin lymphoma (NHL), testicular cancer; head and neck cancer, malignant effusions. |
| Dose and administration | **HL and NHL**: IV at a dose of 10-15 units/m2 days 1 and 15 every 28 days  **Testicular cancer**: 30 units IV on days 2, 9, and 16 every 21 days  **Head and neck cancer**: at a dose of 5-15 units/m2  **Intracavitary instillation into pleural space**: 60 units/m2 |
| Contraindications | Hypersensitivity to the drug, acute pulmonary infection, significantly reduced lung function, known, severe pulmonary disease, use of live vaccines. |
| Drug interactions | Cisplatin, oxygen, anticoagulants, vaccines, vinblastine, digoxin, amphotericin B. |
| Side effects | Alopecia, angular cheilitis, appetite decreased, chills, fever (after administration), haemorrhage, headache, interstitial pneumonia, leucopenia, malaise, nail discolouration, nail disorder, nausea, pain, pulmonary fibrosis (dose-related), scleroderma, skin reactions, stomatitis, vomiting, weight decreased, diarrhoea, dizziness, hepatocellular injury, oliguria, shock, urinary disorders, vein wall hypertrophy, venous stenosis. |
| Cautions | Risk factors for pulmonary toxicity (e.g., pre-existing pulmonary disease), compromised renal or hepatic function, pregnancy, breastfeeding. |
| Storage condition | Store under refrigeration at 2°C to 8°C. Store the reconstituted solution at 2-8 °C for no more than 24 hours if needed. |
| **Capecitabine** | |
| Pharmacological class | Antineoplastic agent, fluoropyrimidine |
| Dosage form | Tablet: 150 mg, 500 mg. |
| Indications | Colorectal cancer, metastatic breast cancer and gastric cancer. |
| Dose and administration | **Colorectal cancer**: 1,250 mg/m2 orally twice daily for 2 weeks followed by a 1-week rest period, repeated in 3-week cycles.  **Breast cancer**: 1,250 mg/m2 orally twice daily for 2 weeks followed by a 1-week rest period, repeated in 3-week cycles.  **Gastric cancer**: 800-1000 mg/m2 orally twice daily for 2 weeks followed by a 1-week rest period, repeated in 3-week cycles. |
| Contraindications | Complete dihydropyrimidine dehydrogenase deficiency, severe hepatic impairment, severe renal impairment (CrCl < 30 ml/min). |
| Drug interactions | Anticoagulants, phenytoin, phenobarbital, or rifampin, proton pump inhibitors and H2-receptor antagonists. |
| Side effects | Nausea, vomiting, diarrhea, stomatitis, hand-foot syndrome (palmar-plantar erythrodysesthesia), neutropenia and thrombocytopenia, hepatotoxicity, fatigue and weakness, skin reactions, headache and dizziness. |
| Cautions | Diabetes mellitus, diarrhoea or dehydration, electrolyte disturbances, history of angina pectoris, history of arrhythmias, history of significant cardiovascular disease, nervous system disease, contraception, renal impairment, hepatic impairment, pregnancy and breastfeeding. |
| Storage condition | Store below 30°C. Protect from heat, light and moisture. |
| **Carboplatin** | |
| Pharmacological class | Alkylating agent, platinum analog |
| Dosage form | Injection: 50 mg/5 ml, 150 mg/15 ml, 450 mg/45 ml, 600 mg/60 ml |
| Indications | Ovarian cancer, small cell lung cancer (SCLC) and NSCLC, head and neck cancer, bladder cancer, and testicular cancer. |
| Dose and administration | **Ovarian cancer**: Area under the curve (AUC) of 5 to 7.5 mg/ml/min intravenously once every 3 to 4 weeks, often in combination with other chemotherapeutic agents.  **Lung cancer**: AUC of 5 to 7 mg/ml/min intravenously once every 3 to 4 weeks, often in combination with other chemotherapeutic agents.  **Head and neck cancer**: Dosages can vary widely but may be similar to those used for ovarian or lung cancer, administered IV every 3 to 4 weeks in combination with other chemotherapy drugs or radiation therapy  **Bladder cancer**: Similar dosages to ovarian or lung cancer may be used, typically administered IV every 3 to 4 weeks in combination with other chemotherapy agents.  **Testicular cancer**: Dosages are often calculated based on the patient's renal function and may be administered intravenously in combination with other chemotherapy drugs. |
| Contraindications | Hypersensitivity to the drug or any platinum-containing compounds, peripheral neuropathy with functional impairment, severe bone marrow suppression, severe renal impairment (CrCl less than 20 ml/min). |
| Drug interactions | Myelosuppressive drugs. |
| Side effects | Alopecia, anaemia, asthenia, cardiovascular disorder, constipation, diarrhoea, gastrointestinal discomfort, haemorrhage, hypersensitivity, increased risk of infection, leucopenia, mucosal abnormalities, musculoskeletal disorder, nausea, neutropenia, ototoxicity, peripheral neuropathy, reflexes decreased, respiratory disorders, sensation abnormal, skin reactions, taste altered, thrombocytopenia, urogenital disorder, vision disorders, vomiting. |
| Cautions | Renal impairment, bone marrow suppression, ototoxicity (pre-existing hearing impairment), allergic reactions, liver impairmrnt, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C. Protect from light and moisture. Store reconstituted solution for up to 24 hours at 2-8 °C. |
| **Chlorambucil** | |
| Pharmacological class | Alkylating agent, nitrogen mustard |
| Dosage form | Tablet: 2mg |
| Indications | CLL, HL and NHL. |
| Dose and administration | **CLL:** 0.15-0.2 mg/kg/day for 3 to 6 weeks, followed by a rest period and repeated every 4 to 6 weeks.  **Lymphomas:** 0.1-0.2 mg/kg/day for 3 to 6 weeks, followed by a rest period and repeated every 4 to 6 weeks. |
| Contraindications | Hypersensitivity to the drug, cross-hypersensitivity with other alkylating agents, history of epilepsy. |
| Drug interactions | Phenobarbital, phenytoin, and other drugs that stimulate the liver P450 system. |
| Side effects | Anaemia, bone marrow disorders, diarrhoea, GI disorder, leucopenia, nausea, neoplasms, neutropenia, oral ulceration, seizures, thrombocytopenia, vomiting. |
| Cautions | Severe hepatic impairment, renal impairment, seizure disorders, bone marrow suppression, radiation therapy, use of myelosuppressive drugs, therapy should be discontinued promptly if generalized skin rash develops. |
| Storage condition | Store in the refrigerator between 2°C and 8°C. Protect from light. |
| **Cisplatin** | |
| Pharmacological class | Antineoplastic agent, platinum analog. |
| Dosage form | Injection: 10 mg/10 ml, 20 mg/20 ml, 50 mg/50 ml,  100 mg/100 ml |
| Indications | Testicular cancer, ovarian cancer, bladder cancer, head and neck cancer, oesophageal cancer, SCLC and NSCLC, NHL and Neuroblastoma (in paediatric patients) |
| Dose and administration | **Ovarian cancer**: 75-100 mg/m2 IV on day 1 every 21 days as part of the cisplatin/paclitaxel regimen, and 100 mg/m2 on day 1 every 21 days as part of the cisplatin/cyclophosphamide regimen.  **Testicular cancer:** 20-50 mg/m²/day IV for 5 days, repeated every 21 days.  **NSCLC**: 60–100 mg/m2 IV on day 1 every 21 days as part of the cisplatin/etoposide or cisplatin/gemcitabine regimens.  **Head and neck cancer**: 20 mg/m2 /day IV continuous infusion for 4 days. |
| Contraindications | Hypersensitivity to the drug or other platinum analogue, severe renal impairment (CrCl <40 ml/min). |
| Drug interactions | Phenytoin, aminoglycosides, amphotericin B, etoposide, methotrexate, ifosfamide, bleomycin, paclitaxel. |
| Side effects | Anaemia, arrhythmias, bone marrow failure, electrolyte imbalance, extravasation, necrosis, fever, leucopenia, nephrotoxicity, sepsis, thrombocytopenia, anaphylactoid reaction, ototoxicity, abnormal spermatogenesis. |
| Cautions | Abnormal renal function, hearing impairment or pre-existing peripheral neuropathy, aluminium needles. |
| Storage condition | Store between 15 °C and 30°C. Protect from light. |
| **Cyclophosphamide** | |
| Pharmacological class | Alkylating agent, nitrogen mustard |
| Dosage form | Powder for injection: 200mg, 500mg, 1000mg, 2000mg in vial.  Capsule/Tablet: 25mg, 50 mg |
| Indications | Breast cancer, NHL, CLL, ovarian cancer, bone and soft tissue sarcoma, rhabdomyosarcoma, neuroblastoma and Wilms’ tumor. |
| Dose and administration | **Breast cancer**: 100 mg/m2 PO on days 1–14 given every 28 days. 600 mg/m2 IV given every 21 days as part of the AC or CMF regimens.  **NHL**: 400–600 mg/m2 IV on day 1 every 21 days, as part of the CVP regimen, and 750 mg/m2 on day 1 every 21 days, as part of the CHOP regimen. |
| Contraindications | Pregnancy, breastfeeding, and severe renal impairment (creatinine clearance < 40 ml/min). |
| Drug interactions | Phenobarbital, phenytoin, and other drugs that stimulate the liver P450 enzyme, anticoagulants, digoxin, doxorubicin, allopurinol. |
| Side effects | Agranulocytosis, alopecia, anaemia, asthenia, bone marrow disorders, cystitis, decreased leucocytes, fever, haemolytic uraemic syndrome, haemorrhage, hepatic disorders, immunosuppression, increased risk of infection, mucosal abnormalities, neutropenia, progressive multifocal leukoencephalopathy (PML), reactivation of infections, sperm abnormalities, thrombocytopenia, appetite decreased, embolism and thrombosis, flushing, hypersensitivity, ovarian and fallopian tube disorders, sepsis. |
| Cautions | Acute porphyrias, diabetes mellitus, haemorrhagic cystitis, previous or concurrent mediastinal irradiation, abnormal renal function. |
| Storage condition | Store below 30°C. Protect from light and moisture. Reconstituted solutions should be stored under refrigeration in glass containers and used within 14 days. |
| **Cytarabine** | |
| Pharmacological class | Antimetabolite, pyrimidine analog |
| Dosage form | Tablet: 50 mg  Injection: 100 mg/ml in vial |
| Indications | ALL, AML, CML, NHL and Leptomeningeal neoplasm. |
| Dose and administration | **AML induction**: 100 mg/m2/day IV as a continuous IV infusion over 24 hours for days 1–7 in combination with an anthracycline as induction chemotherapy.  **AML consolidation**: 1.5–3.0 g/m2 IV every 12 hours for day 1, day 3 and day 5.  **CML:** 20 mg/m2 SC for 10 days per month for 6 months, associated with IFN-α.  **Leptomeningeal neoplasm secondary to leukemia or lymphoma**: 10–30 mg intrathecal (IT) up to three times weekly.  **ALL:** 1-3 g/m² administered intravenously every 12 hours for 2-6 doses.  **NHL**: 3 g/m² every 12 hours for 4 doses on days 1 and 2 of the cycle. |
| Contraindications | Hypersensitivity to the drug, severe renal impairment (CrCL <40 ml/min). |
| Drug interactions | Digoxin, phenytoin, live vaccines. |
| Side effects | Myelosuppression, nausea, vomiting, diarrhoea, oral mucositis, rash, fever, elevated liver function tests, alopecia, ocular discomfort. conjunctivitis, GI haemorrhage, oesophagitis, jaundice, dizziness, cellulitis at injection site, chest pain, urinary retention, renal impairment, and anaphylaxis, palmar-plantar erythrodysesthesia. |
| Cautions | Myelosuppression, abnormal liver and/or renal function, alkalinization of urine (pH >7), tumor lysis syndrome, GI disorders, neurological (e.g., peripheral neuropathy, cerebral and cerebellar dysfunction) and pulmonary toxicity (e.g., cardiomyopathy, pulmonary oedema), corneal toxicity, pregnancy and breastfeeding. |
| Storage condition | Store between 15 °C and 30 °C. Protect from light and moisture. Reconstituted solutions should be stored at 2-8 °C, but portions remaining unused after 24 hours must be discarded. |
| **Dacarbazine** | |
| Pharmacological class | Alkylating agent, triazene derivative |
| Dosage form | Powder for injection: 100mg, 200 mg, 500mg in vial |
| Indications | Hodgkin’s lymphoma, malignant melanoma, soft tissue sarcomas, neuroblastoma. |
| Dose and administration | **Hodgkin’s lymphoma**:375 mg/m2 IV on days 1 and 15 every 28 days, as part of the ABVD regimen,  **Soft tissue sarcoma**: 250 mg/m2/day IV continuous infusion on days 1–4 as part of the AD regimen and 750 mg/m2 IV on day 1 every 21 days as part of the CYVADIC regimen.  **Melanoma:** As a single agent, 250 mg/m2 IV for 5 days or 800–1,000 mg/m2 IV every 3 weeks. |
| Contraindications | Hypersensitivity to the drug, pregnancy, breastfeeding, renal impairment, pre-existing myelosuppression, live vaccines. |
| Drug interactions | Heparin, lidocaine, hydrocortisone, phenytoin, phenobarbital. |
| Side effects | Diarrhoea, flu-like syndrome (fever, myalgia, malaise), transient increases in hepatic transaminases and alkaline phosphatase (ALP), facial flushing, pain along injected vein, nausea and vomiting, agranulocytosis, blurred vision, seizures, confusion, headache, alopecia, erythematous and maculopapular rash, photosensitivity, hypotension, hepatic vein thrombosis, hepatocellular necrosis, and tissue damage due to extravasation. |
| Cautions | Moderate to severe hepatic and/or renal dysfunction, bone marrow suppression. |
| Storage condition | Store at a temperature between 2 °C and 8 °C. Protect from light and moisture. Reconstituted solutions should be stored at 4 °C for up to 72 hours only. |
| **Dactinomycin (Actinomycin-D)** | |
| Pharmacological class | Antineoplastic agent, antibiotic |
| Dosage form | Powder for injection: 0.5 mg in vial |
| Indications | Wilms tumor (nephroblastoma), rhabdomyosarcoma, germ cell tumors, gestational trophoblastic disease, Ewing sarcoma. |
| Dose and administration | **Wilms tumor, rhabdomyosarcoma, Ewing sarcoma**: 0.015 mg/kg/day (up to a maximum dose of 0.5 mg/day) IV on days 1–5 over 16–45 weeks, depending on the specific regimen.  **Germ cell tumors and gestational trophoblastic disease:** 0.4–0.45 mg/m2 IV on days 1–5 every 2–3 weeks. |
| Contraindications | Hypersensitivity to the drug, pregnancy and breastfeeding, live vaccines, severe bone marrow suppression or bleeding disorders, patients infected with chickenpox or herpes zoster, severe generalized diseases. |
| Drug interactions | Phenytoin, radiation therapy, vesicant. |
| Side effects | Neutropenia and thrombocytopenia, nausea and vomiting, oral mucositis, oesophagitis, pharyngitis, diarrhoea, fever, malaise, myalgia, alopecia, alopecia, hyperpigmentation of skin, erythema, and increased sensitivity to sunlight, radiation-recall reaction, extravasation, anaphylaxis, hepatotoxicity, hepatic veno-occlusive disease (common in Wilms tumour). |
| Cautions | Hepatic or biliary impairment, concurrent or previous radiotherapy, rapid administration, sun exposure. |
| Storage condition | Store between 20-30 °C. Protect from light and moisture. |
| **Daunomycin hydrochloride (Daunorubicin)** | |
| Pharmacological class | Antineoplastic agent, anthracycline antibiotic |
| Dosage form | Powder for injection: 20 mg, 50 mg (as hydrochloride) in vial  Injection: 2 mg/ml, 5 mg/ml (as hydrochloride) in vial. |
| Indications | AML, ALL, Kaposi’s sarcoma |
| Dose and administration | **AML:** 45 mg/m2 IV on days 1–3 of the first course of induction therapy and on days 1 and 2 of subsequent courses. Used in combination with continuous infusion Cytarabine  **ALL:** 45 mg/m2 IV on days 1–3 in combination with vincristine, prednisone, and L-asparaginase.  Single agent—40 mg/m2 IV every 2 weeks.  **Kaposi’s sarcoma:** 20-40mg/ m2 every 2-3 weeks. |
| Contraindications | Hypersensitivity to the drug or any anthracyclines, congestive heart failure, left ventricular ejection fraction < 30–40%, arrhythmias, pre-existing bone marrow suppression or bleeding disorders. |
| Drug interactions | Cyclophosphamide, dexrazoxane, dexamethasone, heparin methotrexate, phenytoin, live vaccines, and radiation therapy. |
| Side effects | Abdominal pain, alopecia, amenorrhoea, anaemia, arrhythmias, ascites, atrioventricular block, azoospermia, bone marrow disorders, cardiac inflammation, cardiomyopathy, chills, congestive heart failure, cyanosis, death, dehydration, diarrhoea, dyspnoea, extravasation necrosis, fever flushing, gastrointestinal disorders, haemorrhage, hepatomegaly, hyperpyrexia, hyperuricaemia, hypoxia, infection, ischaemic heart disease, leucopenia, mucositis, myocardial infarction, nail discolouration, nausea, nephropathy, neutropenia, oedema, pain, paraesthesia, pleural effusion, radiation injuries, shock, skin reactions, stomatitis, thrombocytopenia, thrombophlebitis, urine discolouration, venous sclerosis, vomiting. |
| Cautions | Irritant to tissues, neutrophil count less than 1500/mm3, hepatic impairment, renal impairment, cardiac disease, reduced cardiac reserve or treatment with other cardiotoxic drugs, previous treatment to maximum cumulative dose with another anthracycline, sun exposure, pregnancy and breastfeeding. |
| Storage condition | Store below 30 °C. Protect from light and moisture. Store at 2 °C – 8 °C after reconstitution. |
| **Docetaxel** | |
| Pharmacological class | Antineoplastic agent, taxane |
| Dosage form | Injection: 20mg/ml, 40 mg/ml |
| Indications | Breast cancer, lung cancer, prostate cancer, gastric cancer, head and neck cancer, refractory ovarian cancer, eosophageal cancer. |
| Dose and administration | **Breast cancer**: 60 -100 mg/m2 IV every 3 weeks or 35–40 mg/m2 IV weekly for 3 weeks with 1-week rest as single agent  **Breast cancer**: 75 mg/m2 IV every 3 weeks in combination with cyclophosphamide and doxorubicin for adjuvant therapy.  **NSCLC:**75 mg/m2 IV every 3 weeks or 35–40 mg/m2 IV weekly for 3 weeks with 1-week rest after platinum-based chemotherapy.  **NSCLC**: 75 mg/m2 IV every 3 weeks in combination with cisplatin in patients who have not received prior chemotherapy  **Metastatic prostate cancer:** 75 mg/m2 IV every 3 weeks in combination with prednisone.  **Advanced gastric cancer**:75 mg/m2 IV every 3 weeks in combination with cisplatin and 5-FU.  **Head and neck cancer**: 75 mg/m2 IV every 3 weeks in combination with cisplatin and 5-FU for induction therapy of locally advanced disease  **Refractory ovarian cancer:** 60mg/m2 in combination with carboplatin  **Eosophageal cancer:** 75mg/m2 on day 1 and day 22 in combination with cisplatin |
| Contraindications | Hypersensitivity to the drug and/or polysorbate 80, severe hepatic impairment or baseline neutrophil counts less than 1,500 cells/mm3, and acute Porphyrias. |
| Drug interactions | Radiation therapy, cyclosporine, ketoconazole, and erythromycin |
| Side effects | Abdominal pain, alopecia, anaemia, appetite decreased, arrhythmia, arthralgia, asthenia, constipation, diarrhoea, dyspnoea, fluid imbalance, haemorrhage, hypersensitivity, hypertension, hypotension, increased risk of infection, myalgia, nail disorders, nausea, neutropenia, peripheral neuropathy, sepsis, skin reactions, stomatitis, taste altered, thrombocytopenia, vomiting, GI disorders, heart failure. |
| Cautions | Abnormal liver function, fluid retention, pregnancy and breastfeeding. |
| Storage | Store between 15 and 30°C. Store multiple-dose vials for up to 28 days. Protect from light. |
| **Doxorubicin** | |
| Pharmacological class | Antineoplastic agent, anthracycline antibiotic |
| Dosage form | Powder for injection: 10 mg, 50 mg (hydrochloride) in vial  Injection: 2 mg/ml (hydrochloride) in 5 ml, 25 ml vial, 2 mg/ml (as pegylated liposomal) in 10 ml, 25 ml vial |
| Indications | Breast cancer, Hodgkin’s and non-Hodgkin’s lymphoma, soft tissue sarcoma, ovarian cancer, lung cancer, bladder cancer, thyroid cancer, hepatoma, gastric cancer, Wilms tumor, neuroblastom, acute lymphoblastic leukemia |
| Dose and administration | **For all** Indications**:**  Single agent: 60–75 mg/m2 IV every 3 weeks.  Single agent: 15–20 mg/m2 IV weekly.  Combination therapy: 45–60 mg/m2 every 3 weeks.  Continuous infusion: 60–90 mg/m2 IV over 96 hours |
| Contraindications | Hypersensitivity to the drug or other anthracyclines, pre-existing bone marrow suppression or bleeding disorders, severe hepatic impairment or severe myocardial insufficiency, congestive heart failure, left ventricular ejection fraction <30–40%, arrhythmias. |
| Drug interactions | Dexrazoxane, phenobarbital, phenytoin, trastuzumab, mitomycin-C, mercaptopurine, warfarin, ciclosporin, 5-FU, cyclophosphamide, paclitaxel, cimetidine, digoxin, dexamethasone, heparin. |
| Side effects | Alopecia, anaemia, anxiety, appetite decreased, arrhythmias, arthralgia, asthenia, bone marrow suppression, breast pain, cachexia, cardiovascular disorder, chest discomfort, chills, constipation, cough, decreased leucocytes, dehydration, depression, diarrhoea, dizziness, drowsiness, dry mouth, dysphagia, dyspnoea, dysuria, electrolyte imbalance, epistaxis, eye inflammation, fever, gastrointestinal disorders, headache, hyperhidrosis, hypersensitivity, hypertension, hyperthermia, hypotension, increased risk of infection, influenza like illness, infusion related reaction, insomnia, malaise, mucosal abnormalities, muscle complaints, muscle tone increased, muscle weakness, nail disorder, nausea, nerve disorders, neutropenia, oedema, oral disorders, pain, scrotal erythema, sensation abnormal, sepsis, skin reactions, skin ulcer, syncope, taste altered, thrombocytopenia, vasodilation, vision blurred, vomiting, weight decreased, confusion, embolism and thrombosis. |
| Cautions | Irritant to the tissues, previous treatment to maximum cumulative dose with another anthracycline, hepatic impairment, renal impairment, cardiac disease, treatment with other cardiotoxic drugs, previous mediastinal or pericardial irradiation, sun exposure, pregnancy and breastfeeding. |
| Storage condition | Powder for injection: store below 30°C. Protect from light and moisture.  Solution for injection: store in a refrigerator at temperature between 2 °C and 8 °C. |
| **Epirubicin** | |
| Pharmacological class | Antineoplastic agent, anthracycline antibiotic |
| Dosage form | Injection: 50mg |
| Indications | Breast cancer, gastric cancer, ovarian cancer, lung cancer, colorectal cancer, lymphoma, bladder cancer. |
| Dose and administration | **Breast and lung cancer**: 100–120 mg/m2 IV every 3 weeks.  **For others:** 50-100mg**/**m2 IV every 3 weeks. |
| Contraindications | Hypersensitivity to the drug or other anthracyclines, bladder problems, severe hepatic impairment, cardiac problems. |
| Drug interactions | Heparin, cimetidine, mitomycin-C and other cardiotoxic medication. |
| Side effects | Alopecia, amenorrhoea, anaemia, appetite decreased, arrhythmias, cardiac conduction disorders, chills, congestive heart failure, dehydration, diarrhoea, eye inflammation, fever, gastrointestinal discomfort, gastrointestinal disorders, haemorrhage, increased risk of infection, leucopenia, malaise, mucositis, nail discolouration, nausea, neutropenia, oral disorders, skin reactions, thrombocytopenia, urine discolouration, vasodilation, vomiting, asthenia, embolism and thrombosis, sepsis. |
| Cautions | Irritant to tissues, hepatic and renal impairment, pregnancy and breastfeeding, cardiac disorder, patients previously treated with radiation therapy. |
| Storage condition | Lyophilized powder for injection: store below 30 °C. Protect from light and moisture.  Solution for injection:store at a temperature between 2 °C and 8°C. |
| **Etoposide** | |
| Pharmacological class | Antineoplastic agent, topoisomerase II inhibitor |
| Dosage form | Powder for injection: 100mg  Injection: 20 mg/ml in 5 ml ampoule  Capsule: 50 mg, 100 mg |
| Indications | Testicular cancer, ovarian cancer, lung cancer, Non-Hodgkin’s lymphoma, Hodgkin’s lymphoma, gastric cancer, AML, nephroblastoma |
| Dose and administration | **Testicular cancer**: As part of the PEB regimen, 100 mg/m2 IV on days 1–5 with cycles repeated every 3 weeks.  **SCLC**: As part of the cisplatin/VP-16 regimen, 100–120 mg/m2 IV on days 1–3 with cycles repeated every 3 weeks.  **Testicular cancer, lung cancer, lymphomas:** 50-100 mg/m2 /day PO for 21 days. |
| Contraindications | Hypersensitivity to the drug or other topoisomerase II inhibitors, severe bone marrow suppression or bleeding disorders, pregnancy, breastfeeding, severe hepatic impairment, allergy to polysorbate 80 or benzyl alcohol, intrathecal administration. |
| Drug interactions | Ciclosporin, phenobarbital, phenytoin, warfarin. |
| Side effects | Abdominal pain, acute leukaemia, alopecia, anaemia, appetite decreased, arrhythmia, asthenia, bone marrow suppression, constipation, diarrhoea, dizziness, hepatotoxicity, hypertension, leucopenia, malaise, mucositis, myocardial infarction, nausea, neutropenia, skin reactions, thrombocytopenia, vomiting, nerve disorders, dysphagia, neurotoxicity, radiation recall reaction, respiratory disorders, seizure, severe cutaneous adverse reactions (SCARs), taste altered, vision loss. |
| Cautions | Irritant to tissue, hepatic and renal impairment, anaphylactic reactions, signs of phlebitis. |
| Storage condition | Store below 30°C. Protect from light and moisture. Store at 2-8 °C after dilution. |
| **Fludarabine** | |
| Pharmacological class | Antineoplastic agent, purine analog |
| Dosage form | Powder for injection: 50 mg (phosphate) in vial  Tablet: 10 mg |
| Indications | CLL, cutaneous T-cell lymphoma |
| Dose and administration | Injection: 25 mg/m2 IV on days 1–5 every 28 days.  Oral: 40 mg/m2PO on days 1–5 every 28 days. |
| Contraindications | Hypersensitivity to any nucleoside analogs, severe bone marrow suppression, bleeding disorders, haemolytic anaemia. |
| Drug interactions | Phenytoin, phenobarbital, warfarin. |
| Side effects | Neutropenia, autoimmune haemolytic anaemia, increased risk of infection, nausea and vomiting, hypersensitivity reaction, neurotoxicity. |
| Cautions | Abnormal renal function, elderly, bone marrow impairment, pregnancy and breastfeeding, infection, susceptibility to skin cancer or worsening of existing skin cancer. |
| Storage condition | Store below 30°C. Protect from light and moisture. Reconstituted solution should be used immediately or within 8 hours if stored at room temperature, or within 24 hours if stored at 2 °C to 8 °C. |
| **Fluorouracil (5-Fluorouracil)** | |
| Pharmacological class | Antimetabolite, a pyrimidine analog |
| Dosage form | Injection: 50 mg/ml in 10 ml ampoule, topical cream 5% |
| Indications | Colorectal cancer, breast cancer, anal, oesophageal, gastric, pancreatic cancer, head and neck cancer, hepatoma, topical use in basal cell cancer of skin and actinic keratosis. |
| Dose and administration | **Bolus monthly schedule**: 425–450 mg/m2IV on days 1–5 every 28 days.  **Bolus weekly schedule**: 500–600 mg/m2 IV every week for 6 weeks every 8 weeks.  **24-hour infusion**: 2,400–2,600 mg/m2 IV every week.  **96-120-hour infusion**: 1,000 mg/m2/day IV on days 1–5 every 21–28 days. |
| Contraindications | Hypersensitivity to any fluoropyrimidines, severe bone marrow suppression, infection, active ischemic heart disease or history of myocardial infarction within previous 6 months, absence of dihydropyrimidine dehydrogenase activity. |
| Drug interactions | Antifolate analogs, warfarin, phenytoin, metronidazole, and cimetidine. |
| Side effects | Agranulocytosis, alopecia, anaemia, anal inflammation, appetite decreased, asthenia, bone marrow disorders, bronchospasm, diarrhoea, gastrointestinal disorders, haemorrhage, hand and foot syndrome (long term use), healing impaired, immunosuppression, increased risk of infection, ischaemic heart disease, leucopenia, malaise, mucositis, nausea, neutropenia, skin reactions, stomatitis, thrombocytopenia, vomiting, arrhythmias, cardiac inflammation, cardiogenic shock, cardiomyopathy congestive, dehydration, dizziness, drowsiness, euphoric mood, eye disorders, eye inflammation, headache, heart failure, hepatic disorders, hypotension, movement disorders, myocardial infarction, nail discolouration, nail disorders, nerve disorders, ovulation disorder, parkinsonism, photosensitivity reaction, sepsis, spermatogenesis disorder, vision disorders. |
| Cautions | History of heart disease, partial dihydropyrimidine dehydrogenase deficiency, mucositis and/or diarrhoea, GI toxicity, neurologic toxicity, hand-foot syndrome, pregnancy and breastfeeding. |
| Storage condition | Store below 30°C. Protect from light and moisture. |
| **Gemcitabine** | |
| Pharmacological class | Antineoplastic agent, nucleoside analog |
| Dosage form | Powder for injection: 200mg, 1g in vial  Solution for injection: 10 mg/ml |
| Indications | Pancreatic cancer, NSCLC, breast cancer, ovarian cancer, bladder cancer, soft tissue sarcoma. |
| Dose and administration | **NSCLC:** 1,200 mg/m2 IV on days 1, 8, and 15 every 28 days.  **For others**: 1,000 mg/m2IV every week for 7 weeks, with 1-week rest. Treatment then continues weekly for 3 weeks, followed by 1-week rest; OR1,000 mg/m2 IV on days 1, 8, and 15 in combination with Abraxane 125 mg/m2 IV on days 1, 8, and 15, with cycles repeated every 28 days. |
| Contraindications | Hypersensitivity to the drug, severe renal impairment (CrCl< 20 ml/min). |
| Drug interactions | Azathioprine, bleomycin, carbimazole, capecitabine, cisplatin, chlorambucil, cyclophosphamide, docetaxel, doxorubicin, epirubicin, ethosuccimide, etoposide, fluorouracil, ifosfamide, irinotecan, linezolid, methotrexate, mercaptopurine, mycophenolate, olanzapine, oxaliplatin, paclitaxel, rituximab, propylthiouracil, sulphamethoxazole, sulfadiazine, trimethoprim, vincristine, vinblastine, zidovudine. |
| Side effects | Alopecia, anaemia, appetite decreased, asthenia, back pain, bone marrow depression, chills, constipation, cough, diarrhoea, drowsiness, dyspnoea, fever, haematuria, headache, hyperhidrosis, influenza like illness, insomnia, leucopenia, myalgia, nausea, neutropenia, oedema, oral disorders, proteinuria, rhinitis, skin reactions, thrombocytopenia, vomiting, respiratory disorders, capillary leak syndrome, hypotension, myocardial infarction, encephalopathy syndrome, severe cutaneous adverse reactions, skin ulcer, thrombocytosis. |
| Cautions | Pregnancy and breastfeeding, pre-existing cardiac disease, abnormal liver and/or renal function. |
| Storage condition | Store between 15°C to 30°C. Reconstituted solutions should be used immediately or stored under refrigeration (2-8°C). |
| **Hydroxyurea (hydroxycarbamide)** | |
| Pharmacological class | Antineoplastic agent, antimetabolite |
| Dosage form | Tablet: 100 mg, 200 mg, 300 mg, 400 mg, 500 mg, 1 g  Capsule: 500mg |
| Indications | CML, essential thrombocytosis, polycythemia vera, sickle cell disease, head and neck cancer. |
| Dose and administration | **CML**: 20–40 mg/kg PO daily.  **Sickle cell disease**: 15 mg/kg/day PO for adult and 20mg/kg/day for paediatrics as a single dose. Increase the daily dose by 5mg/kg every 12 week to the maximum of 35mg/kg/day.  **Combination therapy with irradiation of head and neck cancer**: 80 mg/kg PO every third day and initiated at least 7 days before radiation therapy.  **Polycythemia vera and Essential thrombocytosis:** 15-20mg/kg/day |
| Contraindications | Hypersensitivity to the drug, severe bone marrow suppression or bleeding disorders, renal impairment (CrCl< 60 ml/min). |
| Drug interactions | 5-FU, zidovudine. |
| Side effects | Alopecia, anaemia, appetite decreased, asthenia, bone marrow disorders, chills, constipation, cutaneous vasculitis, dermatomyositis, diarrhoea, disorientation, dizziness, drowsiness, dyspnoea, dysuria, fever, gastrointestinal discomfort, haemorrhage, hallucination, headache, hepatic disorders, leucopenia, malaise, mucositis, nail discolouration, nail disorder, nausea, neoplasms, neutropenia, oral disorders, pancreatitis, peripheral neuropathy, pulmonary oedema, red blood cell abnormalities, respiratory disorders, seizure, skin reactions, skin ulcers, sperm abnormalities, thrombocytopenia, vomiting. |
| Cautions | Leg ulcers (vasculitic ulcerations), pregnancy and breastfeeding, hepatic and renal impairment. |
| Storage condition | Store below 30 °C. Protect from moisture and light. |
| **Ifosfamide** | |
| Pharmacological class | Antineoplastic agent, alkylating agent |
| Dosage form | Powder for injection: 500 mg, 1000mg, 2000mg, 3000mg in vial |
| Indications | Germ cell tumors, sarcoma, NHL, HL, SCLC and NSCLC, head and neck cancer. |
| Dose and administration | **Germ cell cancer**: 1,200 mg/m2IV on days 1–5 every 21 days.  **Sarcoma**: 2,000 mg/m2 IV continuous infusion on days 1–3 every 21 days.  **NHL and HL**: 1,000 mg/m2 on days 1 and 2 every 28 days.  **Head and neck cancer**: 1,000 mg/m2 on days 1–3 every 21–28 days.  **Lung cancer**: 1,200-1500 mg/m2/day IV for 3-5 days every 21-28 days. |
| Contraindications | Acute infection, cystitis, urinary tract obstruction, urothelial damage, hypersensitivity to ifosfamide or any of its components, severe bone marrow suppression or bleeding disorders, severe renal impairment (CrCl< 10 ml/min), severe liver disease, and/or cardiac disease. |
| Drug interactions | Phenobarbital, phenytoin, and other drugs that stimulate CYP450 system, cimetidine, allopurinol, cisplatin, warfarin. |
| Side effects | Alopecia, appetite decreased, bone marrow disorders, haemorrhage, hepatic disorders, infection, leucopenia, nausea, reactivation of infection, renal impairment, thrombocytopenia, vomiting, cardiotoxicity, diarrhoea, hypotension, oral disorders. |
| Cautions | Pregnancy and breastfeeding, signs of haemorrhagic cystitis and neurotoxicity, acute porphyrias. |
| Storage condition | Store between 15°C and 30°C. Protect from light. |
| **Irinotecan** | |
| Pharmacological class | Antineoplastic agent, topoisomerase I inhibitor |
| Dosage form | Injection: 40 mg/2 ml in 2 ml; 100 mg/5 ml in 5 ml; 500 mg/25 ml in 25 ml vial. |
| Indications | Colorectal cancer, pancreatic cancer, NSCLC, SCLC. |
| Dose and administration | **Standard regimen**: 180 mg/m2 IV as monotherapy or in combination on every-2-week schedule  **Alternative regimen**: 300–350 mg/m2 IV on an every-3-week schedule. |
| Contraindications | Hypersensitivity to the drug, severe bone marrow suppression, bowel obstruction, chronic inflammatory bowl diseases. |
| Drug interactions | Phenytoin, carbamazepine, rifampicin, phenobarbital, St. John’s Wort, ketoconazole, itraconazole, erythromycin, and clarithromycin. |
| Side effects | Neutropenia, thrombocytopenia, diarrhoea, alopecia, asthenia and anorexia, hepatic and renal toxicity, increase risk of infection. |
| Cautions | Pregnancy and breastfeeding, renal and hepatic (bilirubin concentration 1.5-3.0 times the upper limit of normal) impairment. |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Melphalan** | |
| Pharmacological class | Alkylating agent, nitrogen mustard |
| Dosage form | Tablet: 2 mg  Powder for injection: 50 mg in vial |
| Indications | Multiple myeloma, breast cancer, ovarian cancer, polycythemia vera. |
| Dose and administration | **Multiple myeloma**: 9 mg/m2 IV on days 1–4 every 4 weeks or 0.15mg/kg/day orally for 4 days dose may vary according to regimen.  **Polycythemia vera**: 6-10mg oral daily for 5-7 days then reduce 2-4mg daily until satisfactory response, then reduce to 2-6mg orally once weekly.  **Breast cancer and ovarian cancer**: 0.2 mg/kg/day for 5 days orally, repeat every 4-5 weeks. |
| Contraindications | Hypersensitivity to the drug, severe bone marrow suppression, active infection. |
| Drug interactions | Cimetidine, cyclosporine and other nephrotoxic drugs. |
| Side effects | Alopecia, anaemia, bone marrow suppression (delayed), diarrhoea, feeling hot (with IV use), myalgia and myopathy (with IV use), nausea, stomatitis, leucopenia (with oral use), paraesthesia (with IV use), thrombocytopenia, vomiting, haemolytic anaemia, hepatic disorders, respiratory disorders, skin reactions. |
| Cautions | Risk of infection, mucositis, dehydration, pregnancy and breastfeeding, development of secondary malignancies, haematopoietic stem cell transplantation. |
| Storage condition | Store tablet below 30°C. Protect from moisture and light. Store injection between 2°C to 8°C. |
| **Mercaptopurine** | |
| Pharmacological class | Antineoplastic agent, antimetabolite purine analog. |
| Dosage form | Tablet: 50 mg  Oral liquid: 20 mg/ml |
| Indications | ALL, crohn's disease and ulcerative colitis. |
| Dose and administration | **Acute lymphoblastic leukemia (ALL)**  Induction therapy**:** 2.5 mg/kg PO daily or 50-75mg/m2.  Maintenance therapy: 1.5–2.5 mg/kg PO daily.  **Crohn's disease and ulcerative colitis**: 1-1.5mg/kg daily. |
| Contraindications | Hypersensitivity to the drug, severe bone marrow suppression, severe hepatic impairment (bilirubin > 3 times), absent thiopurine methyltransferase activity. |
| Drug interactions | Warfarin, allopurinol, trimethoprim/sulfamethoxazole. |
| Side effects | Anaemia, appetite decreased, bone marrow depression, diarrhoea, hepatic disorders, hepatotoxicity (more common at high doses), leucopenia, nausea, oral disorders, pancreatitis, thrombocytopenia, and vomiting, arthralgia, fever, increased risk of infection, neutropenia, and rash. |
| Cautions | Pregnancy and breastfeeding, liver function tests, development of secondary malignancies, low activity of thiopurine methyltransferase. |
| Storage condition | Store between 15° and 30°C. Protect from moisture and light. |
| **Methotrexate** | |
| Pharmacological class | Antineoplastic agent, antimetabolite |
| Dosage form | Powder for injection: 50 mg in vial, 500mg/20ml.  Solution for injection: 50mg/2 ml.  Tablet: 2.5 mg, 5mg (as sodium salt).  Intrathecal: 5mg/2ml.  Oral liquid: 20 mg/ml |
| Indications | Breast cancer, head and neck cancer, sarcoma, ALL, lymphoma, bladder cancer, gestational trophoblastic diseases, rheumatoid arthritis, chron’s disease, psoriasis, vasculites, ulcerative colitis. |
| Dose and administration | **Breast cancer and head and neck cancer**: 40mg/m2IV days 1 and 8 every 4 week.  Low dose: 10–50 mg/m2 IV every 3–4 weeks.  **Sarcoma**: 12g/m2 IV over 4 -6 hrs every 1-3 weeks as per protocol.  **ALL**: Intrathecal 7-15mg day 1,8,22 and 29  **Lymphoma:**  Low dose weekly: 25 mg/m2IV weekly.  Moderate dose: 100–500 mg/m2 IV every 2–3 weeks.  High dose: 1–12 g/m2 IV over a 3- to 24-hour period every 1–3 weeks.  Intrathecal: 10–15 mg IT two times weekly until CSF is clear, then weekly dose for 2–6 weeks, followed by monthly dose.  Intramuscular: 25 mg/m2 IM every 3 weeks. |
| Contraindications | Hypersensitivity to the drug, severe bone marrow suppression, pre-existing liver disease, pleural effusion, active infection, CrCl < 30ml/min. |
| Drug interactions | Azathioprine, bleomycin, carbimazole, capecitabine, carboplatin, cisplatin, chlorambucil, cyclophosphamide, docetaxel, doxorubicin, epirubicin, ethosuccimide, etoposide, fluorouracil, gemcitabine, ifosfamide, irinotecan, linezolid, methotrexate, mercaptopurine, mycophenolate, olanzapine, oxaliplatin, paclitaxel, rituximab, propylthiouracil, sulphamethoxazole, sulfadiazine, trimethoprim, vincristine, vinblastine, zidovudine, atorvastatin, bedaquiline, carbamazepine, clavulanate, doxycycline, flucloxacillin, fluconazole, isoniazid, leflunomide, methotrexate, paracetamol, tetracycline, valproate, and sulfasalazine. |
| Side effects | Neutropenia, thrombocytopenia and anaemia, mucositis, nausea, vomiting, renal toxicity, hepatotoxicity, pneumonitis, hyperuricemia, headaches, nuchal rigidity, seizures, fever, encephalopathy with dementia and motor paresis, skin rash, pruritus, urticaria, photosensitivity, hyperpigmentation, reversible oligospermia. |
| Cautions | Photosensitivity, dehydration, diarrhoea, blood disorders, peptic ulceration, risk of pleural effusion or ascites, ulcerative colitis, ulcerative stomatitis, pregnancy and breastfeeding, renal and liver impairment. |
| Storage condition | Store between 15°C and 30°C. Protect from moisture and light. |
| **Oxaliplatin** | |
| Pharmacological class | Antineoplastic agent, platinum-based chemotherapy |
| Dosage form | Solution for injection: 50 mg/10 ml in 10 ml vial, 100 mg/20 ml in 20 ml.  Vial: 200 mg/40 ml in 40 ml vial.  Powder for injection: 50 mg, 100 mg in vial. |
| Indications | Colorectal cancer, pancreatic cancer and gastroesophageal cancer. |
| Dose and administration | 85 mg/m2 IV over 2 hours, on an every-2-week schedule. Can also be administered at 100–130 mg/m2 IV on an every-3-week schedule. |
| Contraindications | Hypersensitivity to the drug, peripheral neuropathy with functional impairment, severe renal impairment (CrCl less than 30 ml/min), severe bone marrow suppression. |
| Drug interactions | Nitrofurantoin, isoniazid, lamivudine, metronidazole, phenytoin, thalidomide, theophylline. |
| Side effects | Peripheral neuropathy, nausea, vomiting, diarrhoea, thrombocytopenia, anaemia, facial flushing, rash, urticaria, bronchospasm, hypertension. |
| Cautions | Mild to moderate renal impairment, pregnancy and breastfeeding, renal impairment, and sign of neurotoxicity. |
| Storage condition | Store below 30°C. Protect from light and moisture. |
| **Paclitaxel** | |
| Pharmacological class | Antineoplastic agent, taxane |
| Dosage form | Solution for injection: 6mg/ml |
| Indications | Ovarian cancer, breast cancer, SCLC and NSCLC, head and neck cancer, esophageal cancer, prostate cancer, bladder cancer, AIDS-related Kaposi’s sarcoma. |
| Dose and administration | **Ovarian cancer**: 135–175 mg/m2IV as 3-hour infusion every 3 weeks.  **Breast cancer and SCLC and NSCLC**: 175 mg/m2 IV as 3-hour infusion every 3 weeks.  **Bladder cancer, head and neck cancer**: 250 mg/m2 IV as 24-hour infusion every 3 weeks.   * Weekly schedule: 80–100 mg/m2 IV each week for 3 weeks with 1 week of rest. * Infusion schedule: 140 mg/m2 as a 96-hour infusion.   **AIDS-related Kaposi’s sarcoma**: 135mg/m2 IV over 3 hrs every 3 weeks |
| Contraindications | Hypersensitivity to the drug, severe bone marrow suppression, severe hepatic impairment (bilirubin > 5 times), acute porphyrias. |
| Drug interactions | Radiation therapy and CYP 450 inducers and inhibitors. |
| Side effects | Hypersensitivity reaction, neutropenia, thrombocytopenia, neurotoxicity, alopecia (total body hair loss), heart block, ventricular arrhythmias, mucositis, diarrhoea, nausea, vomiting, hepatotoxicity, oncholysis. |
| Cautions | Age > 75 years, metastatic adenocarcinoma of the pancreas, pregnancy and breastfeeding, liver impairment, cardiac disorder, diabetes mellitus, chronic alcoholism, neurotoxic agents, and sun exposure. |
| Storage condition | Store between 20° to 30°C. Protect from heat and light. |
| **Procarbazine** | |
| Pharmacological class | Antineoplastic agent, alkylating agent. |
| Dosage form | Capsule: 50 mg (as hydrochloride). |
| Indications | HL, NHL, brain tumors. |
| Dose and administration | **HL and NHL**: 100 mg/m2 PO daily for 14 days, as part of MOPP regimen.  **Brain tumors**: 60 mg/m2PO daily for 14 days, as part of PCV regimen. |
| Contraindications | Hypersensitivity to the drug, severe bone marrow suppression, severe hepatic impairment (bilirubin > 5 times), pre-existing severe leucopenea and thrombocytopenea. |
| Drug interactions | Alcohol- or tyramine-containing foods, MAO inhibitors, antihistamines, CNS depressants, levodopa, meperidine, tricyclic antidepressants, antidiabetic agents (sulfonylurea, insulin). |
| Side effects | Neutropenia, thrombocytopenia, anaemia, nausea and vomiting, diarrhoea, loss of appetite, CNS toxicity, hypersensitivity reaction, amenorrhea and azoospermia, increased risk of infections, increased risk of secondary malignancies in the form of AML. |
| Cautions | History of pulmonary disorders, cardiovascular disease, cerebrovascular disease, epilepsy, phaeochromocytoma, pregnancy and breastfeeding. |
| Storage condition | Store between 15 °C and 30 °C. Protect from heat and light. |
| **Vinblastine** | |
| Pharmacological class | Antineoplastic agent, vinca alkaloid |
| Dosage form | Powder for injection: 10 mg (sulphate) in vial.  Solution for injection: 1 mg/ml (sulfate) |
| Indications | HL and NHL, testicular cancer, breast cancer, Kaposi’s sarcoma, gestational trophoblastic diseases, ovarian cancer. |
| Dose and administration | **HL, NHL, Breast cancer, Kaposi’s sarcoma gestational trophoblastic diseases and Ovarian cancer**: 6 mg/m2IV on days 1 and 15 of 28-day cycle.  **Testicular cancer**: 0.15 mg/kg IV on days 1 and 2. |
| Contraindications | Hypersensitivity to the drug, severe hepatic impairment (bilirubin > 5 times), intrathecal administration. |
| Drug interactions | Calcium channel blockers, cimetidine, cyclosporine, erythromycin, metoclopramide, ketoconazole, phenobarbitol, rafampin, phenytoin, and bleomycin. |
| Side effects | Mucositis, nausea/vomiting, constipations, alopecia, ototoxicity, hypertension, peripheral neuropathy, orthostatic hypotension, paralytic ileus, urinary retention, cranial nerve paralysis, ataxia, cortical blindness, seizures, extravasation, syndrome of inappropriate antidiuretic hormone release (SIADH), headache, depression, stroke, MI, and Raynaud’s syndrome. |
| Cautions | Extravasation at the injection site, neuropathy, pregnancy and breastfeeding. |
| Storage condition | Store in a refrigerator between 2° C and 8° C in a dark place. |
| **Vincristine** | |
| Pharmacological class | Antineoplastic agent, vinca alkaloid |
| Dosage form | Powder for injection: 1mg, 2mg, 5mg (sulphate) in vial |
| Indications | ALL, HL, NHL, multiple myeloma, sarcoma, neuroblastoma, Wilms’ tumor, chronic leukemias, thyroid cancer, brain tumors, gestational trophoblastic disease, breast and lung cancer. |
| Dose and administration | Doses usually vary between 0.5 to 1.5 mg/m2 with the maximum weekly dose of 2mg.  *Note:* *Vincristine injections are for IV administration only. In adverent interathecal administration can cause severe neurotoxicity which is usually fatal.* |
| Contraindications | Hypersensitivity to the drug, severe hepatic impairment (bilirubin > 5 times), intrathecal administration. |
| Drug interactions | Refer to vinblastine above |
| Side effects | Refer to vinblastine above |
| Cautions | Refer to vinblastine above |
| Storage condition | Store in a refrigerator at a temperature between 2° C and 8° C in a dark place. |
| **Vinorelbine** | |
| Pharmacological class | Antineoplastic agent, vinca alkaloid |
| Dosage form | Solution for injection: 10 mg/ml in vial  Capsule: 20 mg, 30 mg, 80 mg |
| Indications | NSCLC, breast cancer, ovarian cancer. |
| Dose and administration | 60mg/m2 once weekly for 3 weeks, then increased if tolerated to 80mg/m2once weekly (maximum per dose 160mg.) *OR*  30 mg/m2IV on a weekly schedule. |
| Contraindications | Hypersensitivity to the drug, severe bone marrow suppression, severe hepatic impairment (bilirubin > 3 times), intrathecal administration. |
| Drug interactions | Refer to vinblastine above |
| Side effects | Refer to vinblastine above |
| Cautions | Refer to vinblastine above |
| Storage condition | Capsule: store below 30 °C. Protect from heat and light.  Solution for injection: store in a refrigerator between 2°C and 8 °C. |

## Targeted therapies

Unlike traditional antineoplastic drugs’ blunt approach, which indiscriminately targets rapidly dividing cells, targeted therapies improve in on specific molecules or pathways crucial for cancer growth and survival. By directly addressing the molecular abnormalities fuelling cancer progression, these therapies offer the tantalizing prospect of heightened efficacy while potentially sparing patients from debilitating side effects. Most targeted therapies are either small-molecule drugs or monoclonal antibodies. Small-molecule drugs are small enough to enter cells easily, so they are used for targets that are inside cells. Monoclonal antibodies, also known as therapeutic antibodies, are proteins produced in the laboratory. These proteins are designed to attach to specific targets found on cancer cells. Some monoclonal antibodies mark cancer cells so that they will be better seen and destroyed by the immune system. Other monoclonal antibodies directly stop cancer cells from growing or cause them to self-destruct. Still others carry toxins to cancer cells.

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| **Azacitidine** | |
| Pharmacological class | Antineoplastic agent, nucleoside metabolic inhibitor. |
| Dosage form | Powder for injection: 60 mg, 150 mg, 440 mg in vial. |
| Indications | Myelodysplastic syndromes (MDS), AML, CML. |
| Dose and administration | 75 mg/m2 SC or IV daily for 7 days. Cycles are repeated every 4 weeks. |
| Contraindications | Hypersensitivity to the drug and advanced malignant hepatic tumors. |
| Drug interactions | None well characterized to date. |
| Side effects | Alopecia, anaemia, anxiety, appetite decreased, arthralgia, asthenia, bone marrow disorders, chest pain, chills, confusion, constipation, dehydration, diarrhoea, dizziness, drowsiness, dyspnoea, fever, gastrointestinal discomfort, haemorrhage, headache, hypertension, hypokalaemia, hypotension, increased risk of infection, induration, inflammation, insomnia, intracranial haemorrhage, laryngeal pain, leucopenia, malaise, muscle complaints, nausea, neutropenia, pain, renal failure, respiratory disorders, sepsis, skin reactions, stomatitis, syncope, thrombocytopenia, vomiting, weight decreased, hepatic coma, hepatic failure, pyoderma gangrenosum, renal tubular acidosis. |
| Cautions | History of severe congestive heart failure, unstable cardiac disease, and unstable pulmonary disease, pregnancy and breastfeeding. |
| Storage condition | Store between 2 °C and 8 °C. Protect from light. |
| **Bortezomib** | |
| Pharmacological class | Antineoplastic agent, proteasome inhibitor |
| Dosage form | Powder for injection: 3.5 mg in vial. |
| Indications | Multiple myeloma, mantle cell lymphoma. |
| Dose and administration | 1.3 mg/m2 administered by IV or SC twice weekly for 2 weeks (on days 1, 4, 8, and 11) followed by a 10-day rest period (days 12–21). |
| Contraindications | Hypersensitivity to the drug, acute diffuse infiltrative pulmonary and pericardial disease. |
| Drug interactions | Phenobarbital, phenytoin, carbamazepine, rifampicin, St. John’s Wort, ketoconazole, macrolides. |
| Side effects | Fatigue, malaise, and generalized weakness, nausea, vomiting, diarrhoea, thrombocytopenia, neutropenia, peripheral neuropathy, fever, orthostatic hypotension, congestive heart failure, pulmonary toxicity, pulmonary hypertension, reversible posterior leukoencephalopathy syndrome (RPLS). |
| Cautions | Amyloidosis, cardiovascular disease, herpes zoster infection, dehydration, diabetes, history of syncope, pulmonary disease, risk factors for seizures, risk of neuropathy, pregnancy and breastfeeding, hepatic impairment, and peripheral neuropathy. |
| Storage condition | Store between 15 °C to 30 °C. Protect from light. |
| **Dasatinib** | |
| Pharmacological class | Antineoplastic agent, tyrosine kinase inhibitor. |
| Dosage form | Tablet: 20 mg, 50 mg, 70 mg, 80 mg, 100 mg, 140 mg. |
| Indications | CML, philadelphia chromosome–positive (Ph+) ALL |
| Dose and administration | **CML**: 100 mg – 140mg PO once daily  **Philadelphia chromosome–positive (Ph+) ALL**: 140 mg PO once daily |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Ketoconazole, itraconazole, clarithromycin, erythromycin, rifampin, phenytoin, phenobarbital, carbamazepine, and St. John’s Wort, aspirin, NSAIDs, anticoagulant. |
| Side effects | Thrombocytopenia, neutropenia, and anaemia, fluid retention, diarrhoea, nausea, vomiting, and abdominal pain, fatigue, asthenia, and anorexia, hepatotoxicity, hypocalcemia and hypophosphatemia. |
| Cautions | Hepatitis B infection, risk of cardiac dysfunction, susceptibility to QT-interval prolongation, pregnancy and breastfeeding, electrolyte status, depressive symptoms and suicide ideation while on therapy. |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Decitabine** | |
| Pharmacological class | Antineoplastic agent, pyrimidine analog. |
| Dosage form | Powder for injection: 50 mg in vial. |
| Indications | AML |
| Dose and administration | 15 mg/m² IV infusion over 3 hours, repeated every 8 hours for 3 days. Repeat cycles every 6 weeks. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | None well characterized to date. |
| Side effects | Anaemia, diarrhoea, epistaxis, fever, headache, hypersensitivity, increased risk of infection, leucopenia, nausea, neutropenia, sepsis, stomatitis, thrombocytopenia, vomiting, acute febrile neutrophilic dermatosis, pancytopenia. |
| Cautions | Histories of severe congestive heart failure and unstable cardiac disease, pregnancy and breastfeeding. |
| Storage condition | Store between 2 °C and 8 °C. Protect from light. |
| **Erlotinib** | |
| Pharmacological class | Tyrosine kinase inhibitor, antineoplastic agent |
| Dosage form | Tablet: 20 mg, 50 mg, 70 mg, 80 mg, 100 mg, 140 mg. |
| Indications | NSCLC, pancreatic cancer. |
| Dose and administration | **NSCLC:** 150 mg/day PO. For elderly or frail patients, low-dose erlotinib at 50 mg/day may be considered.  **Pancreatic cancer**: Oral, 100 mg once daily. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Phenobarbital, phenytoin, carbamazepine, rifampicin, St. John’s Wort, ketoconazole, macrolides, PPIs, H2-blockers, antacids, HIV-protease inhibitors, Ciprofloxacilin, grape fruit juice and warfarin. |
| Side effects | Allopecia, diarrhea, skin reaction, eye inflammation, haemorrhage, nausea, vomiting, mucositis, renal impairment, pulmonary toxicity. |
| Cautions | Smoking, pregnancy and breastfeeding, pulmonary disorder, renal and liver impairment. |
| Storage condition | Store below 30 °C. Protect from moisture and light. |
| **Ibrutinib** | |
| Pharmacological class | Antineoplastic agent, tyrosine kinase inhibitor |
| Dosage form | Capsule: 140 mg |
| Indications | Mantle cell lymphoma, chronic lymphocytic leukaemia. |
| Dose and administration | **Mantle cell lymphoma:**   * Adult: 560 mg once daily, for dose adjustments due to side-effects.   **Chronic lymphocytic leukaemia:**   * Adult: 420 mg once daily, for dose adjustments due to side-effects. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Ketoconazole, itraconazole, clarithromycin, erythromycin, rifampin, phenytoin, phenobarbital, carbamazepine, and St. John’s Wort, amiodarone, ciprofloxacin, grape fruit juice. |
| Side effects | Arrhythmias, arthralgia, broken nails, CNS haemorrhage, constipation, diarrhoea, dizziness, fever, haemorrhage, headache, hypertension, hyperuricemia, increased leucocytes, increased risk of infection, interstitial lung disease, muscle spasms, musculoskeletal pain, nausea, neoplasms neutropenia, peripheral neuropathy, peripheral oedema, sepsis, skin reactions, stomatitis, thrombocytopenia, tumour lysis syndrome, vision blurred, vomiting,  angioedema, hepatitis B reactivation, leukostasis syndrome, panniculitis. |
| Cautions | Congenital short QT syndrome, risk of leukostasis., and personal history of congenital short QT syndrome, risk of haemorrhagic events, pregnancy and breastfeeding. |
| Storage condition | Store between 15°C and 30°C. Protect from moisture and light. |
| **Imatinib** | |
| Pharmacological class | Antineoplastic agent, tyrosine kinase inhibitor |
| Dosage form | Tablet: 100 mg, 400mg |
| Indications | CML, Ph+ ALL, myelodysplastic/myeloproliferative diseases (MDS/MPD), hypereosinophilic syndrome/chronic eosinophilic leukemia (HES/CEL), gastrointestinal stromal tumors (GIST), dermatofibrosarcoma protuberans. |
| Dose and administration | **CML**: 300-400 mg/day for patients in chronic phase CML and 600-800 mg/day in divided dose for patients in accelerated phase or blast crisis.  **GIST and MDS/MPD**: 400 mg/day.  **HES/CEL**: 100-400 mg/day.  **Ph+ ALL**: 600 mg/day.  **Dermatofibrosarcoma protuberans**: 400mg twice daily. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Ergotamine, calcium channel blockers (dihydropyridines), statins ketoconazole, itraconazole, clarithromycin, erythromycin, rifampin, phenytoin, phenobarbital, carbamazepine, and St. John’s Wort. |
| Side effects | Nausea and vomiting, ankle, periorbital oedema, fluid retention, diarrhoea, neutropenia, thrombocytopenia, skin reaction, insomnia, depression, and suicidal ideation. |
| Cautions | Cardiac disease, hepatitis B infection, history of renal failure, risk factors for heart failure, pregnancy and breastfeeding. Monitor signs and symptoms of fluid retention, hepatic and renal impairment, CBC, cardiac function, depressive symptoms and suicidal ideation. |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Nilotinib** | |
| Pharmacological class | Antineoplastic agent, tyrosine kinase inhibitor |
| Dosage form | Tablet: 150 mg, 200mg |
| Indications | Newly diagnosed Ph+ CML, Ph+ CML |
| Dose and administration | **Newly diagnosed Ph+ CML**:  **Adult:** 300 mg twice daily. For dose adjustments due to side-effects—consult product literature.  **Child**: 230 mg/m2PO bid, rounded to the nearest 50-mg dose (max. single dose of 400 mg).  **Ph+ CML**  **Adult**: 400 mg twice daily. For dose adjustments due to side-effects—consult product literature.  **Child > 2 years**: 230 mg/m2 twice daily, rounded to the nearest 50 mg dose (to a max. single dose of 400 mg) |
| Contraindications | Hypersensitivity to the drug, pregnancy. |
| Drug interactions | Refer to dasatinib above. |
| Side effects | Refer to dasatinib above. |
| Cautions | Refer to dasatinib above. |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Rituximab** | |
| Pharmacological class | Antineoplastic agent, monoclonal antibody. |
| Dosage form | Injection (intravenous): 100 mg/10 ml in 10 ml vial, 500 mg/50 ml in 50 ml vial. |
| Indications | NHL, CLL, thrombotic thrombocytopenic purpura (TTP), Rheumatoid arthritis (RA). |
| Dose and administration | **NHL, CLL and TTP**: 375 mg/m2 IV, frequency and duration depends on regimen type.  **RA**: 1000 mg/m2 IV and repeat after two weeks. 1 1000 mg/m2 IV, then 1000 mg/m2 IV after 2 weeks; maintenance 500 mg/m2 IV, at months 12 and 18, and then every 6 months thereafter if needed. *Note: consult product literature for the treatment of relapse.* |
| Contraindications | Hypersensitivity to the drug, severe active infections and uncontrolled heart disease. |
| Drug interactions | * Amphotericin B, deoxycholate, belatacept, cholera vaccine, cisplatin, denosumab, fingolimod, ioversol, sipuleucel-T. |
| Side effects | Infusion-related reactions, tumor lysis syndrome, skin reactions, arrhythmias, chest pain, nausea and vomiting, increase risk of infections. |
| Cautions | HBV infection, history of angina, arrhythmia, heart failure, pregnancy and breastfeeding. Monitor for infusion-related reaction, hypotension, and tumor lysis syndrome. |
| Storage condition | Store in a refrigerator at 2°C to 8°C. Protect from light. |
| **Trastuzumab** | |
| Pharmacological class | Antineoplastic agent, monoclonal antibody. |
| Dosage form | Powder for injection: 60 mg, 150 mg, 440 mg in vial. |
| Indications | HER2-positive breast cancer, HER2-positive gastric or gastroesophageal junction adenocarcinoma |
| Dose and administration | 4 mg/kg IV loading dose over 90 minutes, followed by a 2 mg/kg IV maintenance dose weekly. One week after the last weekly dose, switch to 6 mg/kg IV every 3 weeks over 30-90 minutes.  Alternatively, give an 8 mg/kg IV loading dose over 30-90 minutes, followed by 6 mg/kg IV maintenance dose every 3 weeks. |
| Contraindications | Hypersensitivity to the drug, severe dyspnoea at rest. |
| Drug interactions | Anthracyclines, taxanes. |
| Side effects | Infusion-related symptoms, increased risk of infections, nausea/vomiting, diarrhoea, cardiac toxicity, thrombocytopenia, anaemia, neutropenia, nasopharyngitis, generalized pain, asthenia, headache and pulmonary toxicity. |
| Cautions | Coronary artery disease, elderly, history of hypertension, impaired left ventricular function, symptomatic heart failure, uncontrolled arrhythmias, pregnancy and breastfeeding. |
| Storage condition | Store in a refrigerator at temperature between 2°C and 8°C. Protect from light. |
| **Tretinoin (All-trans retinoic acid)** | |
| Pharmacological class | Antineoplastic agent, retinoic acid derivative |
| Dosage form | Capsule: 10 mg. |
| Indications | Acute promyelocytic leukemia (APL) |
| Dose and administration | **Adult**: 45 mg/m2/day PO divided in two daily doses for a minimum of 45 days and a maximum of 90 days.  **Child**: 25 mg/m2/day PO divided in two daily doses for a minimum of 45 days and a maximum of 90 days. |
| Contraindications | Hypersensitivity to the drug, retinoids, soya, or peanut, pregnancy and breastfeeding, combination with vitamin A, tetracyclines, retinoids. |
| Drug interactions | Rifampin, phenobarbital, ketoconazole, cimetidine, erythromycin, verapamil, diltiazem, and cyclosporine, vitamin A supplements, pregnancy and lactation. |
| Side effects | Headache, fever, dryness of the skin and mucous membranes, skin rash, peripheral oedema, mucositis, pruritus, and conjunctivitis. flushing, hypotension, cardiac toxicity, pulmonary hypertension. increased serum cholesterol and triglyceride, CNS toxicity, hearing impairment, abdominal pain, constipation, diarrhoea, GI bleeding, liver toxicity, differentiation syndrome. |
| Cautions | History of depression, thromboembolism, differentiation syndrome and liver function tests. |
| Storage condition | Store between 20° °C to 30 °C. Protect from moisture and light. |

## Hormone and antihormones

Hormone and antihormone therapies represent a cornerstone in the realm of cancer treatment, particularly for hormone-sensitive tumours like breast and prostate cancers. These therapies work by either manipulating hormone levels or blocking hormone receptors to impede cancer cell growth and proliferation. In breast cancer, hormone therapy targets estrogen and progesterone receptors, which are often overexpressed in hormone receptor-positive tumours. Selective estrogen receptor modulators (SERMs) like tamoxifen and aromatase inhibitors (AIs) such as anastrozole are commonly used to disrupt estrogen signalling and inhibit tumour progression. Additionally, selective estrogen receptor degraders (SERDs) like fulvestrant work by directly targeting and degrading estrogen receptors, further suppressing tumour growth. Similarly, in prostate cancer, hormone therapy focuses on androgen receptors, as prostate cancer cells are dependent on androgens for growth.

On the other hand, antihormone therapies act by counteracting the effects of hormones on cancer cells. In breast cancer, gonadotropin-releasing hormone (GnRH) agonists like goserelin suppress ovarian function to lower estrogen levels, while selective estrogen receptor down regulators (SERDs) like fulvestrant inhibit estrogen receptor activity. In prostate cancer, estrogen therapy and estrogen receptor antagonists like tamoxifen may be utilized, albeit less commonly than in breast cancer, to mitigate androgen signalling.

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| **Abiraterone** | |
| Pharmacological class | Antineoplastic agent, antiandrogenic |
| Dosage form | Tablet: 250mg, 500mg |
| Indications | Prostate cancer |
| Dose and administration | **Metastatic castration-resistant prostate cancer**, **oral**: 1,000 mg as a single daily dose that must not be taken with food; taking the tablets with food increases systemic exposure to abiraterone. |
| Contraindications | Hypersensitivity to the drug, hepatic impairment. |
| Drug interactions | Thioridazine, dextromethorphan, spironolactone, metoprolol, ketoconazole, itraconazole, ritonavir, rifampin, phenytoin, carbamazepine, diuretics, ACE inhibitors, and angiotensin II receptor blockers. |
| Side effects | Hypertension, angina pectoris, arrythmia, bone fracture, hypokalemia, fluid retention, fatigue, arthralgia, hot flush, diarrhoea, nausea, peripheral oedema, hyperglycemia, hypertriglyceridemia, UTI, vomiting, cough, dyspnoea, and headache. |
| Cautions | Diabetes, history of cardiovascular disease, adrenocortical insufficiency, liver impairment, hypertension, pregnancy and breastfeeding. |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Anastrozole** | |
| Pharmacological class | Antineoplastic agent, aromatase inhibitor |
| Dosage form | Tablet: 1mg |
| Indications | Hormone receptor-positive breast cancer |
| Dose and administration | 1 mg orally once daily |
| Contraindications | Hypersensitivity to the drug, pregnancy and breastfeeding. |
| Drug interactions | Tamoxifen, warfarin, rifampin, carbamazepine, phenytoin, phenobarbital, ketoconazole, ritonavir, macrolides |
| Side effects | Alopecia, appetite decreased, arthritis, asthenia, bone pain, carpal tunnel syndrome, diarrhea, drowsiness, headache, hot flush, hypercholesterolemia, hypersensitivity, joint disorders, myalgia, nausea, osteoporosis, sensation, abnormal, skin reactions, taste altered, vaginal hemorrhage, vomiting, vulvovaginal dryness. |
| Cautions | Hepatic impairment, pre-existing cardiovascular risk factors, low bone mineral density. |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Bicalutamide** | |
| Pharmacological class | Antineoplastic agent, antiandrogen |
| Dosage form | Tablet: 50 mg |
| Indications | Prostate cancer |
| Dose and administration | 50 mg PO once daily if it is combined with LHRH analogue or surgical castration, or 150 mg once daily as monotherapy. |
| Contraindications | Hypersensitivity to the drug, severe hepatic impairment, under the age of 18 years, females, and co-administration with terfenadine, astemizole or cisapride. |
| Drug interactions | Ketoconazole, itraconazole, ritonavir, rifampin, phenytoin, carbamazepine, warfarin. |
| Side effects | Alopecia, anemia, appetite decreased, asthenia, breast tenderness, chest pain, constipation, depression, dizziness, drowsiness, flatulence, gastrointestinal discomfort, gynecomastia, hematuria, hair changes, hepatic disorders, hot flush, hypertransaminasaemia, nausea, edema, sexual dysfunction, skin reactions, weight increased. |
| Cautions | Risk of photosensitivity, liver impairment, and signs of gynecomastia. |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Cabergoline** | |
| Pharmacological class | Dopamine receptor agonist, prolactin inhibitor |
| Dosage form | Tablet: 0.5mg, 1mg |
| Indications | Prolactin-secreting adenomas (prolactinomas), idiopathic hyperprolactinemia, suppression of physiological lactation after childbirth, when breastfeeding is not desired or contraindicated. |
| Dose and administration | **Prevention of lactation:** 1mg single dose in postpartum.  **Suppression of physiological lactation**: 0.25 mg bid for two days.  **Hyperprolactinemic disorders**: 0.25 mg twice weekly. The dosage may be gradually increased at 4-week intervals based on prolactin levels and clinical response, up to a maximum dosage of 1 mg twice weekly. |
| Contraindications | Hypersensitivity to the drug, pre-eclampsia, cardiac valvulopathy, history of pericardial fibrotic disorders, history of puerperal psychosis, history of pulmonary fibrotic disorders, history of retroperitoneal fibrotic disorders. |
| Drug interactions | Antipsychotics, ergot alkaloids, macrolide antibiotics, azole antifungals, metoclopramide. |
| Side effects | Angina pectoris, asthenia, cardiac valvulopathy, confusion, constipation, dizziness, drowsiness, dyspepsia, dyspnea, gastritis, hallucination, headache, hypotension, movement disorders, nausea, edema, pericardial effusion, pericarditis, sexual dysfunction, sleep disorders, vertigo, vomiting |
| Cautions | Cardiovascular disease, history of peptic ulcer, history of serious mental disorders (especially psychotic disorders), postpartum hypertension, Raynaud’s syndrome. |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Goserelin** | |
| Pharmacological class | Gonadotropin-releasing hormone (GnRH) agonist. |
| Dosage form | Implant (depot, SC): 3.6mg, 10.8mg |
| Indications | Prostate cancer, hormone receptor-positive breast cancer, endometriosis, endometrial thinning before intrauterine surgery, before surgery in women who have anaemia due to uterine fibroids. |
| Dose and administration | **Hormone receptor-positive breast cancer, endometriosis, endometrial thinning before intrauterine surgery, before surgery in women who have anaemia due to uterine fibroids**: 3.6 mg implant administered subcutaneously every 28 days.  **Prostate cancer:** 10.8 mgimplant administered subcutaneously every 3 months. |
| Contraindications | Hypersensitivity to the drug, undiagnosed vaginal bleeding. |
| Drug interactions | Warfarin, rifampin, carbamazepine, ketoconazole, macrolides, progesterone, St. John's Wort, quinidine, amiodarone, flecainide, propafenone, chlorpromazine, amitriptyline, methadone, moxifloxacin, quinine |
| Side effects | Hot flashes, decreased libido, impotence, and gynecomastia, tumor flare, bone loss, elevated serum cholesterol levels, hypersensitivity reaction, nausea and vomiting, myocardial infarction and stroke |
| Cautions | Depression, diabetes, hypertension, patients with metabolic bone disease, polycystic ovarian disease, risk of spinal cord compression in men, risk of ureteric obstruction in men, patients with pre-existing cardiovascular risk factors, hepatic impairment, renal impairment, pregnancy and breastfeeding. |
| Storage condition | Store between 2°C and 30°C. Protect from light and moisture. |
| **Letrozole** | |
| Pharmacological class | Antineoplastic agent, aromatase inhibitor |
| Dosage form | Tablet: 1mg |
| Indications | Hormone receptor-positive breast cancer |
| Dose and administration | **Breast cancer, adjuvant therapy**: oral: 2.5mg once daily for 5-10 years.  **Breast cancer, advanced, first or second line therapy,** oral: 2.5mg once daily until disease progression. |
| Contraindications | Hypersensitivity to the drug, premenopausal women, pregnancy. |
| Drug interactions | Ethinylestradiol, tamoxifen, methadone and nintedanib. |
| Side effects | Alopecia, appetite abnormal, arthralgia, asthenia, bone fracture, bone pain, constipation, depression, diarrhea, dizziness, gastrointestinal discomfort, headache, hot flush, hypercholesterolemia, hyperhidrosis, hypertension, malaise, myalgia, nausea, edema, osteoporosis, skin reactions, vaginal, hemorrhage, vomiting, weight changes |
| Cautions | Hypercholesterolemia, cirrhosis, severe hepatic impairment, osteoporosis, renal impairment, breastfeeding. |
| Storage condition | Store below 30°C. Protect from moisture and light. |
| **Leuprorelin** | |
| Pharmacological class | Gonadotropin-releasing hormone (GnRH) agonist. |
| Dosage form | Injection: 3.75mg, 7.5mg, 11.5mg, 22.5mg (as citrate) |
| Indications | Prostate cancer, hormone receptor-positive breast cancer, endometriosis, reduce size of uterine fibroids and associated bleeding before surgery. |
| Dose and administration | **Prostate cancer and Pre- and peri-menopausal breast cancer**, by SC injection:  **Adult**: 11.25 mg every 3 months  **Endometriosis and reduce size of uterine fibroids and associated bleeding before surgery**, by IM injection:  **Adult**: 11.25 mg every 3 months for maximum duration of 6 months (not to be repeated), to be started during first 5 days of menstrual cycle. |
| Contraindications | Undiagnosed vaginal bleeding, hypersensitivity to leuprorelin or any of its components. |
| Drug interactions | Refer to goserelin above |
| Side effects | Appetite decreased, arthralgia, bone pain, breast abnormalities, depression, dizziness, fatigue, gynaecomastia, headache, hepatic disorders, hot flush, hyperhidrosis, injection site necrosis, insomnia, mood altered, muscle weakness, nausea, paraesthesia, peripheral edema, sexual dysfunction, testicular atrophy, vulvovaginal dryness, weight change |
| Cautions | Diabetes, family history of osteoporosis, patients with metabolic bone disease, risk of spinal cord compression in men with prostate cancer, risk of ureteric, obstruction in men with prostate cancer, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C. Do not freeze. Protect from light. |
| **Tamoxifen** | |
| Pharmacological class | Selective oestrogen receptor modulator (SERM) |
| Dosage form | Tablet: 10 mg, 20 mg (as citrate). |
| Indications | Hormone receptor-positive breast cancer, anovulatory infertility, gynacomastia, breast cancer. |
| Dose and administration | **Breast cancer (chemoprevention in women at moderate to-high risk**):  **Adult**: 20 mg-40mg daily for 5 years,  **Anovulatory infertility:**  **Adult**: Initially 20 mg daily if necessary the daily dose may be increased to 40 mg then 80mg for subsequent courses;  **Gynecomastia:**  **Adult:** 20 mg once weekly |
| Contraindications | Hypersensitivity to the drug, history of deep vein thrombosis (DVT), pulmonary embolism (PE), or other thromboembolic events, history of endometrial cancer. |
| Drug interactions | Warfarin, erythromycin, calcium channel blockers, cyclosporine, paroxetine, fluoxetine, bupropion, duloxetine, and sertraline, thioridazine, perphenazine, pimozide, cimetidine, quinidine, ticlopidine, and terfenadine |
| Side effects | Hot flashes, vaginal discharge, vaginal bleeding or spotting, nausea, vomiting, fatigue, headache, dizziness, mood changes, and skin rash, DVT, PE, endometrial hyperplasia, visual disturbances, fluid retention, |
| Cautions | Coagulation disorders, menopausal symptoms, impending ureteral obstruction, spinal cord compression, or extensive bone metastases, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C. Protect from moisture and light |
| **Triptorelin** | |
| Pharmacological class | Gonadotropin-releasing hormone (GnRH) agonist. |
| Dosage form | Injection: 3.75mg, 11.25mg |
| Indications | Prostate cancer, hormone receptor-positive breast cancer, endometriosis, Reduction in size of uterine fibroids |
| Dose and administration | **Advanced prostate cancer,** IM:  **Adult**: 11.25 mg every 3 months  **Endometriosis, reduction in size of uterine fibroids,** IM:  **Adult**: 11.25 mg every 3 months for maximum 6 months (not to be repeated), to be started during first 5 days of menstrual cycle  **Premenopausal breast cancer (as combination therapy)**, IM:  **Adult**: 3 mg every 4 weeks for up to 5 years, initiated 6–8 weeks before starting aromatase inhibitor. |
| Contraindications | Hypersensitivity to the drug, undiagnosed vaginal bleeding. |
| Drug interactions | Refer to goserelin above |
| Side effects | Anxiety, asthenia, depression, diabetes mellitus, dizziness, dry mouth, embolism, gastrointestinal discomfort, gynaecomastia, haemorrhage, headache, hot flush, hyperhidrosis, hypersensitivity, hypertension, joint disorders, menstrual cycle irregularities, mood altered, muscle complaints, nausea, edema, ovarian and fallopian tube disorders, pain, painful sexual intercourse, pelvic pain, sexual dysfunction skin reactions, sleep disorders. weight changes. |
| Cautions | History of depression, patients with metabolic bone disease, risk factors for osteoporosis, risk of spinal cord compression in men, risk of ureteric obstruction in men, pregnancy, breastfeeding. |
| Storage condition | Store below 30°C. Protect from moisture and light. |

## Supportive medicines

Supportive medicines in cancer therapy are drugs that help to manage tumor and treatment related complications. This includes prevention and palliative management of side effects for cancer chemotherapy such as nausea and vomiting, inflammatory and allergic disorders, myelosuppression, oedema, detoxification of urothelial toxicity, and skeletal related symptoms.

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| **Alendronate (Alendronic acid)** | |
| Pharmacological class | Bisphosphonate |
| Dosage form | Tablet: 70mg |
| Indications | Treatment of postmenopausal osteoporosis; treatment of osteoporosis in men; prevention and treatment of corticosteroid-induced osteoporosis in postmenopausal women not receiving hormone replacement therapy |
| Dose and administration | **Treatment of postmenopausal osteoporosis**, oral:  **Adult** (female): 10 mg daily, alternatively 70 mg once weekly.  **Treatment of osteoporosis in men**, oral:  **Adult** (male): 10 mg daily.  **Prevention and treatment of corticosteroid-induced osteoporosis in postmenopausal women not receiving hormone replacement therapy**, oral:  **Adult** (female): 10 mg daily.  *Note: Alendronate should be taken on an empty stomach, preferably in the morning, with a full glass of plain water. Patients should remain upright (sitting or standing) for at least 30 minutes after taking the medication to reduce the risk of oesophageal irritation and ensure optimal absorption.* |
| Contraindications | Abnormalities of oesophagus, hypocalcaemia, other factors which delay emptying (e.g., stricture or achalasia). |
| Drug interactions | Antacids, calcium, or vitamin supplements. |
| Side effects | Gastrointestinal disorders, joint swelling, vertigo, haemorrhage, femoral stress fracture, oropharyngeal ulceration, photosensitivity reaction, severe cutaneous adverse reactions (SCARs). |
| Cautions | Active GI bleeding, atypical femoral fractures, duodenitis, dysphagia, osteoporosis, gastritis, history of ulcers, surgery of the upper GIT, symptomatic oesophageal disease, upper GI disorders. |
| Storage condition | Store below 30 °C. Protect from light and moisture. Keep from freezing. |
| **Allopurinol** | |
| Pharmacological class | Xanthine oxidase inhibitor. |
| Dosage form | Tablet: 100 mg, 300 mg |
| Indications | Prophylaxis of gout and of uric acid and calcium oxalate renal stones; prophylaxis of hyperuricemia associated with cancer chemotherapy. |
| Dose and administration | **Prophylaxis of gout and of uric acid and calcium oxalate renal stones | prophylaxis of hyperuricemia associated with cancer chemotherapy**, oral:  **Adult:**   * **Induction dose**: 100 mg daily, for maintenance adjust dose according to plasma or urinary uric acid concentration, dose to be taken preferably after food. * **Maintenance dose in mild conditions:** 100–200 mg daily, dose to be taken preferably after food. * **Maintenance dose in moderately severe conditions:** 300–600 mg daily in divided doses (max. per dose 300 mg), dose to be taken preferably after food. * **Maintenance dose in severe conditions:** 700–900 mg daily in divided doses (max. per dose 300 mg), dose to be taken preferably after food. |
| Contraindications | Hypersensetivity to the drug, acute gout. |
| Drug interactions | Amoxicillin, ampicillin, azathioprine, ciclosporin, cyclophosphamide, didanosine, hydrochlorothiazide, mercaptopurine, and warfarin. |
| Side effects | Rash, hypersensitivity, nausea and vomiting. |
| Cautions | Dehydration, pregnancy and breastfeeding, thyroid disorders, renal impairment, hepatic impairment. |
| Storage condition | Store below 30 °C. Protect from light and moisture. Keep from freezing. |
| **Calcium folinate (leucovorin calcium)** | |
| Pharmacological class | Vitamin and trace element (folate) |
| Dosage form | Injection: 3 mg/ml in 10 ml ampoule, 7.5 mg/ml in 2 ml ampoule, 10 mg/ml in 5 ml ampoule. |
| Indications | Prevention of methotrexate-induced adverse effects; antidote to methotrexate over dosage; adjunct to fluorouracil in colorectal cancer. |
| Dose and administration | **Reduction of methotrexate-induced adverse effects,** IM, IV or IV infusion:  **Adult**: 15 mg every 6 hours for 24 hours, to be started usually 12–24 hours after start of methotrexate infusion.  **Antidote to methotrexate**, IM, IV or IV infusion:  **Adult**: Up to 120 mg in divided doses over 12–24 hours, then 12–15 mg by IM injection every 6 hours for 48–72 hours.  **Child**: Up to 120 mg in divided doses over 12–24 hours, then 12–15 mg by IM injection every 6 hours for 48–72 hours.  **Methotrexate over dosage**, IV or IV infusion:  **Adult**: Initial dose equal to or exceeding dose of methotrexate (started as soon as possible, preferably within 1 hour of administration of methotrexate), to be given at a maximum rate of 160 mg/minute.  **Child**: Dose equal to or higher than that of methotrexate, at rate not exceeding 160 mg/min. |
| Contraindications | Hypersensitivity to the drug, intrathecal injection, pernicious anaemia or other megaloblastic anaemias due to vitamin B12 deficiency. |
| Drug interactions | Phenobarbital, phenytoin, fluorouracil, trimethoprim, methotrexate, fluoropyrimidine. |
| Side effects | Bone marrow failure, dehydration, diarrhoea, mucositis, nausea, oral disorders, skin reactions, vomiting, fever, depression, epilepsy exacerbated, GI disorders, insomnia, urticarial. |
| Cautions | Pregnancy, breastfeeding, renal and hepatic impairment. |
| Storage condition | Store in a refrigerator between 2 °C and 8 °C. Diluted solutions may be stored for a maximum of 24 hours at 2-8°C. |
| **Dexamethasone** | |
| Pharmacological class | Corticosteroid. |
| Dosage form | Injection: 4 mg/ml (as disodium phosphate salt) in 1 ml ampoule  Oral liquid: 2 mg/5 ml.  Tablet: 2 mg, 4 mg. |
| Indications | Nausea and vomiting induced by single-day IV chemotherapy regimen and adjunctive therapy for certain types of cancer. |
| Dose and administration | **Highly emetogenic chemotherapy**, oral:  **Adult**: 12 mg administered prior to chemotherapy in combination with other antiemetics on day of chemotherapy and 8 mg once or twice daily on post-chemotherapy days 2 to 4.  **Moderately emetogenic chemotherapy**, oral:  **Adult**: 8–12 mg in combination with other antiemetics on day of chemotherapy and 8 mg on post-chemotherapy days 2 and 3.  **Low emetogenic chemotherapy**, oral:  **Adult:** 4 to 8 mg administered as a single agent.  **Chemotherapy-induced nausea and vomiting**, oral:  **Child all ages**: 0.2 mg/kg (maximum 8 mg) then 0.1 mg/kg/dose (max. 4 mg) every 6 hours, in conjunction with other antiemetics. |
| Contraindications | Untreated systemic infection, administration of live virus vaccines. |
| Drug interactions | Albendazole, amphotericin B, carbamazepine, oral contraceptives; digoxin, diuretics, enalapril, erythromycin, insulins, metformin, lopinavir, ritonavir, methotrexate, NSAIDs, phenobarbital, phenytoin, praziquantel, propranolol, rifampicin, salbutamol. |
| Side effects | Nausea, increased susceptibility to infection, masking of signs of infection, sodium and water retention, oedema, hypertension, hypokalemia, hyperglycemia, increased appetite, dyspepsia, delayed wound healing, bruising, acne, psychiatric effects (euphoria, hypomania, depression, disturbances of mood, cognition, sleep and behavior), and transient itching, burning or tingling in perineal area (after IV bolus), peptic ulceration, posterior sub-capsular cataracts, glaucoma, hypersensitivity reactions, including anaphylaxis. |
| Cautions | Risk of infection, TB, amoebiasis, strongyloidiasis, risk of severe chickenpox in nonimmune patients, diabetes mellitus, peptic ulcer, hypertension, corneal perforation, osteoporosis, and myasthenia gravis andmeasles. |
| Storage condition | Store below 30 °C. Protect from light and moisture. Keep from freezing. |
| **Hydrocortisone** | |
| Pharmacological class | Corticosteroid. |
| Dosage form | Powder for injection: 100 mg (as sodium succinate) in vial. |
| Indications | Acute lymphoblastic leukaemia, multiple myeloma, chemotherapy-induced nausea and vomiting, brain edema associated with tumors or metastases. |
| Dose and administration | The recommended dosage and administration is individualised based on the disease, patient characteristics, and treatment regimen.  **For the prevention and treatment of chemotherapy-induced nausea and vomiting*:***   * Dosing schedule and duration of therapy may vary depending on the specific chemotherapy protocol and individual patient factors.   **For palliative management of cancer-related symptoms:**   * Doses may range from 10 mg to 100 mg per day, administered orally, intravenously, or by injection.   **For the treatment of brain oedema associated with brain tumours or metastases:**  IV, oral: Use at doses ranging from 100 mg to 400 mg per day, depending on the severity of symptoms and individual patient response. |
| Contraindications | Hypersensitivity to the drug, systemic infection, live virus vaccines, in patients receiving immunosuppressive doses. |
| Drug interactions | Acetylsalicylic acid, NSAIDs, amphotericin B, carbamazepine, diuretics, methotrexate, phenobarbital, phenytoin, rifampicin, and warfarin. |
| Side effects | Adrenal suppression, increased susceptibility to infection, masking of signs of infection, sodium and water retention, oedema, hypertension, hypokalaemia, hyperglycaemia, dyslipidemia, osteoporosis, fractures, increased appetite, dyspepsia, delayed wound healing, skin atrophy, bruising, acne, hirsutism, growth retardation in children, myopathy, muscle weakness and wasting, fat redistribution, weight gain, amenorrhoea, increased appetite, disturbances of mood and osteonecrosis. |
| Cautions | Adrenal suppression, abrupt withdrawal, peptic ulcer disease, psychiatric disorders, glaucoma, osteoporosis, myasthenia gravis, infection, growth restriction, hypertension, congestive heart failure, hepatic impairment, renal impairment, diabetes mellitus, ocular herpes simplex, epilepsy, hypothyroidism, history of steroid myopathy, ulcerative colitis, diverticulitis, recent intestinal anastomoses, thromboembolic disorders, latent TB. |
| Storage condition | Store between 15° and 30°C. |
| **Mesna** | |
| Pharmacological class | Detoxifying agent, uroprotective agent. |
| Dosage form | Injection: 100 mg/ml in 4 ml and 10 ml ampoules.  Tablet: 400 mg; 600 mg |
| Indications | Prevention of urothelial toxicity, including haemorrhagic cystitis, microhaematuria, and macrohaematuria in patients treated with ifosfamide and cyclophosphamide, in doses considered to be urotoxic. |
| Dose and administration | **Cytotoxic induced urothelial toxicity,** oral or IV:  **Adult**: Dose to be calculated according to oxazaphosphorine (cyclophosphamide or ifosfamide) treatment. When ifosfamide or cyclophosphamide is used as an IV bolus: IV injection over 15–30 minutes at 20% of the simultaneously administered oxazaphosphorine on a weight-for-weight basis (w/w). The same dose is repeated after 4 and 8 hours. The total dose of mesna is 60% (w/w) of the oxazaphosphorine dose. This is repeated on each occasion that cytotoxic agents are used. When Ifosfamide is given as a 24-hour infusion, mesna can be used as concurrent infusion with an initial 20% (w/w) of total ifosfamide dose given as IV bolus, then an infusion at 100% (w/w) of the ifosfamide dose over 24 hours followed by a further 12-hour infusion of 60% (w/w) of the ifosfamide dose. Total mesna dose being 180% (w/w) of ifosfamide dose. |
| Contraindications | Hypersensitivity to the drug or other thiol compounds. |
| Drug interactions | Drugs that affect renal function or urine pH. |
| Side effects | Appetite decreased, arthralgia, asthenia, chest pain, chills, concentration impaired conjunctivitis, constipation, cough, dehydration, diarrhoea, dizziness, drowsiness, dry mouth, dyspnoea, dysuria, fever, flatulence, flushing, gastrointestinal discomfort, haemorrhage, headache, hyperhidrosis, influenza like illness, laryngeal discomfort, lymphadenopathy, malaise, mucosal irritation, myalgia, nasal congestion, nausea, oral irritation, pain, palpitations, respiratory disorders, sensation abnormal, skin reactions, sleep disorders, syncope, vision disorders, vomiting. |
| Cautions | Nephrotoxicity, myelosuppression, or neurotoxicity, benzyl alcohol as preservative, haemorrhagic cystitis, hematuria, treatment with ifosfamide or cyclophosphamide. |
| Storage condition | Store between 15 °C and 30°C. Protect from light and moisture. |
| **Methylprednisolone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Injection: 40 mg/ml (as sodium succinate) in 1 ml single-dose vial and 5 ml multi-dose vials; 80 mg/ml (as sodium succinate) in 1 ml single-dose vial |
| Indications | Suppression of inflammatory and allergic disorders, management of cancer-related symptoms and complications, control of chemotherapy-induced nausea and vomiting. |
| Dose and administration | **Suppression of inflammatory and allergic disorders, cerebral oedema associated with malignancy,** slow IV or IV infusion:  **Adult**: Initially 10–500 mg, doses can range from 40 mg to 1000 mg per day, depending on the severity of symptoms and individual patient response.  **Child**: 0.5–1.7 mg/kg daily in 2–4 divided doses, divide doses depending on condition and response.  **Suppression of inflammatory and allergic disorders,**deep IM:  **Adult**: 40–120 mg, then 40–120 mg after 2–3 weeks if required, to be injected into the gluteal muscle.  **Palliative management of cancer-related symptoms*,*** slow IV or IV infusion:  **Adult**: Doses may range from 4 mg to 1000 mg per day.  **Note**: The frequency and duration of use may vary based on the severity of symptoms and individual patient response. The route of administration and dosage should be individualized based on the patient's needs and treatment response. |
| Contraindications | Hypersensitivity to the drug, systemic fungal infections. |
| Drug interactions | Antiepileptics, protease inhibitors, macrolides, antifungals, aspirin, NSAIDs, rifampicin. |
| Side effects | Confusion, delusions, depressed mood, diarrhoea, dizziness, dyslipidaemia, hallucination, hiccups, Kaposi’s sarcoma, lipomatosis, oedema, schizophrenia, suicidal thoughts, vomiting, withdrawal syndrome. |
| Cautions | Rapid IV administration. |
| Storage condition | Store between 15° to 30 °C. Protect from heat, moisture, and light. |
| **Prednisolone** | |
| Pharmacological class | Corticosteroid |
| Dosage form | Tablet: 5 mg; 25 mg.  Oral liquid: 5 mg/ml |
| Indications | Leukemias and lymphomas, suppression of inflammatory and allergic disorders. |
| Dose and administration | **Leukaemias and lymphomas**, oral:  **Child ≤ 1 year**: Initially up to 25 mg, then gradually reduced to 5–10 mg daily.  **Child 2–7 years**: Initially up to 50 mg daily, then gradually reduced to 10–20 mg daily.  **Child 8–12 years**: Initially up to 75 mg, then gradually reduced to 15–30 mg daily.  **Adolescent and adult**: Initially up to 100 mg daily, then gradually reduce, if possible to 20–40 mg daily.  **Suppression of inflammatory and allergic disorders,** oral:  **Adult**: Initially 10–20 mg daily, dose preferably taken in the morning after breakfast, can often be reduced within a few days but may need to be continued for several weeks or months. For maintenance, 2.5–15 mg daily, higher doses may be needed, cushingoid side effects increasingly likely with doses above 7.5 mg daily.  **Suppression of severe inflammatory and allergic disorders**, oral:  **Adult**: Initially up to 60 mg daily, dose preferably taken in the morning after breakfast, can often be reduced within a few days but may need to be continued for several weeks or months. |
| Contraindications | Untreated bacterial, viral, fungal infections, live virus vaccines. |
| Drug interactions | Antiepileptics, protease inhibitors, macrolides, antifungals, NSAIDs, rifampicin. |
| Side effects | Diarrhoea, dizziness, dyslipidaemia, lipomatosis, protein catabolism, scleroderma renal crisis. |
| Cautions | Hypertension, fluid and electrolyte imbalance, diabetes, renal impairment, pregnanncy, infant. |
| Storage condition | Store between 15° C and 30°C. Protect from light and moisture. |
| **Rasburicase** | |
| Pharmacological class | Detoxifying agents, urate oxidase. |
| Dosage form | Powder for injection: 1.5mg,7.5 mg in vial |
| Indications | Prophylaxis and treatment of acute hyperuricemia, before and during initiation of chemotherapy, in patients with haematological malignancy and high tumour burden at risk of rapid lysis. |
| Dose and administration | **Management of tumor lysis syndrome**, IV infusion:  **Adult**: 0.2mg/kg once daily, administered as a once daily 30-minute IV infusion in 50 ml of a sodium chloride 9 mg/ml (0.9%) solution, for up to 7 days according to plasma-uric acid concentration.  *Note: For IV infusion, it is advised to give intermittently in 0.9% sodium chloride; reconstitute with solvent provided; gently swirl vial without shaking to dissolve; dilute requisite dose to 50ml with infusion fluid and give over 30 minutes.* |
| Contraindications | Hypersensitivity to the drug, G6PD deficiency and other cellular metabolic disorders known to cause haemolytic anaemia. |
| Drug interactions | Antacids, calcium, or vitamin supplements. |
| Side effects | Diarrhoea, fever, headache, nausea, skin reactions, vomiting, bronchospasm, haemolysis, haemolytic anaemia, hypersensitivity, hypotension, methaemoglobinaemia, seizure. |
| Cautions | Atopic allergies, screen patients for G6PD deficiency (immediately and permanently discontinue therapy in any patient developing haemolysis), and adequate hydration. |
| Storage condition | Store lyophilized product and diluent at 2 °C to 8 °C. Protect from light. Do not freeze. Reconstituted or diluted solution may be stored at 2 °C to 8 °C for up to 24 hours after reconstitution if needed. |
| **Zoledronic acid** | |
| Pharmacological class | Bisphosphonate, antiresorptive agent |
| Dosage form | Concentrate solution for infusion: 4 mg/5 ml in vial.  Solution for infusion: 4 mg/100 ml in 100 ml bottle. |
| Indications | Prevention of skeletal related events (SREs) in advanced malignancies involving bone; tumour-induced hypercalcaemia, multiple myeloma. |
| Dose and administration | **Prevention of SREs in advanced malignancies involving bone**,IV infusion:  **Adult**: 4 mg every 3–4 weeks, calcium 500 mg daily and vitamin D 400 units daily should also be taken.  **Tumour-induced hypercalcaemia**,by IV infusion:  **Adult**: 4 mg for 1 dose. |
| Contraindications | Hypersensitivity to the drug or other bisphosphonates, patients with hypocalcaemia, severe renal impairment (CrCl < 35 ml/min), pregnancy and breastfeeding. |
| Drug interactions | Calcium containing IV fluids, magnesium or phosphorus, bumetamide, furosemide, mineral supplements, amikacin, amphotericin, bacitracin, capreomycin, carboplatin, cephalexin, cefixime, ceftazidime, cisplatin, diclofenac, gentamicin, ibuprofen, gentamicin, indomethacin, meloxicam, methotrexate, oxaliplatin, streptomycin, tacrolimus, trimethoprim, vancomycin, tenofovir, zidovudine. |
| Side effects | Flushing, anaphylactic shock, anxiety, arrhythmias, chest pain, circulatory collapse, cough, drowsiness, dry mouth, dyspnoea, haematuria, hyperhidrosis, hypertension, hypotension, leucopenia, muscle spasms, proteinuria, respiratory disorders, sensation abnormal, sleep disorder, stomatitis, syncope, thrombocytopenia, tremor, vision blurred, and weight increased. |
| Cautions | Atypical femoral fractures, cardiac disease, concomitant medicines that affect renal function, renal impairment. |
| Storage condition | Store in a refrigerator at 2°C – 8°C but no longer than 24 hours. Once reconstituted, the solution should be used refrigerated at 2-8°C and within 24 hours. |

# Medicines Used for Benign Prostatic Hyperplasia

Benign prostatic hyperplasia (BPH) is a common condition that affects older men. Alpha 1 blockers and 5α-reductase inhibitors are the main classes of medications used for management of BPH. Alpha 1 blocker including; alfuzosin, doxazosin, and tamsulosin treat the dynamic component of bladder outlet obstruction. Furthermore, they are short acting and are given once or twice daily. On the other hand, dutasteride and finasteride are inhibitors of the enzyme 5α-reductase, which metabolizes testosterone to the more potent androgen dihydrotestosterone. This inhibition of testosterone metabolism leads to a reduction in prostate size, with an improvement in the urinary flow rate and obstructive symptoms. They are alternatives to alpha-blockers, particularly in men with significantly enlarged prostate.

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| **Alfuzosin** | |
| Pharmacologic class | alpha1-selective adrenoceptor blockers |
| Dosage form | Tablet: 2.5mg, 5mg,10mg |
| Indications | Benign prostatic hyperplasia, acute urinary retention associated with benign prostatic hyperplasia adjunct to catheterization or post catheterization. |
| Dose and Administration | **Adult,** oral: 10 mg daily, review treatment at 3–6 months and then every 6–12 months (may require several months treatment before benefit is obtained). |
| Contraindications | Hypersensitivity to the drug, history of micturition, syncope, history of postural hypotension, hepatic insufficiency (advanced). |
| Drug interactions | Azole antifungals (such as ketoconazole), ciprofloxacin, clarithromycin, diclofenac, doxycycline, erythromycin, isoniazid, propofol, protease inhibitors, quinidine, verapamil, CYP3A4 inhibitors, carbamazepine, nafcillin, nevirapine, phenobarbital, phenytoin, rifamycins, and other CYP3A4 inducers, calcium channel blockers, nitrates, general anesthetics |
| Side effects | Asthenia, diarrhea, weakness, faintness/dizziness, dry mouth, headache, malaise, nausea, postural hypotension, vertigo, vomiting, lightheadedness, and hepatic failure |
| Cautions | Acute heart failure, cerebrovascular disease, angina, elderly, history of QT-interval prolongation, patients undergoing cataract surgery, priapism, renal and hepatic impairment. |
| Storage condition | Store below 30°C. |
| **Dutasteride** | |
| Pharmacologic class | 5α-reductase inhibitor |
| Dosage form | Capsule: 0.5mg |
| Indications | Benign prostatic hyperplasia |
| Dose and Administration | **Adult,** oral: 0.5mg daily, review treatment at 3–6 months and then every 6–12 months (may require several months treatment before benefit is obtained) |
| Contraindications | Hypersensitivity to the drug, pregnancy, children, and severe hepatic impairment. |
| Drug interactions | Carbamazepine, cimetidine, clarithromycin, erythromycin, isoniazid, itraconazole, ketoconazole, rifabutin, rifampin and St John's Wort. |
| Side effects | Sexual dysfunction, breast disorder, alopecia (primarily body hair loss), hypertrichosis, angioedema, depressed mood, hypersensitivity, localized edema, skin reactions, testicular pain and swelling. |
| Cautions | Obstructive uropathy, liver disease, blood donation (until 6 months after last dose of the drug), cardiac failure, women of childbearing potential. |
| Storage condition | Store below 30°C. Protect from light. |
| **Finasteride** | |
| Pharmacologic class | 5α-reductase inhibitor |
| Dosage form | Tablet: 5mg |
| Indications | Benign prostatic hyperplasia |
| Dose and Administration | **Adult,** oral: 5 mg daily, review treatment at 3–6 months and then every 6–12 months. |
| Contraindications | Hypersensitivity to the drug, pregnancy, women of childbearing potential, children, and adolescents |
| Drug interactions | Inhibitors and inducers of cytochrome P450 3A4, St John's Wort |
| Side effects | Sexual dysfunction, breast abnormalities, skin reactions, angioedema, depression, infertility, palpitations, testicular pain, hypersensitivity reactions, angioedema and hepatitis. |
| Cautions | Obstructive uropathy, liver disease, prostate and breast cancer. |
| Storage condition | Store below 30°C. Protect from light. |
| **Tamsulosin hydrochloride** | |
| Pharmacologic class | alpha1-selective adrenoceptor blockers |
| Dosage form | Tablet: 0.4mg |
| Indications | Benign prostatic hyperplasia |
| Dose and Administration | **Adult:** 0.4 mg orallydaily after meal. If symptoms do not improve in 4 weeks, the dose can be increased to a maximum of 0.8mg. |
| Contraindications | Hypersensitivity to the drug, history of micturition syncope, history of postural hypotension, severe hepatic insufficiency |
| Drug interactions | Ketoconazole, fluconazole, diltiazem, verapamil, phenobarbitone, carbamazepine, phenytoin, rifampicin, hypotensive drugs |
| Side effects | Dizziness, ejaculation disorders, asthenia, constipation, diarrhoea, headache, nausea, palpitations, postural hypotension, rhinitis, skin reactions, vomiting and hypersensitivity reactions |
| Cautions | Liver disease, general anesthesia, hypotension, prostatic cancer, angina, intraoperative floppy iris syndrome (cataract surgery), heart failure and hypertension |
| Storage condition | Store below 30°C. Protect from light and moisture. |

# Ophthalmic Medicines

Ophthalmic medicines, available as drops, ointments, and gels, are used to treat a range of eye conditions such as infections, inflammation, glaucoma, and dry eyes.

Antibiotic ophthalmic medications like tobramycin, ciprofloxacin, and erythromycin treat bacterial infections such as conjunctivitis and keratitis. Antiviral agents like ganciclovir target viral infections like herpetic keratitis, while antifungal medications like natamycin manage fungal infections.

Anti-inflammatory ophthalmic medications include steroids like prednisolone acetate and NSAIDs such as ketorolac, which reduce inflammation in conditions like uveitis and post-surgery inflammation. Antihistamines and mast cell stabilizers like olopatadine and ketotifen treat allergic conjunctivitis by alleviating itching and swelling.

Glaucoma medications lower intraocular pressure and include prostaglandin analogs (e.g., latanoprost), beta-blockers (e.g., timolol), alpha agonists (e.g., brimonidine), carbonic anhydrase inhibitors (e.g., dorzolamide), and Rho kinase inhibitors (e.g., netarsudil). Mydriatics and cycloplegics like atropine dilate the pupil for eye exams or inflammatory conditions.

Artificial tears and lubricants such as carboxymethylcellulose relieve dry eyes by providing lubrication, while ophthalmic anesthetics like proparacaine numb the eye for procedures. Anti-VEGF agents such as ranibizumab are used to treat macular degeneration and diabetic retinopathy, and corticosteroids like dexamethasone manage inflammation in various eye conditions.

## Miotics and Anti-Glaucoma Medicines

Miotics and anti-glaucoma medications are crucial for managing glaucoma by reducing intraocular pressure (IOP). Miotics such as pilocarpine and carbachol work by constricting the pupil and increasing aqueous humour outflow, though they may cause side effects like headaches and blurred vision.

Anti-glaucoma medications include prostaglandin analogs like latanoprost, which enhance aqueous humour outflow. Beta-blockers such as timolol decrease aqueous humour production but can cause systemic side effects, including bradycardia. Alpha agonists like brimonidine reduce aqueous humour production, while carbonic anhydrase inhibitors like dorzolamide also lower production but may lead to metabolic acidosis. Rho kinase inhibitors like netarsudil improve aqueous outflow.

Combination medications, such as timolol/dorzolamide, enhance compliance by combining multiple agents. Hyperosmotic agents like mannitol are used in acute settings to quickly lower IOP. Proper storage at room temperature, protected from light and moisture, is vital for maintaining the effectiveness of these medications. Together, these treatments play a key role in preventing vision loss and managing the progression of glaucoma.

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| **Acetazolamide** | |
| Pharmacologic class | Carbonic anhydrase inhibitor |
| Dosage form | Tablet: 250mg |
| Indications | Reduction of intraocular pressure (IOP) in open-angle glaucoma, reduction of IOP perioperatively in angle-closure glaucoma |
| Dose and administration | **Adult:** 250 mg to 1 g daily in divided doses  **Child below 12 years:** 8 to 12 mg/kg daily in divided doses  **Child above 12 years:** 15 to 30 mg/kg daily in divided doses |
| Contraindications | Hypersensitivity to the drug, chronic angle-closure glaucoma, severe renal impairment, severe hepatic impairment, hypokalemia, hyponatremia, and hyperchloremic acidosis. |
| Drug interactions | Quinidine, procainamide, mexiletine, and tricyclic antidepressants, lithium, diuretics and potassium-depleting agents, methenamine, valproate, aspirin, methotrexate. |
| Side effects | Paresthesia, fatigue, dizziness, loss of appetite, taste alterations, depression, drowsiness, confusion, myopia, blood dyscrasias, kidney stones, metabolic acidosis, liver dysfunction |
| Cautions | Operating machinery, driving, prolonged therapy, pulmonary obstruction, emphysema |
| Storage condition | Store below 300C. Protect from light. |
| **Acetylcholine chloride** | |
| Pharmacological class | Cholinergic |
| **Dosage form** | Sterile solution: 1% acetylcholine chloride, available in single-dose vials or ampoules |
| **Indications** | Induction of miosis during anterior segment surgery (e.g., cataract extraction, keratoplasty, iridectomy). |
| **Dose and administration** | **Adult:** A single dose of 0.5 to 2.0 ml instilled directly into the anterior chamber (intracameral injection) during surgery. |
| **Contraindications** | Hypersensitivity to the drug or any component of the formulation, and conditions where miosis is undesirable (e.g., acute iritis). |
| **Drug interactions** | Systemic anticholinergics |
| **Side effects** | Corneal edema, corneal clouding, increased IOP, temporary stinging or burning sensation, systemic effects including hypotension, bradycardia, bronchospasm, sweating, flushing |
| **Cautions** | Cardiovascular disease, asthma, COPD, pregnancy, nursing mothers. |
| **Storage condition** | Store in a refrigerator at 2-8°C. Do not freeze. Protect from light. |
| **Betaxolol** | |
| Pharmacologic class | Beta-adrenergic blocker |
| Dosage form | Eye drops 5 ml (0.5% w/v). |
| Indications | Treatment of chronic open-angle glaucoma and ocular hypertension. |
| Dose and administration | **Adult:** 1 to 2 drops, twice daily.  **Child:** Not recommended. |
| Contraindications | Hypersensitivity to the drug, bradycardia, heart block, uncontrolled heart failure |
| Drug interactions | Amiodarone, ciprofloxacin, ketoconazole, norfloxacin, chlorpromazine, fluoxetine, quinine, ritonavir, phenobarbital |
| Side effects | Brown pigmentation, blepharitis, ocular irritation and pain, conjunctival hyperemia, transient punctate epithelial erosion, skin rash, dry eyes, headache, photophobia, darkening, thickening, lengthening of eyelashes |
| Cautions | Asthma, poor cardiac reserve, hepatic impairment, pregnancy |
| Storage condition | Store below 300C. Protect from light. |
| **Brimonidine** | |
| Pharmacologic class | Alpha-2 adrenoceptor agonist |
| Dosage form | Solution: 0.5% |
| Indications | Raised intra-ocular pressure in open-angle glaucoma in patients for whom beta-blockers are inappropriate, ocular hypertension in patients for whom beta-blockers are inappropriate, adjunctive therapy when intra-ocular pressure is inadequately controlled by other antiglaucoma therapy |
| Dose and administration | Instil one drop into the affected eye(s) 2 times daily |
| Contraindications | Hypersensitivity to the drug, use in child under 2 years of age. |
| Drug interactions | Antihypertensives, CNS depressants |
| Side effects | Asthenia, dizziness, drowsiness, dry eye, dry mouth, eye discomfort, eye disorders, eye inflammation, GI disorder, headache, hyperemia, pulmonary reaction, sensation of foreign body, skin reactions, altered taste, vision disorders. |
| Cautions | Cerebral insufficiency, coronary insufficiency, depression, postural hypotension, Raynaud’s syndrome, severe cardiovascular disease, thromboangiitis obliterans, driving |
| Storage condition | Store below 300C. Protect from light. |
| **Dorzolamide** | |
| Pharmacologic class | Carbonic anhydrase inhibitor |
| Dosage form | Solution: eye drop 2% |
| Indications | Ocular hypertension, open angle glaucoma |
| Dose and administration | **Adult**: Instil 1 drop 3 times daily  **Child**: Follow adult dosing |
| Contraindications | Hypersensitivity to the drug, severe renal impairment |
| Drug interactions | Memantine |
| Side effects | Metabolic acidosis, thrombocytopenia, angioedema, Stephen Johnson syndrome, toxic epidermal necrolysis, aplastic anemia, bitter taste, burning, stinging or itching of the eye, blurred vision, tearing, conjunctivitis, eyelid inflammation |
| Cautions | Elderly patients, diabetes mellitus, pulmonary obstruction, prolonged use, multiple-dose ophthalmic solutions, contact lenses, pregnancy, breastfeeding |
| Storage condition | Store below 300C. Protect from light. |
| **Dorzolamide and timolol** | |
| Pharmacologic class | Carbonic anhydrase inhibitor and nonselective beta-adrenergic receptor blocker |
| Dosage form | Solution: eye drop 2% + 0.5% |
| Indications | Ocular hypertension, open-angle glaucoma, pseudo-exfoliative glaucoma |
| Dose and administration | Instil one drop into the affected eye(s) 2 times daily |
| Contraindications | Hypersensitivity to the drug, history of bronchial asthma, severe COPD, sinus bradycardia, second- or third-degree atrioventricular block, overt cardiac failure, cardiogenic shock |
| Drug interactions | Refer to dorzolamide and timolol individual monographs |
| Side effects | Ocular burning, stinging, discomfort, bitter taste, superficial punctate keratitis, ocular allergic reactions, stinging, burning, pain, itching, erythema, transient dryness, allergic blepharitis, transient conjunctivitis, keratitis, decreased corneal sensitivity, diplopia, ptosis |
| Cautions | Hepatic impairment, renal impairment, respiratory disorders, diabetes mellitus, cardiovascular conditions |
| Storage condition | Store below 300C. Protect from light. |
| **Glycerin** | |
| Pharmacologic class | Osmotic agent |
| Dosage form | Oral solution: 50% |
| Indications | Reduction of intraocular pressure in closed-angle glaucoma |
| Dose and administration | **Adult and Child:** 1-2 g/kg, typically diluted with an equal volume of water or fruit juice, taken as a single dose |
| Contraindications | Severe dehydration, severe renal impairment, anuria, severe pulmonary congestion, pulmonary edema. |
| Drug interactions | Other hyperosmotic agents |
| Side effects | Nausea, vomiting, headache, dizziness, confusion, dehydration, hyperglycemia, electrolyte imbalance, increased thirst, diarrhea, abdominal cramps, dry mouth |
| Cautions | Renal impairment, diabetes mellitus, dehydration |
| Storage condition | Store below 300C. Protect from light. |
| **Latanoprost** | |
| Pharmacologic class | Prostaglandin analog |
| Dosage form | Solution: 0.005% |
| Indications | Reduction of elevated intraocular pressure in glaucoma and ocular hypertension in patients intolerant or unresponsive to other agents |
| Dose and administration | **Adult**: Instil 1 drop once daily in the evening |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Bimatoprost, tafuprost, thimerosal, travoprost, unoprostone. |
| Side effects | Brown pigmentation, blepharitis, ocular irritation and pain, conjunctival hyperemia, transient punctate epithelial erosion, skin rash, dry eyes, headache, photophobia, darkening, thickening, lengthening of eyelashes |
| Cautions | Hepatic impairment, renal impairment |
| Storage condition | Store between 2-8°C in the refrigerator. |
| **Mitomycin C** | |
| Pharmacologic class | Antimetabolite |
| Dosage form | Sterile powder for reconstitution: 2mg, 10mg |
| Indications | Palliative treatment of certain cancers, including gastric, pancreatic, bladder, and breast cancer, prevention of scarring after glaucoma surgery (trabeculectomy) or after pterygium surgery |
| Dose and administration | **For ophthalmic use (topical application during surgery)**  Applied in concentrations ranging from 0.2 mg/mL to 0.4 mg/mL during surgery to reduce scarring.  *Note: 2 mg vial can be reconstituted to create a 0.2 mg/mL solution for surgical application while 10 mg vial is reconstituted similarly and may be diluted to the desired concentration based on clinical needs.* |
| Contraindications | Hypersensitivity to the drug, active ocular infection, pregnancy, breastfeeding |
| Drug interactions | No significant topical interactions |
| Side effects | Local irritation or burning sensation, delayed wound healing, corneal defects or thinning, scleral melting or necrosis in severe cases, increased risk of infection due to delayed healing |
| Cautions | Pre-existing ocular surface disease, surgery (contact with the cornea or other sensitive ocular tissues) |
| Storage condition | Store below between 30°C.  *Note: Reconstituted solution should be used immediately or stored according to instructions, typically at 2°C to 8°C for a short time. Protect from light.* |
| **Mannitol** | |
| Pharmacologic class | Osmotic diuretic |
| Dosage form | Intravenous infusion solution: 20% in 500ml |
| Indications | Reduction of intracranial pressure associated with cerebral edema and acute glaucoma, promotion of diuresis in acute renal failure, prevention of renal toxicity during chemotherapy or drug poisoning, treatment of cerebral edema |
| Dose and administration | **Adult:**  **Intracranial pressure:** 0.25–2 g/kg as a 15%–25% IV infusion over 30–60 minutes.  **Intraocular pressure:** 1.5–2 g/kg as a 15%–20% IV infusion over 30–60 minutes.  **Diuresis/Renal protection:** 50–100 g in a 20% solution over 24 hours, adjusted based on clinical response.  **Child:**  **Intracranial/Intraocular pressure:** 0.25–1 g/kg IV over 30–60 minutes as needed. |
| Contraindications | Hypersensitivity to the drug, anuria, pulmonary congestion or edema, dehydration, active intracranial bleeding |
| Drug interactions | Nephrotoxic drugs, lithium, other diuretics |
| Side effects | Fluid and electrolyte imbalances, hypotension, nausea, vomiting, dizziness, headache, pulmonary edema (from fluid overload), chest pain, renal dysfunction in patients with pre-existing kidney disease |
| Cautions | Renal impairment, cardiovascular disease, pregnancy, breastfeeding |
| Storage condition | Store below 300C. Protect from light. |
| **Pilocarpine hydrochloride (nitrate)** | |
| Pharmacologic class | Miotic agent (Cholinergic agonist) |
| Dosage form | Ophthalmic solution: 1%, 2%, 4%  Ophthalmic gel: 4% |
| Indications | Treatment of elevated intraocular pressure in patients with open-angle glaucoma or ocular hypertension, management of acute angle-closure glaucoma, induction of miosis for surgical or diagnostic procedures |
| Dose and administration | **Adult:**  **Open-angle glaucoma or ocular hypertension:** Instill 1 drop of 1%, 2%, or 4% solution in the affected eye(s) up to 4 times daily.  **Acute angle-closure glaucoma:** Instill 1 drop of 1% or 2% solution in the affected eye(s) every 5 to 10 minutes until intraocular pressure decreases.  **Inducing miosis (for surgery or diagnostics):** Instill 1 drop of 1% or 2% solution in the affected eye(s) before the procedure.  **Child:**  **Open-angle glaucoma or ocular hypertension:** Instill 1 drop of 1%, 2%, or 4% solution in the affected eye(s) up to 2 times daily, depending on the clinical response and age of the child.  **Acute angle-closure glaucoma:** Instill 1 drop of 1% or 2% solution in the affected eye(s) every 5 to 10 minutes, under close medical supervision until the intraocular pressure decreases.  **Inducing miosis:** Instill 1 drop of 1% solution in the affected eye(s) before the procedure.  *Note: Pediatric doses should be closely monitored and adjusted based on the child’s age, response, and tolerability. Always consult with a healthcare provider for specific dosing in children.* |
| Contraindications | Hypersensitivity to the drug, acute iritis, anterior uveitis, acute inflammation of the anterior segment, conditions where miosis is undesirable (e.g., pupillary block glaucoma) |
| Drug interactions | Beta-blockers (ophthalmic or systemic), anticholinergic agents, systemic cholinergic agonists |
| Side effects | Blurred vision, eye irritation, eye pain, brow ache, reduced night vision (especially in dim light), increased lacrimation, headache, sweating, nausea, vomiting, bronchospasm, bradycardia |
| Cautions | Asthma, COPD, history of retinal detachment or severe myopia, elderly |
| Storage condition | Store below 300C. Protect from light. |
| **Timolol Maleate** | |
| Pharmacologic class | Nonselective beta-adrenergic receptor blocker |
| Dosage form | Eye drops: 0.25%, 0.5% |
| Indications | Ocular hypertension, chronic open-angle glaucoma, aphakic glaucoma, some secondary glaucoma |
| Dose and administration | **Ocular hypertension, open-angle glaucoma**  **Adult:** Instill 1 drop in the affected eye(s) twice daily.  **Child 2 years and above**: Instil 1 drop in affected eye(s) once daily |
| Contraindications | Hypersensitivity to the drug, history of bronchial asthma, severe COPD, sinus bradycardia, second- or third-degree atrioventricular block, overt cardiac failure, cardiogenic shock. |
| Drug interactions | Other beta-blockers, calcium channel blockers, catecholamine-depleting drugs, digitalis, quinidine, CYP2D6 inhibitors, epinephrine |
| Side effects | Stinging, burning, pain, itching, erythema, transient dryness, allergic blepharitis, transient conjunctivitis, keratitis, decreased corneal sensitivity, diplopia, ptosis |
| Cautions | Elderly, angle-closure glaucoma, eye infection, driving or other activities requiring clear vision |
| Storage condition | Store below 300C. Protect from light. |

## Mydriatics / Cycloplegics

Mydriatics and cycloplegics are ophthalmic agents primarily used to dilate the pupil (mydriasis) and paralyze the ciliary muscle (cycloplegia) respectively. These agents are essential for eye examinations, ophthalmic surgeries, and managing inflammatory eye conditions such as iritis and uveitis to prevent the formation of adhesions between the lens and the iris.

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| **Atropine sulphate** | |
| Pharmacologic class | Anticholinergic |
| Dosage form | Eye drops: 1% |
| Indications | Cycloplegic refraction, Iritis, uveitis |
| Dose and administration | **Cycloplegic refraction**  **Adult:** 1 drop twice daily for 1–2 days before the procedure or a single application of 1 drop 1 hour before the procedure.  **Infant 3 months - 1 year:** 1 drop (0.1%) twice daily for 1–3 days.  **Child 1 - 5 years:** 1 drop (0.1–0.5%) twice daily for 1–3 days.  **Child over 5 years:** 1 drop (0.5–1%) twice daily for 1–3 days.  **Iritis, uveitis**  **Adult:** 1 drop (0.5% or 1% solution) up to 4 times daily.  **Infant over 3 months:** 1 drop (0.5% or 1%) up to three times daily. |
| Contraindications | Hypersensitivity to the drug, closed-angle glaucoma |
| Drug interactions | No known significant drug interactions |
| Side effects | Intolerance to bright light, stinging on instillation, blurred vision, transient intraocular pressure elevation, conjunctivitis, contact allergic blepharitis, persistent ocular irritation, punctal stenosis with prolonged use, insomnia, dryness of skin and moutj, fever, facial flushing, tachycardia, irritability, disorientation, ataxia, visual hallucinations, incoherent speech, delirium, psychosis, seizures, hyperactivity. |
| Cautions | Closed-angle glaucoma, significant head injury, child with spastic paralysis or brain damage |
| Storage condition | Store below 300C. Protect from light. |
| **Cyclopentolate hydrochloride** | |
| Pharmacologic class | Anticholinergic |
| Dosage form | Eye drops: 0.5%, 1%, or 2% |
| Indications | Mydriasis/cycloplegia |
| Dose and administration | **Adult:** Apply 1-2 drops of 0.5%, 1%, or 2% solution in the eye which may be repeated in 5 to 10 minutes if necessary. Use 2% in highly pigmented iris. Wait 5 minutes between drops.  **Cycloplegia**  **Child 3 months–11 years:** Apply 1 drop, 30–60 minutes before examination, using 1% eye drops.  **Child 12–17 years:** Apply 1 drop, 30–60 minutes before examination, using 0.5% eye drops.  **Uveitis:**  **Child 3 months–17 years:** Apply 1 drop 2–4 times a day, using 0.5% eye drops (1% for deeply pigmented eyes). |
| Contraindications | Hypersensitivity to the drug, untreated narrow-angle glaucoma |
| Drug interactions | Clozapine, amitriptyline, atropine |
| Side effects | Blurred vision, burning sensation in the eye, light intolerance, tachycardia, conjunctivitis, raised intraocular pressure, drowsiness, eye edema |
| Cautions | Down syndrome, elderly, pregnancy, breastfeeding |
| Storage condition | Store below 300C. Protect from light. |
| **Phenylephrine** | |
| Pharmacologic class | Alpha-adrenergic receptor agonist |
| Dosage form | Eye drop: 2.5% |
| Indications | Mydriasis production |
| Dose and administration | **Adult:** Apply 1 drop, to be administered before procedure, then apply 1 drop after 60 minutes if required  **Child:** Apply 1 drop, to be administered before procedure |
| Contraindications | Hypersensitivity to the drug, aneurysms, cardiovascular disease, hypertension, thyrotoxicosis |
| Drug interactions | Amitriptyline, clomipramine, desipramine, imipramine, isocarboxazid, linezolid, nortriptyline, phenelzine, procarbazine |
| Side effects | Arrhythmias, conjunctivitis, eye discomfort, hypertension, myocardial infarction, palpitations. |
| Cautions | Asthma, cerebral arteriosclerosis, corneal epithelial damage, darkly pigmented iris, diabetes mellitus, ocular hyperemia, angle-closure glaucoma, driving, pregnancy, breastfeeding. |
| Storage condition | Store below 300C. Protect from light. |

# Ear, Nose and Throat Preparations (ENT)

Ear, Nose, and Throat (ENT) preparations encompass a variety of medications used to treat conditions affecting these areas. These includes antibiotics, antifungals, antihistamines, nasal decongestants, corticosteroids, analgesics, and nasal saline sprays. These medications play a crucial role in managing a variety of conditions affecting the ear, nose, and throat. For instances, antibiotics are used for bacterial infections (e.g., sinusitis, otitis media) while antifungals are used for fungal infections (oral candidiasis, otitis media). Antihistamines such as diphenhydramine, loratadine and cetirizine are used for allergies and allergic rhinitis. Corticosteroids like fluticasone (nasal spray), budesonide (nasal spray) and mometasone (nasal spray) are used for inflammation in conditions like sinusitis and allergic rhinitis. Nasal decongestant drops and sprays exert their effect by vasoconstriction of the mucosal blood vessels, reducing edema of the nasal mucosa. These medicines (sympathomimetic preparations) are more likely to cause rebound effect/congestion withdrawal, due to a secondary vasodilatation with a subsequent temporary increase in nasal congestion.

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| **Acetic acid** | |
| Pharmacologic class | Antibacterial and antifungal |
| Dosage form | Solution : 2% |
| Indications | Otitis Externa to remove all cerumen and debris |
| Dose and Administration | **Adult and children > 3years**  Insert cotton wick saturated with acetic acid otic solution into ear canal; alternatively, may saturate wick following insertion  Keep wick in place for at least 24 hr and maintain moisture by adding 3-5 drops q5-6hr  Remove wick after 24 hr; thereafter, continue to instil 5 gtt to affected ear(s) three to four times daily for as long as indicated |
| Contraindications | Hypersensitivity to the drug, perforated tympanic membrane. |
| Drug interactions | There is no known significant drug interaction. |
| Side effects | Stinging/burning upon instillation, local irritation. |
| Cautions | Acutely inflamed ear |
| Storage condition | Store below 25° C. Protect from light. |
| **Betahistine** | |
| Pharmacologic class | Antihistamine |
| Dosage form | Tablet: 24mg |
| Indications | Meniere’s associated with vertigo, tinnitus and hearing loss. |
| Dose and Administration | **Adult:**  Oral: usual daily dose is 24-48 mg divided into 1-2 equal doses.  *Note: tablets should be swallowed un-chewed with sufficient fluid with or after a meal.* |
| Contraindications | Hypersensitivity to the drug, phaeochromocytoma, pregnancy and lactation. |
| Drug interactions | Other antihistamines. |
| Side effects | Gastrointestinal discomfort, headache, palpitations, tightness of the chest, worsened an existing bronchial asthma, temporary urticaria, skin rashes and pruritus and sensation of heat. |
| Caution | Asthma, peptic ulcer and severe pronounced hypotension. |
| Storage condition | Store below 25°C. |
| **Ciprofloxacin** | |
| Pharmacologic class | Antibacterial |
| Dosage form | Topical, 0.3% ear drops |
| Indications | Chronic suppurative otitis media. |
| Dose and Administration | **Adults and Children (age ≥1 year):** 2 – 3 drops twice daily for 02 weeks. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | There is no known significant drug interaction. |
| Side effects | Ear pruritus, local discomfort, ear pain. |
| Cautions | Perforated tympanic membrane and do not touch the dropper. |
| Storage condition | Store below 30ºC. Protect from light. |
| **Chlorhexidine gluconate** | |
| Pharmacologic class | Antimicrobial |
| Dosage form | Solution (oral wash), 0.2% (as gluconate/digluconate) |
| Indications | Oral hygiene and plaque inhibition, oral candidiasis, gingivitis and management of aphthous ulcers |
| Dose and Administration | **Adult and children > 12 years:** Rinse or gargle 10 ml twice daily (rinse or gargle for about 1 minute)  **Managing dentures:** Cleanse and soak dentures in oral wash solution for 15 minutes twice daily.  Duration of treatment:  **Gingivitis** -1month.  **Aphthous ulceration and oral candidiasis:** Rinse or gargle 10 ml twice daily and the treatment will be continued for 48 hours after clinical resolution.  **Child:** Rinse or gargle 10 ml twice daily (rinse or gargle for about 1 minute) |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Anionic agents. |
| Side effects | Dry mouth, hypersensitivity, tongue discolouration, tooth discolouration, oral/throat irritation, and change in taste of food/drinks |
| Cautions | Do not swallow, pediatric < 12years. |
| Storage condition | Store below 30ºC. |
| **Clotrimazole** | |
| Pharmacologic class | Antifungal |
| Dosage form | Solution (ear drops): 1% |
| Indications | Fungal infection in the ear (otitis externa) |
| Dose and Administration | **Ear drops**  **Child:** Apply 2–3 times a day continue for at least 14 days after disappearance of infection.  **Adult:** Apply 2–3 times a day continue for at least 14 days after disappearance of infection. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | There are no known drug interactions |
| Side effects | Hypersensitivity, burning, irritation, oedema, itching and redness immediately after application but will subside without treatment |
| Cautions | Avoid contact with eye. |
| Storage condition | Store below 30°C. |
| **Fluticasone** | |
| Pharmacologic class | Corticosteroid |
| Dosage form | Nasal spray, 0.055% (as furoate) |
| Indications | Prophylaxis and treatment of allergic rhinitis and perennial rhinitis and nasal polyps |
| Dose and Administration | **Allergic rhinitis and perennial rhinitis**  **Adult and children ≥12 years:** two sprays into each nostril once a day, increased if necessary to 2 sprays twice daily, reduced to one spray daily when control achieved.  **Child 6–11 years:** one spray into each nostril once daily, increased if necessary to 2 sprays daily, reduced to one spray daily when control achieved.  **Treatment of nasal polyps**  **Adult and child above 12 years:** 2 spray 1–2 times a day, to be administered into each nostril, alternative treatment should be considered if no improvement after 4–6 weeks.  **Child 6–11 years:** one spray into each nostril once daily, increased if necessary to 2 sprays daily, reduced to one spray daily when control achieved. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Ritonavir and ketoconazole |
| Side effects | Hypersensitivity reactions including anaphylaxis, angioedema, rash, and urticarial, epistaxis, nasal ulceration and nasal septum perforation. |
| Cautions | Nasal septal ulcers, trauma, or surgery, history of increased intraocular pressure (IOP), glaucoma, and/or cataracts. |
| Storage condition | Store below 30˚C. Protect from light & moisture. |
| **Hydrogen Peroxide** | |
| Pharmacologic class | Antiseptic |
| Dosage form | Solution, 3% ear drops (stabilized) |
| Indications | Inflammatory conditions of the external auditory canal and for removal of ear wax |
| Dose and Administration | **Pediatric and adult**  Outer ear (patient should lie down on their side), administer the instructed number of drops into the ear canal and fill it with fluid, keep still for 5 minutes; sit up after 5 minutes and blot the outer ear with a tissue to absorb any liquid that comes out, repeat for the other ear |
| Contraindications | No absolute contraindication |
| Drug interactions | There are no known significant drug interactions. |
| Side effects | Redness, stinging, irritation. |
| Cautions | Avoid eye exposure and if accidental exposure occurs, flush eyes with water for 15-30 minutes and initiate monitoring and further evaluation as appropriate. |
| Storage condition | Store between 20°C and 30°C. |
| **Lidocaine Hydrochloride** | |
| Pharmacologic class | **Local anaesthetic** |
| Dosage form | Oro-mucosal spray: 4% |
| Indications | Bronchoscopy, laryngoscopy, esophagoscopy and endotracheal intubation: |
| Dose and Administration | **Pediatric and adult**  **Bronchoscopy, laryngoscopy, esophagoscopy and endotracheal intubation:** Up to 20 doses  **Maxillary sinus puncture:** 3 doses |
| Contraindications | Adjacent skin infection, inflamed skin |
| Drug interactions | There is no significant drug interaction. |
| Side effects | Dizziness, allergic reaction, drowsiness, mental changes, mild nausea. |
| Cautions | Avoid anesthesia of the pharynx before meals. |
| Storage condition | Store below 30ºC. Protect from light. |
| **Miconazole** | |
| Pharmacologic class | Antifungal |
| Dosage form | Oral gel: 25mg/ml |
| Indications | Oral candidiasis |
| Dose and Administration | **Oral candidiasis:** orally using oral gel  **Child 4–23 months:** 1.25 ml 4 times a day.  **Child 2–17 years:** 2.5 ml 4 times a day  **Adult:** 2.5 ml 4 times a day.  In all age group treatment should be continued for at least 7 days after lesions have healed or symptoms have cleared, to be smeared around the inside of the oral after feed and retain near oral lesions before swallowing (dental prostheses and orthodontic appliances should be removed at night and brushed with gel).  Dose equivalence and conversion: One 5-ml spoonful of oral gel equivalent to 124 mg miconazole |
| Contraindications | Known hypersensitivity to the drug or other imidazole derivatives, infants with impaired swallowing reflex. |
| Drug interactions | Carbamazepine, phenytoin, busulfan, tobramycin, midazolam, methylprednisolone, HMG-CoA reductase inhibitors such as simvastatin and lovastatin, ergot alkaloids, warfarin. |
| Side effects | Dry mouth, nausea, oral discomfort, vomiting, skin reactions and abnormal taste. |
| Cautions | Acute porphyria |
| Storage condition | Store below 30°C. |
| **Mometasone** | |
| Pharmacologic class | Corticosteroid |
| Dosage form | Nasal spray: 0.05% |
| Indications | Prophylaxis and treatment of seasonal allergic or perennial rhinitis and for treatment of nasal polyps in adults. |
| Dose and Administration | **Treatment of seasonal allergic or perennial rhinitis:**  **Adult and Child >12years:** two sprays into each nostril once a day, reduced to one spray daily when control achieved.  **Child 6–11 years:** one spray into each nostril once daily.  **Treatment of nasal polyps:**  **Adult:** two sprays into each nostril once daily.  *Note: If symptoms are not controlled after 5 to 6 weeks, the dose may be increased to two sprays in each nostril twice daily. Once symptoms are under control, dose should be reduced to the lowest amount where symptoms are still controlled.* |
| Contraindications | Hypersensitivity to the drug, presence of untreated localized infection involving the nasal mucosa, such as herpes simplex, patients who have experienced recent nasal surgery or trauma and nasal septum perforation. |
| Drug interactions | There is no significant drug interaction. |
| Side effects | Headache, pharyngitis, cough, viral infection, epistaxis, nasal irritation, burning and ulceration, epistaxis. |
| Cautions | Active tuberculous infections, untreated fungal, bacterial, or systemic viral infections. |
| Storage condition | Store below 30°C. Do not freeze. |
| **Nystatin** | |
| Pharmacologic class | Antifungal |
| Dosage form | Suspension: 100000 u/ml |
| Indications | Oral candidiasis |
| Dose and Administration | **Oral candidiasis,** oral:  **Neonate:** 1 ml (100,000 U) four times daily usually for 7 days, and continued for 48 hours after lesions have resolved, to be given after feeds.  **Infants (1 month to 2 years):** 2 ml (200,000 U) 4 times daily (1 ml for each side of the oral after feeds; treatment is usually given for 7 days and continued for 2 days after lesions have healed.  **Children (over 2 years) and adults:** 4 – 6 ml (400,000 – 600,000 U) 4 times daily (half dose in each side of the oral) after food usually for 7 days, continue for 48 hours after lesions have resolved. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | There is no significant drug interaction. |
| Side effects | Diarrhoea, gastrointestinal distress, nausea and vomiting, rash, including urticaria, Steven-Johnson Syndrome. |
| Cautions | Patients with rare hereditary problems of fructose intolerance, glucose-galactose malabsorption or sucrase-isomaltase insufficiency. |
| Storage condition | Store below 30°C. |
| **Oxytetracycline hydrochloride + hydrocortisone acetate + polymixin B sulphate** | |
| Pharmacologic class | Antibacterial and corticosteroid |
| Dosage form | Ear drops: 5mg +15mg + 10,000U/ml |
| Indications | Bacterial infection with eczematous inflammation in otitis external |
| Dose and Administration | **Adult and pediatric >8years:**  Instil two to four drops into the affected ear three times daily. |
| Contraindications | Hypersensitivity to the drug, acute herpes simplex, vaccinia, varicella and other viral diseases of the cornea, viral otic infections, perforated tympanic membrane and perforation of the eardrum. |
| Drug interactions | There is no significant drug interaction. |
| Side effects | Local sensitivity reactions, secondary infection (bacterial, fungal). |
| Cautions | Prolonged use |
| Storage condition | Store below 30°C. Protect from light. |
| **Pilocapine** | |
| Pharmacologic class | **Cholinomimetic agent** |
| Dosage form | Tablet:5mg |
| Indications | Alleviation of symptoms of salivary gland hypofunction in patients with severe xerostomia following irradiation for head and neck cancer, treatment of symptoms of dry mouth and dry eyes in patients with Sjogren's syndrome. |
| Dose and Administration | **Radiation-induced Xerostomia:**  **Adult:** 5 mg orally every 8hr; may titrate up to 10 mg orally every 8hr; not to exceed 30 mg/day  **Xerostomia Associated with Stogner’s syndrome**  **Adult:** 5 mg orally every 6hr |
| Contraindications | Hypersensitivity to the drug, uncontrolled cardio-renal disease, uncontrolled asthma and acute iritis. |
| Drug interactions | Beta adrenergic antagonists, other parasympathomimetic |
| Side effects | Sweating, headache, flushing, dizziness, diarrhoea, atrioventricular block, tachycardia, bradycardia, shock, mental confusion, cardiac arrhythmia, and tremors, hypotension, lacrimation, blurred vision, abnormal vision, conjunctivitis, eye pain, rhinitis, dyspepsia, diarrhoea, abdominal pain, nausea, vomiting and increased urinary frequency, |
| Cautions | Hepatic impairment, chronic bronchitis and/or chronic obstructive pulmonary disease, known or suspected cholelithiasis or biliary tract disease, peptic ulceration, underlying cognitive or psychiatric disturbances, renal insufficiency and narrow-angle glaucoma. |
| Storage condition | Store below 30°C. Protect from light. |
| **Saline spray** | |
| Pharmacologic class | Crystalloid: isotonic/hypertonic préparation |
| Dosage form | Isotonic : 0.9% ; Hypertonic : 3% |
| Indications | For relieving nasal congestion by dissolving and softening thick and crusty mucus in the nose and pre-treatment for nasal steroid |
| Dose and Administration | **Nasal dryness & congestion:** isotonic solution (0.9%)   * Apply one or two drops in each nostril as needed * Turn your head to the left in the extended position. * Gently introduce the tip at the entrance of the right nostril. Press the vial. * Turn the head on the other side and repeat the same operation with the other nostril.   **Pre-treatment for nasal steroid:** hypertonic saline (3%):  1 spray/nostril 2-6 times |
| Contraindications | No absolute contraindication. |
| Drug interactions | There is no significant drug interaction. |
| Side effects | Dry nose, nasal irritation, allergic reactions, sneezing, cough |
| Cautions | Not for ingestion, avoid contact with eyes, use of same tube/spray by >1 person |
| Storage condition | Store below 30ºC. Protect from light and do not refrigerate or freeze. |
| **Silver nitrate** | |
| Pharmacologic class | Antiseptic |
| Dosage form | Solution: 0.75% |
| Indications | Antiseptic wound cauterization |
| Dose and Administration | **Sticks:** apply to mucous membranes and other moist skin surfaces only on area to be treated  **Topical solution:** apply a cotton applicator dipped in solution on the affected area 2-3 times per week for 2-3 weeks. |
| Contraindications | Hypersensitivity to the drug, broken skin, wounds, or cuts |
| Drug interactions | Allogeneic cultured keratinocytes and fibroblasts |
| Side effects | Burning and skin irritation, staining of the skin, methemoglobinemia. |
| Cautions | Highly toxic to gastrointestinal tract and central nervous system when ingested; prolonged contact, inappropriate use of product, tends to stain skin, utensils, clothing, and linens. |
| Storage condition | Store below 30ºC. |
| **Triamcinolone acetonide** | |
| Pharmacologic class | Corticosteroid |
| Dosage form | Spray: 55mcg/spray, Oral paste: 0.1% |
| Indications | Prophylaxis and treatment of allergic rhinitis, inflammatory or ulcerative lesions of oral mucosa resulting from trauma. |
| Dose and Administration | **Treatment of allergic rhinitis,** nasal spray:  **Adults and children (over 12 years):** nasal spray 2 sprays in each nostril once daily, dose can be reduced to 1 spray in each nostril once daily as soon as symptoms are under control.  **Children aged 6 to 12 years:**  1spray in each nostril once daily. For more severe symptoms, the dose can be doubled to 2 sprays in each nostril once daily, use the least effective dose as soon as symptoms are under control.  **Children aged 2 to 5 years:**  1 spray in each nostril once daily  **Inflammatory or ulcerative lesions of oral mucosa resulting from trauma,** oral paste: Apply thin film to affected areas 2 to 3 times daily |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | CYP3A inhibitors, including medicinal products containing Cobicistat. |
| Side effects | Flu like syndrome, pharyngitis, headache, bronchitis, dyspepsia, tooth disorder, epistaxis, excoriation, increased cough, rhinorrhoea and rash. |
| Cautions | In children under 12 years, long-term use of more than 3 months, history of increased IOP, glaucoma, or cataracts, recent nasal surgery, nasal trauma, nasal septum ulcers, tuberculosis, fungal, bacterial, viral, or parasitic infections, or ocular herpes simplex. |
| Storage condition | Store below 30°C. |
| **Xylometazoline** | |
| Pharmacologic class | Sympathomimetic |
| Dosage form | Solution (nasal drops) : 0.05%, 0.1% |
| Indications | For the symptomatic relief of nasal congestion, perennial and allergic rhinitis (including hay fever), sinusitis. |
| Dose and Administration | **Child 6–11 years:** 1–2 drops 1–2 times a day as required for maximum duration of 5 days, 0.05% solution to be administered into each nostril.  **Child 12–17 years and Adults:** 2–3 drops 2–3 times a day as required for maximum duration of 7 days, 0.1% solution to be administered into each nostril. |
| Contraindications | Hypersensitivity to the drug, concurrent use with [monoamine oxidase inhibitors](http://www.netdoctor.co.uk/diseases/depression/monoamineoxidaseinhibitors_000101.htm) (MAOIs) |
| Drug interactions | MAOIs, tricyclic antidepressants. |
| Side effects | Hypersensitivity reaction (angioedema, rash, pruritus), headache, nasal dryness or discomfort, burning sensation, burning at application site. |
| Cautions | More than seven consecutive days, hypertension, cardiovascular disease, hyperthyroidism, narrow angle glaucoma, diabetes mellitus. |
| Storage condition | Store below 30ºC. Protect from light. |

# Dermatologic Medicines

Dermatological medicines combine vehicles and active ingredients to treat skin conditions, with vehicles often playing a therapeutic role by hydrating the skin and enhancing drug absorption. Lotions and sprays suit large or hairy areas, while ointments are used for dry skin and creams for moist areas. Topical use of systemic antibiotics like penicillins and gentamicin should be avoided to prevent resistance, as hygiene often suffices for mild infections. For deep infections like cellulitis, systemic antibiotics are required. Mupirocin and fusidic acid are used for impetigo and staphylococcal infections, while silver sulfadiazine is essential for treating infected burns. Other agents like metronidazole and tetracycline are also used for specific skin conditions, but their use should be controlled to prevent resistance.

## Anti-bacterials

Topical antibiotics are used to treat localized skin infections, offering direct antibacterial action at the infection site. **Fusidic acid**is commonly used for skin infections like impetigo. **Mupirocin** is another effective agent against Staphylococcus and Streptococcus, often used in treating impetigo and small infected wounds. **Metronidazole** is widely employed for rosacea due to its action against anaerobic bacteria. **Nitrofurazone** is used for wound infections, especially in burn care. **Paromomycin** targets parasitic skin infections like cutaneous leishmaniasis, while **silversulfadiazine** is essential for preventing infections in burn wounds. **Tetracycline** is often used in treating acne due to its antibacterial and anti-inflammatory properties. These agents help control infections but should be used cautiously to avoid resistance and skin irritation

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| **Fusidic Acid** | |
| Pharmacological class | Topical antibacterial |
| Dosage form | Cream: 2% |
| Indications | Primary and secondary skin infections caused by sensitive strains of *Staphylococcus aureus*, *Streptococcus spp.,* and *Corynebacterium minutissimum*, such as impetigo contagiosa, superficial folliculitis, sycosis barbae, paronychia and erythrasma, infected eczematoid dermatitis, infected contact dermatitis, and infected cuts/abrasions. |
| Dose and Administration | **Uncovered lesions**:  **Adult**: Apply gently 3 or 4 times daily for 1 week.  **Covered lesions**: Less frequent applications may be adequate  **Child dose:** Same as adult |
| Contraindications | Hypersensitivity to the drug or any component of the formulation |
| Drug interactions | There are no known significant interactions |
| Side effects | Local hypersensitivity reactions |
| Cautions | Prolonged or recurrent use may increase the risk of developing contact sensitization |
| Storage condition | Store below 30 oC. |
| **Metronidazole** | |
| Pharmacological class | Topical antibacterial |
| Dosage form | Cream: 0.75 % w/w,1%w/w |
| Indications | Acute inflammatory exacerbation of rosacea, malodorousfungatingtumors and malodorous gravitational and decubitus ulcers, inflammatory papules and pustules of rosacea, inflammatory papules, pustules and erythema of rosacea |
| Dose and administration | **Acute inflammatory exacerbation of rosacea, to the skin**: **Adult**: Apply 0.75% twice daily for 8 weeks, to be applied thinly to the affected area  **Malodorous fungating tumors and malodorous gravitational and decubitus ulcers, to the skin**:  **Adult**: Apply 1–2 times a day, to be applied to clean wound and covered with non-adherent dressing  **Inflammatory papules and pustules of rosacea, to the skin**: **Adult**: Apply twice daily for 6 weeks (longer if necessary)  **Inflammatory papules, pustules and erythema of rosacea, to the skin**:  **Adult**: Apply twice daily for 3–4 months. |
| Contraindications | Hypersensitivity to the drug or nitroimidazoles or parabens |
| Drug interactions | Alcohol, lopinavir, warfarin. |
| Side effects | Skin dryiness, skin scaling, pruritus, skin discomfort, cutaneous stinging/burning. |
| Cautions | Exposure to strong sunlight or UV light, patients with blood dyscrasias |
| Storage condition | Store below 30 oC. |
| **Mupirocin** | |
| Pharmacological class | Topical antibacterial |
| Dosage form | Cream: 2%  Ointment: 2% |
| **Indications** | Bacterial skin infections, particularly those caused by gram-positive organisms (except pseudomonal infection), non-bullous impetigo. |
| Dose and administration | **Bacterial skin infections, particularly those caused by gram-positive organisms (except pseudomonal infection)**, **to the skin**:  **Adult**: Apply up to 3 times a day for up to 10 days.  **Non-bullous impetigo**, **to the skin:**  **Adult**: Apply 3 times a day for 5–7 days.  **Bacterial skin infections, particularly those caused byGram-positive organisms (except pseudomonal infection**), **to the skin**: Child: Apply up to 3 times a day for up to 10 days  **Non-bullous impetigo, to the skin**:  **Child**: Apply 3 times a day for 5–7 days |
| Contraindications | Hypersensitivity to the drug or any component of the formulation |
| Drug interactions | There are no known significant interactions. |
| Side effects | Burning at the application site, headache, rash, nausea, abdominal pain, bacterial skin infection (cellulitis), skin inflammation, dizziness, itching, secondary wound infection, and oral sores. |
| Cautions | Renal impairment, prolonged use may result in fungal or bacterial superinfection, patients with extensive burn |
| Storage condition | Store below 30 oC. |
| **Nitrofurazone** | |
| Pharmacological class | Topical antibacterial |
| Dosage form | Cream: 0.2% |
| Indications | In bacterial skin infections including pyodermas, infected dermatoses and infections of cuts, wounds, and burns, otitis externa, as an adjunctive therapy for second- and third-degree burns, in skin grafting when bacterial contamination may cause graft rejection or donor site infection |
| Dose and administration | **Burns or skin infections**: Topically apply directly to lesion or place on gauze depending on the usual dressing technique.  *Note: If overgrowth of nonsusceptible organisms occur, or if irritation, sensitization, or superinfection develops, treatment should be discontinued*. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | There are no significant interactions |
| Side effects | Sensitization and generalized allergic skin reactions. |
| Cautions | Patient with renal impairment and metabolic acidosis. |
| Storage condition | Store below 30 oC. |
| **Paromomycin** | |
| Pharmacological class | Topical antibacterial |
| Dosage form | Cream:15% |
| **Indications** | Cutaneous leishmaniasis. |
| Dose and administration | It should be applied twice daily for a period of 10 days. If complete healing has not occurred after 10 days of therapy, an additional 10-day course of treatment may be recommended.  *Note: The affected area should be cleaned. The medication should completely cover the lesion. The lesion may then be covered with a sterile bandage.* |
| Contraindications | Known hypersensitivity to the drug. |
| Drug interactions | Aminoglycosides. |
| Side effects | May cause redness, irritation, local inflammation, local burning sensation, erythema, edema, local pain, contact dermatitis. |
| Cautions | Patients sensitive to neomycin, patients with renal, hepatic or hearing impairment |
| Storage condition | Store below 30 oC. Protect from light. |
| **Silver sulfadiazine** | |
| Pharmacological class | Topical antibacterial |
| Dosage form | Cream:1% |
| Indications | Prophylaxis and treatment of infection in burn wounds, for conservative management of finger-tip injuries, adjunct to prophylaxis of infection in skin graft donor sites and extensive abrasions, short-term treatment of infection in pressure sores and infection in leg leg ulcers |
| Dose and administration | **Prophylaxis and treatment of infection in burn wounds**, **to the skin:**  **Adult**: Apply daily, may be applied more frequently ifvery exudative  **For conservative management of finger-tip injuries**, **to the skin**: **Adult**: Apply every 2–3 days  **Adjunct to prophylaxis of infection in skin graft donor**  **sites and extensive abrasions**, **to the skin**: Apply every 2–3 days  **Adjunct to short-term treatment of infection in pressuresores**, **to the skin**:  **Adult**: Apply once daily or on alternate days  **As an adjunct to short-term treatment of infection in legulcers**, **to the skin**:  **Adult**: Apply once daily or on alternate days, not recommended if ulcer is very exudative  **Prophylaxis and treatment of infection in burn wounds**, **to the skin**:  **Child**: Apply daily, may be applied more frequently if very exudative  **For conservative management of finger-tip injuries**, **to the skin**: **Child**: Apply every 2–3 days. |
| Contraindications | Hypersensitive to the drug and other sulphonamides (3rd trimester), premature infant or on a newborn during the first 2 months of life, hepatic, renal impairment, pregnancy |
| Drug interactions | Decreases effects of collagenase, papain, trypsin |
| Side effects | Allergic reactions, argyria (following treatment of large areas of skin or prolonged use), burning, itching, leucopenia, rashes |
| Cautions | *Note: treatment should be stopped immediately if blood disorders or rashes develop.* |
| Storage condition | Store below 30 oC. Protect from light. |
| **Tetracycline** | |
| Pharmacological class | Topical antibacterial |
| Dosage form | Skin ointment: 3% |
| Indications | Treatment of bacterial conjunctivitis and trachoma (by preference use oral azithromycin for this indication), prevention of neonatal conjunctivitis. |
| Dose and administration | **Treatment of bacterial conjunctivitis and trachoma:**  First, wash the affected area with warm boiled water, and then apply the ointment to the affected area 1-3 times a day. |
| Contraindications | Hypersensitivity to the drug or other tetracyclines |
| Drug interactions | There are no known significant interactions |
| Side effects | Skin irritation, burning, or stinging at the application site. |
| Cautions | Risk of overgrowthof non-susceptible organisms, stains clothing. |
| Storage condition | Store below 30 oC. |

## Antivirals

Topical antiviral agents are vital for managing viral infections of the skin and mucous membranes. Their main goals include shortening infection duration, preventing complications, reducing recurrences, minimizing transmission, and ultimately eradicating viral latency. Two commonly used antiviral medications are Acyclovir and Ganciclovir. Acyclovir is primarily used to treat Herpes Simplex virus infections, including labial and genital herpes, by inhibiting viral replication. Ganciclovir, on the other hand, is indicated for mild and severe cytomegalovirus (CMV) infections, particularly in immunocompromised patients, and is also used to prevent CMV disease in transplant recipients. Both drugs have specific dosages and administration protocols tailored to their respective indications.

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| **Acyclovir/acyclovir** | |
| Pharmacological class | Topical antiviral |
| Dosage form | Cream: 5% |
| Indications | For the treatment of herpes simplex virus infections of the skin |
| Dose and administration | Apply 5 times a day for 5–10 days, to be applied to lesions approximately every 4 hours, starting at first sign of attack |
| Contraindications | Hypersensitive to the drug or valaciclovir or propylene glycol |
| Drug interactions | There are no significant drug interactions. |
| Side effects | Itching, transient burning or stinging. |
| Cautions | Contact with eyes and mucous membranes (inside the mouth, or vagina). |
| Storage condition | Store below 30 °C. Protect from heat, moisture and light. |
| **Ganciclovir** | |
| Pharmacological class | Other antivirals |
| Dosage form | Injection: 500 mg vial for reconstitution.  Oral Capsules: 250 mg and 500 mg capsules.  Ophthalmic Gel: 0.15% ophthalmic gel. |
| **Indications** | Treatment of cytomegalovirus infections in immunocompromised individuals |
| Dose and administration | **HSV Infections**, IV:  **Adult:** 5 mg/kg IV every 12 hours for 7-14 days, depending on the severity and response to treatment.  **CMV Retinitis**, IV:  Adult: 5 mg/kg IV BID, infused over 1 hr for 14-21 days  **CMV Prevention in Transplant Recipients**, IV:  **Adult:** Induction: 5 mg/kg IV every day infused over 1 hr for 7-14 days; Maintenance: 5 mg/kg IV qDay for 100-120 days after transplant  **CMV Prevention in HIV Infected**, oral:  **Adult:** 1000 mg TID |
| Contraindications | Hypersensitivity to ganciclovir |
| Drug interactions | Zidovudine, probenecid, antineoplastic agents, co-trimoxazole |
| Side effects | Myelosuppression, neutropenia, thrombocytopenia, CNS effects, fever, skin rash, GI disturbances, liver function abnormalities, phlebitis. |
| Cautions | Thrombocytopenia, impaired renal function |
| Storage condition | Store below 30 oC |

## Antifungals

Topical antifungals are medications applied directly to the skin or nails to treat localized fungal infections, such as athlete’s foot, ringworm, and candidiasis. They are effective against various dermatophytes and yeast infections. Common formulations include creams, ointments, and powders, which are generally applied once or twice daily for 1-2 weeks after symptoms resolve to prevent recurrence. Common agents include miconazole, clotrimazole, terbinafine, and ketoconazole. These medications typically have minimal side effects and are preferred for mild to moderate infections. Severe or widespread infections may require systemic treatment.

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| **Benzoic acid + Salicylic acid** | |
| Pharmacological class | Local antifungal and keratolytics |
| Dosage form | Ointment: 6% + 3% |
| **Indications** | Fungal infections of the skin (mild dermatophyte infections, particularly *Tinea pedi*s and *Tinea corporis*). |
| Dose and Administration | **Adult:** Apply topically to the affected area twice daily or as per the direction of the physician. No more than 3 fingertip units should be applied at any one time unless directed to do so by a doctor. One fingertip unit should be enough to cover twice the area of an adult hand.  **Child**: Apply no more than two fingertip unit to the affected area twice a day. Do not exceed this dose unless directed to do so by your doctor.  *Note: it should not be applied to broken or inflamed skin.* |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | There is no known significant interaction |
| Side effects | Skin irritation, dryness may occur and mild inflammatory reaction. |
| Cautions | Broken or inflamed skin, increase sensitivity to sunlight, worsen irritation in pre-existing skin conditions, such as eczema or psoriasis, |
| Storage condition | Store below 30 oC. |
| **Clotrimazole** | |
| Pharmacological class | Topical antifungal |
| Dosage form | Cream: 1%  Ointment: 1%  Tablet (vaginal): 100mg, 500mg |
| Indications | Vulvovaginal candidiasis, susceptible fungal infections and cutaneous candidiasis (moniliasis) caused by *Candida albicans, Tinea corporis*, *Tinea cruris*, *Tinea pedis, Tinea versicolor* (pityriasis versicolor, ‘sun fungus’), *Tinea barbae*, *Tinea capitis* |
| Dose and administration | **Vulvovaginal candidiasis,** intravaginal: Insert 5 g cream (approximately one applicatorful) into the vagina once daily at bedtime for 3 days. For more severe cases, it can be used for 7 days.  **Fungal skin infections**, **to the skin**:  **Adult**: Apply 2–3 times a day  **Child:** Apply 2–3 times a day  **CutaneousCandidiasis:** Apply thinely and evenly to the affected area 2-3 daily for at least 2 weeks.  **Dermatophytes infections**: Apply thinely and evenly to the affected area 2-3 daily for at least 4 weeks. |
| Contraindications | Hypersensitivity to the drug or otherazole antifungals. |
| Drug interactions | Latex contraceptive, progesterone, sirolimus, and tacrolimus. |
| Side effects | Hypersensitivity (skin rash, hives, blistering, burning, itching peeling, redness, stinging, swelling and other sign of skin irritation does not present before therapy). |
| Cautions | Contact with eyes and mucous membranes. |
| Storage condition | Store below 30 °C. Protect from freezing. |
| **Ketoconazole** | |
| Pharmacological class | Topical antifungal |
| Dosage form | Cream: 2%  Shampoo: 2% |
| Indications | Dermatophyte infections of the skin such as *Tinea corporis*, *Tinea cruris*, *Tinea manus* and *Tinea pedis* infections, cutaneous candidosis (including vulvitis), *Tinea* (pityriasis) *versicolo*r Pityriasis capitis (dandruff) and seborrhoeic dermatitis |
| Dose and administration | **Tinea pedis, to the skin** using cream:  **Adult:** Apply twice daily  **Fungal skin infection (not Tinea pedis)**, **to the skin** using cream: **Adult**: Apply 1–2 times a day  **Treatment of seborrhoeic dermatitis and dandruff**, **to the skin** using shampoo:  **Adult**: Apply twice weekly for 2–4 weeks, leave preparation on for 3–5 minutes before rinsing.  **Prophylaxis of seborrhoeic dermatitis and dandruff, to the skin** using shampoo:  **Adult**: Apply every 1–2 weeks, leave preparation on for 3–5 minutes before rinsing.  **Treatment of pityriasis versicolor**, **to the skin** using shampoo: **Adult**: Apply once daily for maximum 5 days, leave preparation on for 3–5 minutes before rinsing.  **Prophylaxis of pityriasis versicolor**, **to the skin** using shampoo:  **Adult**: Apply once daily for up to 3 days before sun exposure, leave preparation on for 3–5 minutes before rinsing.  **Cutaneous candidiasis**, 2% cream:  **Adult**: Apply to the affected area for 2-3 weeks.  **Treatment of seborrhoeic dermatitis and dandruff**, **to the skin** using shampoo:  **Child 12–17 years**: Apply twice weekly for 2–4 weeks, leave preparation on for 3–5 minutes before rinsing.  **Prophylaxis of seborrhoeic dermatitis and dandruff, to the skin** using shampoo:  **Child 12–17 years**: Apply every 1–2 weeks, leave preparation on for 3–5 minutes before rinsing.  **Treatment of pityriasis versicolor**, **to the skin** using shampoo: **Child 12–17 years**: Apply once daily for maximum 5 days, leave preparation on for 3–5 minutes before rinsing.  **Prophylaxis of pityriasis versicolor**, **to the skin** using shampoo:  **Child 12–17 years**: Apply once daily for up to 3 days before sun exposure, leave preparation on for 3–5 minutes before rinsing |
| Contraindications | Hypersensitivity to the drug, acute porphyrias |
| Drug interactions | Ethanol |
| Side effects | For cream and shampoo: itching, stinging, or irritation  For cream: contact dermatitis. |
| Cautions | Pregnancy and lactation, contact with eyes and mucus membrane. |
| Storage condition | Store below 30 oC. |
| **Miconazole** | |
| Pharmacological class | Topical antifungal |
| Dosage form | Cream: 2%  Ointment: 2% |
| **Indications** | Fungal skin and nail infections, vulvovaginal candidiasis. |
| Dose and administration | **Fungal skin infections**, **to the skin**:  **Adult:** Apply twice daily continuing for 10 days after lesions have healed.  **Fungal nail infections**, **to the skin**: Apply 1–2 times a day  **Vulvovaginal candidiasis**, to the vagina:  **Adult:** Insert 1 applicatorfulcream (~ 5g) once daily at bedtime for 7 days.  **Fungal skin infections**, **to the skin**:  **Child**: Apply twice daily continuing for 10 days after lesions have healed  **Fungal nail infections**, **to the skin**:  **Child**: Apply 1–2 times a day  **Vulvovaginal candidiasis**, to the vagina:  **Child**: Insert 1 applicatorful cream (~ 100 mg) once daily at bedtime for 7 days. |
| Contraindications | Hypersensitivity to the drug, children less than 2 years. |
| Drug interactions | Warfarin, progesterone |
| Side effects | Occasional local irritation and burning, contact dermatitis |
| Cautions | Acute porphyrias, contact with eyes and mucous membranes, pregnancy, breastfeeding |
| Storage condition | Store below 30 °C. Protect from heat, moisture, and light. |
| **Terbinafinehydrochloride** | |
| Pharmacological class | Antifungal |
| Dosage form | Tablet: 250mg  Cream: 1%  Ointment 1% |
| Indications | Dermatophyte infections of the nails, ringworm infections including *Tinea pedis, cruris*, and *corporis* |
| Dose and administration | ***Tinea pedis*, topical:**  **Adult:** Apply to affected area twice daily until significant clinical improvement (no more than 4 weeks).  *Tinea corporis*& cruris: Apply once a day for 1 week (no more than 4 weeks).  ***Tinea pedis***, **to the skin**:  **Adult:** Apply 1–2 times a day for up to 1 week, to be applied thinly  Oral: 250 mg once daily for 2-6 weeks  ***Tinea corporis***, **to the skin**:  **Adult:** Apply 1–2 times a day for up to 1–2 weeks, to be applied thinly, review treatment after 2 weeks  Oral: 250 mg once daily for 4 weeks  ***Tinea cruris***, **to the skin**:  **Adult:** Apply 1–2 times a day for up to 1–2 weeks, to be applied thinly, review treatment after 2 weeks  Oral: 250 mg once daily for 2-4 weeks  **Dermatophyte infections of the nails**, **to the skin**:  **Adult:**250 mg once daily for 6 weeks-3 months (occasionally longer in toenail infections)  **Cutaneous candidiasis, pityriasis versicolor**, **to the skin**:  **Adult:** Apply 1–2 times a day for 2 weeks, to be applied thinly, review treatment after 2 weeks  **Tinea capitis, for child over 1 year, body weight 10–20 kg**: 62.5 mg once daily, body weight 20–40 kg: 125 mg once daily, body-weight over 40 kg: 250 mg once daily usually for 4 weeks |
| Contraindications | Hypersesitivity to the drug, severe hepatic or renal impairment |
| Drug interactions | There are no significant drug interactions |
| Side effects | Burning, contact dermatitis, dryness, exfoliation, irritation, pruritus, rash, stinging. |
| Cautions | Patients with psoriasis systemic lupus erythematosus (SLE), contact with eyes and mucous membranes, pregnancy, breastfeeding. |
| Storage condition | Store below 30 °C. |

## Scabicides and pediculicides

**Scabicides**and**pediculicides** are topical agents used to treat infestations caused by ectoparasites. Scabicides are specifically designed to eliminate scabies, a skin condition caused by the Sarcoptes scabiei mite. Common examples include sulfur and benzyl benzoate, which are applied to the affected areas and typically left on for a specified duration to kill both the mites and their eggs. On the other hand, pediculicides are used to treat lice infestations, including head lice (*Pediculus humanus capitis*) and body lice (*Pediculus humanus corporis*). Common pediculicides, such as pyrethrins, are applied to the hair and scalp or the body, depending on the type of lice being treated, and work by suffocating the lice or disrupting their nervous systems.

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| **Benzyl Benzoate** |  |
| Pharmacological class | Acaricide, ectoparasiticide |
| Dosage form | Lotion: 25% |
| Indications | Scabies; head, body and pubic lice. |
| Dose and Administration | **Scabies**:  **Adult:** Apply over the whole body; repeat without bathing on the following day and wash off 24 hours later; a third application may be required in some cases.  **Pediculosis (lice):**  **Adult:** Apply to affected area; may be repeated in minutes and wash off 24 hours later; further applications possibly needed after 7 and 14 days.  **Child**: Dilute with an equal amount of water (12.5%), and 1 part with 3 parts of water for infants (6%). Apply over whole body with a brush (except for face and head); repeat without bathing on the following day and wash off 24 hours later. A third application may be needed in some cases. |
| Contraindications | Hypersensitity to the drug. |
| Drug interactions | There are no known significant interactions |
| Side effects | Slight local irritation, transient burning sensation, occasionally rashes. Frequent use causes contact dermatitis |
| Cautions | Contact with face, eyes, mucous membranes, breastfeeding, pregnancy, childrenless than 6 months |
| Storage condition | Store below 30 °C. Prtect from light and heat. |
| **Permethrin** | |
| Pharmacological class | Scabicide, pediculicide. |
| Dosage form | Cream: 5% w/w  Lotion: 1% |
| Indications | Scabies, head and crab lice |
| Dose and administration | **Scabies**:  **Adult:** Apply once weekly for 2 doses, apply 5% preparation over whole body including face, neck, scalp, and ears. Then wash off after 8–12 hours. If hands arewashed with soap within 8 hours of application, theyshould be treated again with cream  **Crab lice, to the skin:**  **Adult:** Apply once weekly for 2 doses, apply 5% cream over whole body, allow to dry naturally and wash off after 12 hours or after leaving on overnight.  **Head lice**, **to the skin**:  **Adult:** Apply to washed hair, leave on 10 minutes, rinse and comb out nits and eggs; may repeat in 7 days if lice or nits still present.  **Paediatric:**  **Scabies:**  **Child:** Apply once weekly for 2 doses, apply 5% preparation over whole body including face, neck, scalp and ears then wash off after 8–12 hours. If hands are washed with soap within 8 hours of application, they should be treated again with cream  *Note: do not use on inflamed or broken skin*. |
| Contraindications | Hypersensitivity to the drug or other pyrethroids or pyrethrins, infant <2 months. |
| Drug interactions | Corticosteroids |
| Side effects | Swelling, erythema, pruritus, rash, stinging of skin, burning sensation |
| Cautions | Contact with eyes, children aged 2 months–2 years, pregnancy, breastfeeding. |
| Storage condition | Store below 30 °C. Protect from freezing. |
| **Sulfur** | |
| Pharmacological class | Scabicide |
| Dosage form | Ointment: 10% |
| Indications | Treatment of scabies, seborrheic dermatitis, and acne vulgaris, other chronic skin conditions like psoriasis, ringworm and lupus erythematous. |
| Dose and administration | **Adults, children over 12 years and the elderly:**  **Mild dandruff:** used intermittently as an adjunctive treatment to be applied approximately once a week.  **Psoriasis, eczema, seborrhoeic dermatitis and severe dandruff:** Applydaily for three to seven days until improvement has been achieved. In all cases, the affected area should be treated and shampooed off using warm water approximately one hour later.  *Note: do not use on inflammed or broken skin.* |
| Contraindications | Hypersensitivity to the drug or sulphonamides. |
| Drug interactions | Medicated soaps, benzoyl peroxide, resorcinol, salicylic acid, tretinoin, astringents, perfumed toiletries, shaving creams or lotions, cosmetics, isotretinoin, medicated, topical mercury compounds. |
| Side effects | Skin irritation, redness and peeling, bronchospasm |
| Cautions | Contact with mouth, mucus membranes and eyes, pregnancy, breastfeeding. |
| Storage condition | Store below 30ºC. Protect from light. |

## Anti-inflammatories

**Topical corticosteroids** are effective in suppressing inflammatory skin diseases like eczema, dermatitis, psoriasis, and seborrheic dermatitis. The most commonly used topical corticosteroids are b**etamethasone valerate, hydrocortisone acetat, eclobetasol propionate, mometasone, triamcinolone, acetonide, and methyl salicylate**. Prolonged use of these drugs may cause side effects such as skin atrophy, hypopigmentation, and systemic absorption. They should not also be used with occlusive dressings over large areas or for conditions like rosacea.

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| **Betamethasome valerate** | |
| Pharmacological class | Corticosteroid (topical) |
| Dosage form | Cream: 0.1%  Ointment: 0.1% |
| Indications | Inflammatory skin disorders such as seborrheic or atopic dermatitis, eczemas, neurodermatitis, anogenital pruritus, psoriasis, inflammatory phase of xerosis. |
| Dose and Administration | **Severe inflammatory skin disorders such as eczemas unresponsive to less potent corticosteroids, psoriasis**, **to the skin**:  **Adult:** Apply 1–2 times a day, to be applied thinly or as directed by physician.  **Inflammatory skin disorders [unresponsive to less potent corticosteroids, to the skin**:  **Adult:** Apply every 24 hours for up to 30 days, wait at least 30 minutes between applications.  **Severe inflammatory skin disorders such as eczemas unresponsive to less potent corticosteroids, psoriasis**, **to the skin**: **Child**: Apply 1–2 times a day, to be applied thinly |
| Contraindications | Established skin infections (viral, bacterial including cutaneous tuberculosis, acute dermatomycosis) broken skin, rosacea, acne, perioral dermatitis, plaque psoriasishypersensetivity |
| Drug interactions | Salycilic acid. |
| Side effects | Folliculitis, steroid rosacea, perioral dermatitis, skin atrophy, delayed wound healing, dilatation of superficial blood vessels, formation of striae, purpura, depigmentation, telangiectasia, acneiform eruptions at site of application, allergic contact dermatitis. |
| Cautions | Prolonged use in children, use on weeping lesions. Risk of adrenal suppression. |
| Storage condition | Store below 30 oC. |
| **Clobetasol propionate** | |
| Pharmacological class | Corticosteroid(topical) |
| Dosage form | Cream: 0.05% |
| Indications | Short term relief of inflammation of moderate to severe corticosteroid-responsive dermatoses (very high-potency topical corticosteroid) |
| Dose and administration | **Short-term treatment only of severe resistant inflammatory skin disorders**, **to the skin**:  **Adult:** Apply 1–2 times a day for up to 4 weeks, to be applied thinly, maximum 50g of 0.05% preparation per week.  **Child 1–17 years**: Apply 1–2 times a day for up to 4 weeks, to be applied thinly.  **Moderate scalp psoriasis**, **to the skin**:  **Adult**: Apply once daily maximum duration of treatment 4 weeks, to be applied thinly then rinsed off after 15 minutes; frequency of application should be reduced after clinical improvement. |
| Contraindications | Viral, fungal, or tubercular skin lesions, hHypersensitivity to any of the components, ophthalmic |
| Drug interactions | There are no known significant drug interactions |
| Side effects | Skin atrophy, telangiectasia, dry skin, pruritus, local skin burning and pain, hpopigmentation. |
| Cautions | Prolonged use in children, children less than 1 year, pregnancy. |
| Storage condition | Store below 30 oC. |
| **Hydrocortisone acetate** | |
| Pharmacological class | Corticosteroid (topical) |
| Dosage form | Cream: 1%  Ointment: 1% |
| Indications | Mild inflammatory skin disorders such as eczemas, contact dermatitis, lichen planus, intractable pruritus and phototoxic reactions, including polymorphic light eruptions and actinic prurigo, short-term treatment of psoriasis of the face and flexures. |
| Dose and administration | **Mild inflammatory skin disorders such as eczemas**, **to the skin**:  **Adult:** Apply 1–2 times a day, to be applied thinly  **Mild inflammatory skin disorders such as eczemas**, **to the skin**:  **Child**: Apply 1–2 times a day, to be applied thinly  **Nappy rash**, **to the skin**:  **Child**: Apply 1–2 times a day for no longer than 1 week, discontinued as soon as the inflammation subsides. |
| Contraindications | Untreated skin infections or broken skin, hypersensitivity, perioral dermatitis, ophthalmic use, diaper dermatitis. |
| Drug interactions | There are no known significant drug interactions. |
| Side effects | Folliculitis, steroid rosacea, perioral dermatitis, skin atrophy, delayed wound healing, dilatation of superficial blood vessels, formation of striae, purpura, depigmentation, telangiectasia, acneiform eruptions at site of application, allergic contact dermatitis. |
| Cautions | Prolonged use in children, use on weeping lesions, risk of *Kaposi sarcoma* |
| Storage condition | Store below 30 oC. Protect from freezing. |
| **Methyl salicylate** | |
| Pharmacological class | Non-steroidal anti-inflammatory drug(topical) |
| Dosage form | Ointment: 25% w/w |
| Indications | For temporary relief of minor aches and pains of muscles and joints, such as simple backache, lumbago, arthritis, neuralgia, strains, bruises, and sprains. |
| Dose and administration | **Adults and child 2 years and olde**r: Apply externally to the affected area up to 3 to 4 times a day.  **Childunder 2 years**: To be used as per prescribers’ advice.  *Note: do not apply to broken skin.* |
| Contraindications | Hypersensitive to the drug |
| Drug interactions | There are no known significant drug inetractions. |
| Side effects | Burning sensatition, itching, sweeling, rash |
| Cautions | Contact with eyes. |
| Storage condition | Store below 30 °C. |
| **Mometasone furoate** | |
| Pharmacological class | Corticosteroid(topical) |
| Dosage form | Cream: 0.1%  Ointment: 0.1% |
| Indications | Severe inflammatory skin disorders such as eczemas unresponsive to less potent corticosteroids, psoriasis. |
| Dose and administration | **Severe inflammatory skin disorders such as eczemas unresponsive to less potent corticosteroids, psoriasis**, **to the skin**:  **Adult**: Apply thinly once daily; to scalp, in case of lotion  **Severe inflammatory skin disorders, such as eczema, unresponsive to less potent corticosteroids and psoriasi**s, **to the skin**:  **Child below 2 years**: Not recommended for use due to insufficient data on safety  **Child 2–17 years:** Apply thinly once daily; to scalp in case of lotion |
| Contraindications | Hypersensitivity to the drug, primary infectious ulcers, acne vulgaris, facial rosasea, skin atrophy, perioral dermatitis, perianal and genital dermatitis, napkin erruptions, viral skin infections, impetigo, fungal skin infections. |
| Drug interactions | Salicylic acid, azole antifungals (itraconazole, ketoconazole, voriconazole), cobicistat, protease inhibitors, macrolides (clarithromycin), mifepristone. |
| Side effects | Burning, tingling, pruritis, when applied over large areas, over abraded or in occlusive dressing can lead to systemic absorption with adrenal suppression. |
| Cautions | Children (prolonged use> 3 months), elderly, contact with eyes, pregnancy, breastfeeding. |
| Storage condition | Store below 30 °C. |
| **Propranolol** | |
| Pharmacological class | Non-selective beta blockers |
| Dosage form | Tablet: 5mg, 10mg |
| **Indications** | Infantile hemangiomas |
| Dose and administration | **Child under 2 years of age:** Initiate treatment at aged 5 weeks to 5 months. Initially 0.6mg/kgtwicedaily for 1 week, then increase dose to 1.1mg/kg twice daily; after 2 or more weeks, increase to maintenance dose of 1.7 mg/kg twice daily.  C**hild 2 years of age or over:** can start at 2mg/kg/day divided into 8 hourly doses directly. Propranolol for young children is given as a liquid. The liquid is usually given as a 5mg/5ml strength.  **Note**: In infants, the product may be diluted in small quantity of milk or fruit juice and given in baby bottle. |
| Contraindications | Refer to propranolol under medicines for upper GI bleeding. |
| Drug interactions | Refer to propranolol under medicines for upper GI bleeding. |
| Side effects | Refer to propranolol under medicines for upper GI bleeding. |
| Cautions | Refer to propranolol under medicines for upper GI bleeding. |
| Storage condition | Store below 30 oC. |
| **Tacrolimus** | |
| Pharmacological class | Immunosuppressant |
| Dosage form | Ointment: 0.1% |
| Indications | Short-term treatment of moderate to severe atopic eczema (including flares) in patients unresponsive to, or intolerant of conventional therapy, prevention of flares in patients with moderate to severe atopic eczema and 4 or more flares a year who have responded to initial treatment with topical tacrolimus, short-term treatment of facial, flexural, or genital psoriasis in patients unresponsive to, or intolerant of other topical therapy |
| Dose and administration | **Short-term treatment of moderate to severe atopic eczema (including flares) in patients unresponsive to, or intolerant of conventional therapy (initiated by a specialist)**, **to the skin**:  **Adult:** Apply twice daily until lesion clears (consider other treatment if eczema worsens or no improvement after 2 weeks), initially 0.1% ointment to be applied thinly, reduce frequency to once daily or strength of ointment to 0.03% if condition allows  **Prevention of flares in patients with moderate to severe atopic eczema and 4 or more flares a year who have responded to initial treatment with topical tacrolimus (initiated by a specialist)**, **to the skin**:  **Adult:** Apply twice weekly, 0.1% ointment to be applied thinly, with an interval of 2–3 days between applications, use short-term treatment regimen during an acute flare: review need for preventative therapy after 1 year.  S**hort-term treatment of facial, flexural, or genital psoriasis in patients unresponsive to, or intolerant of other topical therapy (initiated under specialist supervision**), **to the skin**:  **Adult:** Apply twice daily until symptoms resolve, 0.1% ointment to be applied thinly, reduce to once daily or switch to 0.03% ointment if condition allows maximum duration of treatment 4 weeks |
| Contraindications | Hypersensitivity to the drug, children below 2 years. |
| Drug interactions | Metotrexate, corticosteroids, ketoconazole, fluconazole, itraconazole, voriconazole, erythromycin, protease inhibitors (e.g. ritonavir, nelfinavir, saquinavir), ritonavir, nilotinib and imatinib. |
| Side effects | Burning sensation, pruritus, flu-like symptoms, skin erythema, headache, seizures, bullous impetigo, osteomyelitis, septicemia, lymphomas, basal cell carcinoma, squamous cell carcinoma, malignant melanoma, acute renal failure, alcohol intolerance. |
| Cautions | Contact with eyes, mucous membranes, excessive exposure to sunlight and sunlamps (UV light). |
| Storage condition | Store below 30 oC. Protect from light and moisture. |
| **Triamcinolone acetonide** | |
| Pharmacological class | Corticosteroid (topical) |
| Dosage form | Cream: 0.1% w/w  Paste: 0.1% w/w |
| Indications | Inflammatory and pruritic manifestations of corticosteroid-responsive dermatoses |
| Dose and administration | **Cream**: Apply a thin layer to the affected area 2-3 times daily, or as directed by a healthcare provider.  **Paste**: Apply a thin layer to the affected area, typically used in the oral cavity or on mucous membranes, 2-3 times daily or as directed by a healthcare provider. |
| Contraindications | Hypersensitivity to the drug, untreatedviral, fungal, or bacterial skin infections |
| Drug interactions | Azole antifungals, protease inhibitors, macrolides. |
| Side effects | Skin atrophy, striae, acneform lesions, pigmentation changes, HPA suppression with higher potency used more than 2 weeks). |
| Cautions | Contact with eyes and mucous membranes, prolonged use |
| Storage condition | Store below 30°C. Protect from moisture |

## Keratolytic/Caustics and Anti-acne medicines

Keratolytic and antiacne medicines are essential for managing dermatological conditions like acne and hyperkeratotic disorders. Benzoyl peroxide, salicylic acid, urea, retinoic acid, clindamycin, azelaic acid, coal tar, aydroquinone, trichloroacetic acid, and podophyllum resin with imiquimod are among the key treatments. They work by reducing inflammation, controlling bacterial growth, and promoting skin cell turnover. These medications offer significant therapeutic benefits, but careful consideration of indications, dosing, and potential side effects is crucial for safe and effective use.

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| **Azelaic acid** | |
| Pharmacological class | Keratolytic |
| Dosage form | Cream: 20 %w/w |
| **Indications** | Topical treatment of mild to moderate inflammatory acne vulgaris and rosacea. |
| Dose and Administration | **Acne vulgaris**, **to the skin:**  **Adult:** Apply twice daily  **Papulopustular rosacea**, **to the skin**:  **Adult:** Apply twice daily, discontinue if no improvement after 2 months  **Acne vulgaris**, **to the skin:**  **Child 12–17 year**s: Apply twice daily.  *Note: cleanse the affected area with mild soap/soapless cleansing machine and pat dry before applying, then massage a thin layer.* |
| Contraindications | Hypersensitivity to the drug or propylene glycol. |
| Drug interactions | There are no known significant drug interactions |
| Side effects | Local skin irritation (redness, itching, scaling, burning), photosensitivity reactions, asthma exacerbations. |
| Cautions | Contact with the eyes, mouth and mucus membrane, risk of systemic side effects |
| Storage condition | Store below 30 oC. |
| **Benzoyl peroxide** | |
| Pharmacological class | Antibacterial agent, antiacne |
| Dosage form | Gel: 2.5%, 5%, 10%  Solution: 2.5%, 5%, 10% |
| **Indications** | Mild to moderate acne and as an adjunct to oral therapy in more severe cases, rosacea. |
| Dose and administration | **Acne:**  **Adult:** Apply on affected area(s) of skin 1-2 times a day, preferably after washing with soap and water.  **Pediatric: Child**, topical: Initially apply to clean skin on alternate days, increasing frequency to one to two times daily as tolerance to irritant effect develops.  **Child 12 years of age and ove**r: Dosage similar to adults  **Adult:**  **Rosacea**: Apply pea sized amount of cream every day in thin layer to each area of the face on clean and dry skin. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | There are no known significant drug interactions. |
| Side effects | Skin irritation, contact dermatitis, erythema, peeling, dryness. |
| Cautions | Contact with eyes, oral, and mucous membranes, use of occlusive dressings and excessive exposure to sunlight, contact with hair and dayed fabrics (pillow, towel) |
| Storage condition | Store below 30 oC. |
| **Clindamycin** | |
| Pharmacological class | Topical antibiotic, antiacne |
| Dosage form | Lotion: 1%w/w  Gel: 1%w/w |
| Indications | Local treatment for acne (acne vulgaris) |
| Dose and administration | **Adults and child 12 years of age and over:** Apply a thin layer of gel on clean dry skin in places of rashes once a day, at night. During the first week of treatment, acne may be exacerbated by the effects of the active substance on the lesions, which were invisible before. In this case, treatment should not be discontinued, the therapeutic effect is observed 8-12 weeks after starting the treatment |
| Contraindications | Hypersensitivity to the drug or lincomycin, inflammatory acne, enteritis, ulcerative colitis, colitis associated with antibiotics (in history), crohn's disease. |
| Drug interactions | Sulfur, resorcinol, salicylic acid, neuromuscular blockers (succinyl choline, atracurium, and pancurium), lincomycin and erythromycin |
| Side effects | Dryness, oiliness, erythema, peeling, burning sensation, headache. |
| Cautions | Contact with broken skin, eyes, oral and mucous membranes, excessive exposure to sunlight, atopic individual |
| Storage condition | Store below 30°C. |
| **Coal tar** | |
| Pharmacological class | Antipsoriatics |
| Dosage form | Ointment: 5%w/w |
| Indications | For the topical treatment of sub-acute and chronic psoriasis, including psoriasis of the scalp and flexures, seborrheic dermatitis. |
| Dose and administration | Apply to the affected area 1-3 times daily, preferably start with lower strength preparations or add 100ml bath taped water and soak the affected area for 10-20 minutes once daily to once every 3 day for at least 10 baths, wash hands after use. |
| Contraindications | Hypersensitivity to the drug, acute sore or pustular psoriasis or in the presence of infection |
| Drug interactions | There are no known significant drug interactions. |
| Side effects | Skin irritation, folliculitis, desquamation, photosensitivity, hair and fabric discoloration |
| Cautions | *Note: as the drug is combustible, patients should be warned to avoid contact with any naked flames or avoid smoking.* |
| Storage condition | Store below 30 oC. |
| **Hydroquinone** | |
| Pharmacological class | Depigmentating agent. |
| Dosage form | Topical solution: 2%, 4%  Cream: 4% |
| Indications | Melanin hyperpigmentation conditions (melisma, cholasma, freckyles), post-inflammatory hyperpigmentation |
| Dose and administration | **Depigmentation or skin lightening**: A thin layer is applied with fingertips and rubbed into the face (or other affected areas) 1 to 2 times a day for 3 to 6 months. If there are no results after 2 to 3 months, hydroquinone should be discontinued. |
| Contraindications | Hypersensitivity to the drug, sun burn, use depilatory agent. |
| Drug interactions | There are no known significant drug interactions |
| Side effects | Dermatitis, dryness, erythema, stinging, inflammatory reaction, sensitization, irritation. |
| Cautions | Pregnancy, photosensitivity |
| Storage condition | Store below 30oC. |
| **Imiquimod** | |
| Pharmacological class | Immunomodulator |
| Dosage form | Cream, 5% |
| **Indications** | Certain types of actinic keratoses (flat, scaly growths on the skin caused by too much sun exposure) on the face or scalp, superficial basal cell carcinoma on the trunk, neck, arms, legs, or feet and warts on the skin of the genital and anal areas, genital and anal warts |
| Dose and administration | **Actinic keratoses:** Apply it once a day for 2 days a week, 3 to 4 days apart  **Superficial basal cell carcinoma:** Apply once a day for 5 days a week.  **Genital and anal warts**: Apply once a day for 3 days a week.  Apply 3 times per week until total clearance of wart or for a maximum of 16 weeks. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Tacrolimus |
| Side effects | Redness, itching, burning, or bleeding of the treated area, flaking, scaling, dryness, or thickening of the skin; swelling, stinging, blisters, scabs, or bumps on the skin, headache, diarrhea, tiredness |
| Cautions | Autoimmune conditions, excessive sunlight exposure, contact with eyes or mucous membrane, children 2-12 years with molluscum. |
| Storage condition | Store below 30 oC. |
| **Isotretinoin** | |
| Pharmacological class | Anti-acne |
| Dosage form | Capsule: 10mg, 20mg |
| Indications | Severe acne including nodular or conglobate acne or acne at risk of permanent scarring resistant to adequate courses of standard therapy with systemic antibacterials and topical therapy (under expert supervision) |
| Dose and administration | **Adult:** Initially, 500 mcg/kg daily in 1–2 divided doses, increased if necessary to 1 mg/kg daily and continued until a total cumulative dose of 120–150 mg/kg is reached—treatment may be  discontinued sooner if there has been an adequate response and no new lesions for 4–8 weeks, treatment course may be repeated after a period of at least 8 weeks if relapse after first course, consider dose reduction to less than 500 mcg/kg daily forpatients at increased risk of or experiencing side effects; maximum 150 mg/kg per course. |
| Contraindications | Hypersensitivity to the drug, pregnancy, hypervitaminosis A, hepatic and renal insufficiency, hyperlipidemia, use of tetracyclines (doxycycline, minocycline). |
| Drug interactions | Tetracyclines, acitretin, tretinoin, vitamin A |
| Side effects | Anaemia, arthralgia, back pain, cheilitis, dry eye, eye discomfort, eye inflammation, hemorrhage, headache, increased risk of infection, myalgia, nasal dryness, neutropenia, proteinuria, skin fragility, skin reactions, thrombocytopenia, thrombocytosis. |
| Cautions | Diabetes mellitus, dry eye syndrome, history of depression, neutropenia, agranulocytosis, risk of suicidal attempts.  *Note: avoid blood donation during treatment and for at least 1 month after treatment.* |
| Storage condition | Store below 30 oC. |
| **Podophyllum resin** | |
| Pharmacological class | Keratolytics |
| Dosage form | Solution: 10% to 25 %. |
| Indications | Management of warts (external anogenital and plantar) and keratosis |
| Dose and administration | **Adult:** Apply carefully to warts, avoiding contact with normal tissue; use 1 drop at a time allowing drying between drops until area is covered; total volume should be limited to <0.5 ml per treatment session; rinse off after 1–6 hours; may be repeated at weekly intervals but no more than 4 times in all; only a few warts should be treated at any one time  **Child:** Not recommended in children under 12 years of age. |
| Contraindications | Pregnancy, breastfeeding, children, diabtes mellitus, ethanol use. |
| Drug interactions | There are no known significant drug interactions. |
| Side effects | Balanoposthitis, skin irritation, paraphemosis, skin necrosis. |
| Cautions | Use on large areas, very irritant to eyes (keep away from face), contact with normal skin, mucus membranes, and open wounds |
| Storage condition | Store below 30 oC. |
| **Salicylic acid** | |
| Pharmacological class | Salicylates, keratolytic |
| Dosage form | Ointment: 2%, 5%, 10% |
| Indications | Hyperkeratotic conditions, including common wart, excluding on the face; adjunct in treatment of psoriasis, fungal infections, seborrheic dermatitis, ichthyosis, acne vulgaris, insect bites, burns, and complications associated with pyoderma |
| Dose and administration | **Adult:** Apply directly to the affected area once daily, starting with lower strength preparations; gradually increase strength until a satisfactory response is obtained.  **Child under 2 years**: Safety and efficacy not established  **Child over 2 years**: Apply once daily, starting with lower strength preparations, gradually increase strength until satisfactory response obtained  *Note: Hydrate skin prior to application by soaking with warm water for 5 minutes, then dry it.* |
| Contraindications | Hypersensitivity to the drug or polyethylene glycols, applications broken or inflamed skin, children under 2 years. |
| Drug interactions | There are no known significant drug interactions |
| Side effects | Stinging, local irritation, salicylism |
| Cautions | Peripheral neuropathy, contact with eyes, oral, and mucous membranes, occlusive dressings, oral asprin use, prolonged use over large area, children with varicella. |
| Storage condition | Store below 30 oC. |
| **Retinoic acid** | |
| Pharmacological class | Antiacne |
| Dosage form | Cream: 0.025%w/w  Gel: 0.01%  Lotion: 0.025%  Ointment: 0.05% |
| Indications | Treatment of acne vulgaris with comedones, papules or pustules. |
| Dose and administration | **Adult**: Applydirectly to the affected area twice daily, preferably to damp skin.  **Children under 12 years**: Not recommended. Safety not established  **Children above 12 years**: Applydirectly to the affected area twice daily, preferably to damp skin. |
| Contraindications | Pregnancy, women planning a pregnancy, breastfeeding, patients with a history of hypersensitivity to the active substance or excipient in the product, patients with personal or familial history of skin cancer, patients with pustular and deep cystic nodular acne varieties (acne conglobate and acne fulminans). |
| Drug interactions | Topical application of Sulphur, benzoyl peroxide, salicyclic acid, resorcinol, photosensitizing medications (thiazides, tetracyclines, fluoroquinolones, phenothiazines, sulfonamides). |
| Side effects | Peeling, dry skin, burning and stinging, erythema, pruritus, sunburns, increased photosensitivity. |
| Cautions | Avoid contact with oral, eyes, mucous membranes and broken or eczematous skin. Avoid frequent application and application at the same time with other topical preparations including cosmetics. |
| Storage condition | Store below 30 OC. Keep away from heat and flame. |
| **Trichloroacetic acid** | |
| Pharmacological class | Keratolytics |
| Dosage form | Topical liquid: 80% solution |
| Indications | Condyloma (a wartlike growth of skin usually seen on external genitalia or near the anus). |
| Dose and administration | Apply to condyloma. Cover with suitable dressing for 5-6 days. Reapply as needed.  *Note: protect the unaffectskin area with petrolatum*. |
| Contraindications | Hypersensitivity to the drug, malignant or premalignant lesions |
| Drug interactions | There are no known significant drug interactions. |
| Side effects | Mild to moderate skin irritation, burning, pain, swelling and tenderness, skin ulcerations. |
| Cautions | May cause severe burning, inflammation, or tenderness |
| Storage condition | Store below 30 oC. |
| **Urea** | |
| Pharmacological class | Hydrating agent, keratolytics |
| Dosage form | Cream: 10% w/w  Ointment: 10%w/w |
| Indications | Hyperkeratotic skin conditions (xerosis, ecteosis, skin crack, fishure, dermatitis, eczema, psoriasis, callus, or keratosis). |
| Dose and administration | **Adult and Child:** apply directly to the affected area twice daily, preferably to damp skin.  *Note: apply into the skin and rub until completely absorbed*. |
| Contraindications | Hypersensitivity to the drug, renal insufficiency. |
| Drug interactions | Corticosteroids, dithranol, fluorouracil. |
| Side effects | Transient stinging and local irritation, rash. |
| Cautions | Application to face or broken skin and contact with eyes. |
| Storage condition | Store below 30ºC. Protect from moisture. |

## Medicines used for psoriasis and eczema

Psoriasis is a chronic inflammatory skin disease that often affects the scalp and extensor surfaces, with nail and joint involvement in some cases. Chronic plaque psoriasis is the most common type, marked by thickening and scaling of the skin. While there is no cure, treatments such as emollients, topical corticosteroids, vitamin D analogues, UV light therapy, immunosuppressants (e.g., methotrexate), and biologics can control symptoms. Prolonged use of potent corticosteroids can cause skin thinning and instability, so breaks between treatments are advised. In eczema, a condition characterized by inflammation and itching, management includes emollients and topical corticosteroids based on severity. Tacrolimus may be used for moderate to severe atopic eczema as a second-line treatment. Antihistamines are generally avoided but can be used in cases of severe itching or urticaria.

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| **Acitretin** | |
| Pharmacological class | Retinoid and related drugs, antipsoriatics |
| Dosage form | Capsule: 10 mg |
| **Indications** | Severe psoriasis not responsive to conventional therapy; pustular psoriasis; severe extensive disorders of keratinization resistant to conventional treatments, such as congenital ichthyosis, darrier's disease and pityriasis rubra pilaris. |
| Dose and administration | **Severe extensive psoriasis resistant to other forms of therapy, palmoplantar pustular psoriasis, severe congenital ichthyosis,** oral:  **Adult:** Initially 25–30 mg daily for 2–4 weeks, then adjusted according to response to 25–50 mg daily, increased to up to 75 mg daily, dose only increased to 75mg daily for short periods in psoriasis  **Severe Darier’s disease (keratosis follicularis),** oral:  **Adult:** Initially 10 mg daily for 2–4 weeks, then adjusted according to response to 25–50 mg daily |
| Contraindications | Hypersensitivity to the drug or other retinoids, pregnancy, women of childbearing potential unless strict contraception is practised 4 weeks before, during and for 2 years after treatment, severely impaired liver or kidney function and in patient with chronic abnormally elevated blood lipid values, |
| Drug interactions | Oral contraceptives, ethanol vitamin A and other retinoids, phenytoin, methotrexate, tetracycline. |
| Side effects | Abdominal pain, arthralgia, brittle nails, diarrhoea, dry oral, eye inflammation, gastrointestinal disorder, haemorrhage, hair texture abnormal, headache, increased risk of infection, mucosalabnormalities, myalgia, nausea, oral disorders, peripheral oedema, skin reactions, thirst, vomiting, xerophthalmia |
| Cautions | Long-term use, diabetes mellitus, obesity, alcoholism, disturbances of lipid metabolism, excessive exposure to sunlight and unsupervised use of sunlamps, history of depression (risk of neuropsychiatric reactions)  *Note: do not donate blood during and for 3 years after stopping therapy (teratogenic risk)* |
| Storage condition | Store below 30 oC. |
| **Calcipotriol** | |
| Pharmacological class | Antipsoriatics |
| Dosage form | Cream: 0.005%  Ointment (scalp application): 0.005% |
| Indications | Plaque psoriasis and scalp psoriasis. |
| Dose and administration | **Adult:** Apply to the affected skin lesions twice daily. Maintenance therapy may be achieved with less frequent application. The weekly dose should not exceed 100 g.  **Child over 6 years**: Apply twice daily. 6-12 years maximum 50 g weekly, over 12 years maximum 75 g weekly. |
| Contraindications | Hypersensitivity to the drug, disorders of calcium metabolism. |
| Drug interactions | Topical preparations containing salicylic acid |
| Side effects | Skin irritation and allergic rashes, facial dermatitis with applications to the face, indiscriminate use of calcipotriol can cause hypercalcaemia. |
| Cautions | Exposure to sunlight and sunlamps, use on face, erythrodermic exfoliative psoriasis, generalized pustular psoriasis. |
| Storage condition | Store below 30 oC. |
| **Dithranol** | |
| Pharmacological class | Antipsoriatic, antracen derivatives. |
| Dosage form | Paste: 1%  Scalp application: 0.25%, 0.5% |
| **Indications** | Subacute and chronic psoriasis |
| Dose and administration | **Adult**: Start with lower strength preparation (0.1%); carefully apply directly to lesions only, leave in contact for 30 minutes, then wash off thoroughly; repeat application daily, gradually increasing strength to 2% and contact time to 60 minutes at weekly intervals; some 0.1–0.5% strength preparations are suitable for overnight use. |
| Contraindications | Hypersensitivity to the drug, use on face, acute eruptions, excessively inflamed areas, acute and pustular psoriasis. |
| Drug interactions | Propylene glycol-containing agents |
| Side effects | Skin irritation, fever, rigors, flu-like symptoms, lymphadenopathy, staining of skin, hair, nails or fabrics |
| Cautions | Contact with eyes and tender parts of the body, use on the face |
| Storage condition | Store below 30 oC. |
| **Ichthammol** | |
| Pharmacological class | Topical anti-inflammatory and antiseptic agent |
| Dosage form | Ointment: 10 % |
| Indications | For treatment of chronic lichenified eczema |
| Dose and administration | **Chronic lichenified eczema**, **to the skin**:  **Adult:** Apply 1–3 times a day  **Child 1–17 years**: Apply 1–3 times a day  *Note: sulfur-like odor of topical preparation may be bothersome to many patients* |
| Contraindications | No absolute contraindications |
| Drug interactions | There is no known significant drug interactions. |
| Side effects | Skin irritation |
| Cautions | Contact with the eyes |
| Storage condition | Store below 30 oC. |
| **Methotrexate** | |
| Pharmacological class | Antimetabolites, antipsoriatics |
| Dosage form | Tablet :2.5 mg, 5 mg |
| Indications | Severe and uncontrolled psoriasis which is not responsive to other therapy |
| Dose and administration | Oral:  **Adult:**2.5-5mg/dose every 12 hours for 3 doses given weekly or Oral, IM:  **Adult:** 10-25mg/dose given once weekly |
| Contraindications | Refer to methotrexate under antineoplastic and supportive medicines. |
| Drug interactions | Refer to methotrexate under antineoplastic and supportive medicines. |
| Side effects | Refer to methotrexate under antineoplastic and supportive medicines. |
| Cautions | Refer to methotrexate under antineoplastic and supportive medicines. |
| Storage condition | Store below 30oC.Protect from light. |
| **Sunscreen** | |
| Pharmacological class | Topical photoprotective agent. |
| Dosage form | WithSPF 30+ (UVA + UVB block) |
| Indications | Photoprotection. |
| Dose and administration | **Adult:** Apply liberally every two hours during exposure of the sun.  **Child 6 months and older**: Apply during exposure to the sun. |
| Contraindications | Use for acute or pustular psoriasis or on inflamed skin |
| Drug interactions | Photosensitization medications include certain antibiotics (e.g., tetracyclines), NSAIDs, diuretics, retinoids |
| Side effects | Acne, burning, itching, or stinging of the skin, redness or swelling of the skin, rash, pain in hairy areas, pus in the hair follicles and drying or tightening of the skin. |
| Cautions | Infants younger than 6 months |
| Storage condition | Store below 30 oC. |
| **Zinc oxide** | |
| Pharmacological class | Topical soothing and protective agent |
| Dosage form | Ointment: 15 %  Lotion: 15 % |
| Indications | Skin protective in various skin conditions such as nappy (diaper) rash, eczema |
| Dose and administration | Apply 3 times daily or as required  **Diaper rash**: change wet and soiled diapers promptly; allow to dry; apply ointment liberally with each diaper change.  *Note: do not apply over deep puncture wounds, infections or lacerations.* |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | Benzylpenicillin. |
| Side effects | Skin sensitivity, irritation |
| Cautions | Contact with eyes |
| Storage condition | Store between 15 to 30 oC. |

## Antipruritics

Antipruritics, often referred to as anti-itch medications, are a class of drugs used to alleviate pruritus, a common symptom associated with various skin conditions and allergic reactions. Antipruritics work by blocking the signals in the nerves that transmit the sensation of itching to the brain or by counteracting the underlying cause of the itch. They come in various forms, including topical creams, lotions, ointments, and oral medications. Some Antipruritics contain ingredients like corticosteroids, which reduce inflammation and suppress the immune response, while others may contain antihistamines, which block the action of histamine. The choice of antipruritic depends on the underlying cause of the itching and the severity of the symptoms.

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| **Calamine** | |
| Pharmacological class | Antipruritics |
| Dosage form | Lotion: 15% w/v |
| Indications | Mild pruritus caused by sunburn and other minor skin conditions |
| Dose and Administration | **Adult:** Apply liberally to the entire affected area 3–4 times daily with a pad of cotton wool.  **Pediatric:** Apply liberally 3–4 times daily with a pad of cotton wool. |
| Contraindications | Hypersensitivity to the drug. |
| Drug interactions | There are no known significant drug interactions. |
| Side effects | Occasional hypersensitivity or irritantion reactions |
| Cautions | Contact with eyes, use on open wounds or burns. |
| Storage condition | Store below 30oC. |

## Antiseptics and disinfectants

Antiseptics and disinfectants are chemical agents used to prevent infections by eliminating or inhibiting the growth of microorganisms. These agents play a vital role in healthcare, household, an industrial setting to control the spread of infections and maintain cleanliness.

Antiseptics are applied to living tissues, such as skin, wounds, and mucous membranes for disinfection and treatment. Examples of commonly used antiseptics include ethyl alcohol, chlorhexidine, iodine, povidone-iodine, and gentian violet. Disinfectants, on the other hand, are used on inanimate surfaces and medical equipment to ensure sterilization and hygiene. They include alcohol-based hand rubs (ethanol 80%, isopropyl alcohol 75%), chlorine-based compounds (0.1% chlorine), chloroxylenol, and glutaral.

**Antiseptics**

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| **Chlorhexidine** | |
| Pharmacological class | Antiseptic |
| Dosage form | Solution or gel: 7.1% (digluconate) delivering 4% chlorhexidine (for umbilical cord care) |
| Indications | For skin disinfection, for cleansing and disinfecting wounds and swabbing in obstetrics, umbilical cord care in newborns. |
| Dose and Administration | Apply the solution or gel to the area and allow it to air dry. Apply the gel to the umbilical cord stump once daily or as directed by a healthcare professional |
| Contraindications | Hypersensitivity the drug, use in body cavities (such as eyes, ears). |
| Drug interactions | Soaps and anionic compounds |
| Side effects | Skin reactions, rash, or contact dermatitis, anaphylaxis, dryness or itchiness of the skin, staining of teeth and other oral surfaces. |
| Cautions | Contact with eyes and mucous membranes, use on deep wounds, puncture wounds, or serious burns, premature infants or on very sensitive skin, staining of fabrics and surfaces. |
| Storage condition | Store below 30ºC. Protect from light and open flame. |
| **Ethyl Alcohol** | |
| Pharmacological class | Antiseptic |
| Dosage form | Solution, 70 % |
| Indications | For disinfection of the skin in preparation for injections or surgical procedures |
| Dose and administration | Topical, apply to the skin |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Potential additive irritant effects when used with other skin antiseptics |
| Side effects | Skin irritation, dryness, or dermatitis with prolonged use, Burning sensation upon application to sensitive or broken skin, Allergic reactions in susceptible individuals |
| Cautions | Broken skin (open wounds), neonates, use in or around the eyes |
| Storage condition | Store below 30ºC. Protect from light and open flame. |
| **Gentian Violet** | |
| Pharmacological class | Antiseptic |
| Dosage form | Solution, 1 % |
| Indications | Candida infections of the oral and throat (thrush); for minor cuts, scrapes, and burns to prevent infection. |
| Dose and administration | **Adult and Child:** apply every 8 – 12 hours daily for 3 years.  It should be painted only on individual lesions with cotton. Apply a thin layer of the solution to the affected area one to two times daily |
| Contraindications | Hypersensitivity the drug |
| Drug interactions | Other related topical medications |
| Side effects | Staining of the skin, mucous membranes, and clothing, esophagitis, laryngitis, or tracheitis. |
| Cautions | Pregnancy (long-term use), use in or around the eyes |
| Storage condition | Store below 30ºC. Protect from light and open flame. |
| **Iodine** | |
| Pharmacological class | Antiseptic |
| Dosage form | Solution, 2 % |
| Indications | For the disinfection and cleaning of minor superficial skin wounds, disinfecting the skin before surgical procedures |
| Dose and administration | Apply a small amount of the solution using a cotton swab or gauze to the affected area one to three times daily. Do not cover with a tight bandage. |
| Contraindications | Hypersensitivity the drug |
| Drug interactions | Iodine-containing compounds, lithium |
| Side effects | Skin irritation or redness, allergic reactions, including itching, rash, or swelling, staining of the skin or clothing |
| Cautions | History of thyroid disease, prolonged use, apply to sensitive area such as the axillary, perianal, or genitalia. |
| Storage condition | Store below 30ºC. Protect from heat and direct sunlight. |
| **Povidone Iodine** | |
| Pharmacological class | Antiseptic |
| Dosage form | Solution (aqueous), 4 %, 7.5 %, 10 % |
| Indications | As skin disinfectant and antiseptic mainly for the treatment of contaminated wounds and pre-operative preparation of the skin and mucous membranes. |
| Dose and administration | **Alcoholic solution, povidone iodine 10%**:  **Adult:** to be applied undiluted in pre- and post-operative skin disinfection  **Antiseptic solution, povidone iodine 10% in aqueous solution**: **Adult:** to be applied undiluted in pre-and postoperative skin disinfection.  **Scalp and skin cleanser solution, povidone iodine, 7.5%, in a surfactant basis**:  **Adult:** use of seborrheic condition of scalp and acne vulgaris of face and neck 1-2 times daily child dose. Child under 2 years not recommended.  **Skin cleanser solution, povidone iodine, 4% in a surfactant basis**:  **Adult:** for infective condition of the skin. Retain on skin for 3-5 minutes before rinsing, repeat twice daily. |
| Contraindications | Hypersensitivity the drug, very low birth weight infants |
| Drug interactions | Iodine-containing compounds |
| Side effects | Severe pain on application, irritation, pruritus, erythema, rash, oedematous erythema, acneform eruption |
| Cautions | Thyroid disorders or those receiving lithium therapies, pregnancy, breastfeeding, infant, children less than 2years, burns |
| Storage condition | Store below 30ºC. Protect from heat and direct sunlight. |

**Disinfectants**

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| **Alcohol based hand rub** | |
| Pharmacological class | Disinfectant |
| Dosage form | Solution: containing ethanol 80% V /V  Solution: containing isopropyl alcohol 75% V/V |
| Indications | Hand sanitization and general skin disinfection |
| Dose and Administration | Put enough sanitizer on hands to cover all surfaces and rub hands together until they feel dry. |
| Contraindications | Hypersensitivity the drug |
| Drug interactions | There are no significant drug interaction |
| Side effects | Skin dryness or irritation, allergic reactions, contact dermatitis |
| Cautions | Contact with eyes, mucous membranes, or open wounds. |
| Storage condition | Store below 30ºC. Protect from direct sunlight and any heat source. |
| **Chlorine base compound** | |
| Pharmacological class | Disinfectant |
| Dosage form | Liquid: (0.1% available chlorine) for solution.  Powder: (0.1% available chlorine) for solution.  Solid: (0.1% available chlorine) for solution. |
| Indications | Surface disinfection in various settings, including healthcare facilities, households, and water treatment. |
| Dose and administration | Dilute the liquid form or dissolve the powder or solid form in water. Apply the solution onto the surface, ensuring thorough coverage, and allow it to remain in contact for the recommended time (typically 1 to 10 minutes) before rinsing with clean water. |
| Contraindications | Hypersensitivity the drug. |
| Drug interactions | Other cleaning agents (those containing ammonia or acids) |
| Side effects | Skin and eye irritation, respiratory irritation or coughing, allergic reactions |
| Cautions | Direct contact with skin, eyes, or mucous membranes. |
| Storage condition | Store below 30ºC. Protect from heat and direct sunlight. |
| **Chloroxylenol** | |
| Pharmacological class | Disinfectant |
| Dosage form | Solution: 4.8% |
| Indications | Disinfection of surfaces and skin antiseptics |
| Dose and administration | Apply the solution to the affected area using a cloth, cotton ball, or swab |
| Contraindications | Hypersensitivity the drug |
| Drug interactions | There are no significant drug interaction. |
| Side effects | Skin irritation, allergic contact dermatitis, severe allergic reactions. |
| Cautions | Avoid contact with eyes, mucous membranes, or open wounds |
| Storage condition | Store below 30ºC. Protect from heat and direct sunlight. |
| **Glutaral** | |
| Pharmacological class | Disinfectant |
| Dosage form | Solution: 2% |
| Indications | Disinfectant for medical equipment, surfaces, and instruments that cannot be heat sterilized |
| Dose and administration | Apply the solution to the surface or medical equipment, ensuring thorough coverage. Allow adequate contact time for disinfection usually 10-30 minutes |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Other cleaning agents (containing ammonia or acids) |
| Side effects | Skin irritation, redness, or allergic reactions, respiratory irritation, eye irritation, chemical burns with prolonged exposure |
| Cautions | Contact with eyes, mucous membranes, or open wounds |
| Storage condition | Store below 30ºC. Protect from heat and direct sunlight. |

# Vaccines

Vaccines are biological preparations that produce and enhance immunity to a particular infectious or malignant disease. They induce active immunity and provide immunological memory by stimulating the production of antibodies and cells involved in the immune response. Antibodies can be detected in the patient’s blood or serum, but even in the absence of detectable antibodies, immunological memory may still be present. A vaccine consists of either:

* **a live attenuated form of the virus** (e.g. measles, mumps and rubella vaccine) or bacteria (e.g. Bacillus Calmette-Guérin vaccine);
* **an inactivated preparation of the virus** (e.g. tick-borne encephalitis vaccine) or bacteria (e.g. meningococcal vaccine);
* **an inactivated toxins (toxoids)** produced by a microorganism (e.g. tetanus and diphtheria vaccines);
* **an extract of a micro-organism** which may be derived from the organism (e.g. pneumococcal vaccine), or **produced by recombinant DNA technology** (e.g. hepatitis B vaccine);
* **a viral vector of replicating (attenuated or low pathogenicity viruses)** or non-replicating viruses (e.g. J&J COVID-19 vaccine), produced using recombinant technology; or
* **a nucleic acid (DNA or RNA)** of an antigen derived from the virus (e.g. Pfizer COVID-19 vaccines) or bacteria.

Live attenuated and replicating viral vector vaccines usually promote a full, long-lasting antibody response. In rare cases, a mild form of the disease may occur with some vaccines, such as a rash following a measles-containing vaccine. Inactivated or non-replicating vaccines (including toxoids) produce an antibody response following a primary course, which may last for months or years. In most cases booster (reinforcing) injections are required for long-term protection. To stimulate the immune system more broadly, some polysaccharide vaccines have been enhanced byconjugation (such as the Haemophilus influenzae type B and meningococcal group C vaccines), while some inactivated vaccines contain an adjuvant (such as aluminum hydroxide or aluminium phosphate) to enhance the antibody response. Inactivated vaccines cannot cause the disease that they are designed to prevent.

Vaccines may be monovalent or multivalent (or polyvalent). A monovalent vaccine contains a single strain of a single antigen/immunogen (e.g. measles vaccine, hepatitis B vaccine), whereas a polyvalent vaccine contains two or more strains/serotypes of the same antigen/immunogen (e.g. OPV and IPV each of which contain three attenuated polio virus types).

Combined vaccines contain two or more different antigens (e.g.,DTwP, DTPa-HepB Hib). The potential advantages of combination vaccines include reducing the cost of storing and administering multiple vaccines simultaneously, reducing the cost of extra health-care visits, improving timeliness of vaccination, and facilitating the addition of new vaccines into immunization programs. Combining antigens usually does not increase the risk of adverse reactions and can lead to an overall reduction in adverse reactions. For instance, it can decrease the number of anxiety-related reactions and the chances of immunization error-related reactions.

Almost all individuals can be safely vaccinated; in only a few individuals is vaccination either contra-indicated or should be deferred. Specialist advice should be sought when in doubt, if using live vaccines, or if there are queries about an individual’s degree of immunosuppression. In some

situations, the specialist may decide that the risk of a specific disease outweighs any potential risk from the vaccine. Antibody responses may be lower in immunosuppressed individuals, therefore additional vaccine doses may be required.

**Vaccination during pregnancy**

Live vaccines should not be administered routinely to pregnant females due to the theoretical risk of fetal infection; these should generally be delayed until after delivery. There is no evidence of risk from vaccinating pregnant females with inactivated vaccines; they do not replicate so cannot harm the fetus. Some inactivated vaccines are actively recommended to prevent severe complications during pregnancy or to the new-born infant, such as the influenza vaccine, and diphtheria with tetanus, pertussis and poliomyelitis vaccine.

**Vaccines in immunosuppression and HIV infection**

Live vaccines can cause severe or fatal infections in some immunosuppressed individuals due to extensive replication of the vaccine strain. Live vaccines are, therefore, not recommended for individuals with some types of severe primary or acquired immunodeficiency, or for those who are on or have recently received high doses of certain immunosuppressive or biological therapies.

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| **BCG Vaccine** | |
| Pharmacological class | Vaccines |
| Dosage form | Injection: 500,000 organisms /ml in 0.05ml, 0.1ml |
| **Indications** | Active immunization against tuberculosis (TB) |
| Dose and Administration | **Pediatric**: 0.05 to 0.1 ml by intradermal. Dosing is according to Immunization Schedule under National Immunization Programme (NIP). |
| Contraindications | History of anaphylaxis to any component of the vaccine, pregnancy, bone marrow or lymphoid malignancy. |
| Drug interactions | Asparaginase, azathioprine, bleomycin, ciclosporin, cyclophosphamide, cytarabine, dacarbazine, dactinomycin, daunorubicin, dexamethasone, doxorubicin, etoposide, fluorouracil, hydrocortisone, hydrocortisone, mercaptopurine, methotrexate, prednisolone, procarbazine, vinblastine, vincristine |
| Side effects | Ulcer at injection site (2–6 weeks after vaccination), enlargement of regional lymph nodes, transient injection site reactions (pain, redness, itching, swelling or burning), transient fever, fainting, disseminated disease or infections such as osteomyelitis, abscess |
| Cautions | Congenital or acquired cell-mediated immune deficiencies (including HIV), patients with systemic corticosteroid/immunosuppressive treatment, malignant condition, pyrexia, generalized infected dermatoses, organ abnormalities, pregnancy. |
| Storage condition | Store between 2°C–8°C. Do not freeze. Protect from light. |
| **Hepatitis B Vaccine (plasma-derived, recombinant vaccines)** | |
| Pharmacological class | Vaccines |
| Dosage form | Injection (inactivated): 16.5% in 2ml, 10ml  Injection (recombinant): 0.5ml |
| **Indications** | Immunization against infection caused by hepatitis B virus, post-exposure prophylaxis |
| Dose and administration | **Administration**: The vaccine should be given in the deltoid region in adults and older children. Anterolateral thigh is the preferred site in infants and young children. It should not be injected into the buttock (vaccine efficacy is reduced).  **Adult**: 3 doses of 1 ml, with an interval of 1 month between the first and second dose and 5–11 months between the second and third doses.  **Pediatric,** IM:  **Neonate, infant,** or **child from birth**: One monovalent dose at birth, then two or three subsequent doses of monovalent or combined hepatitis B vaccine administered according to schedules of national routine immunization programs; generally, subsequent doses after birth dose are given at 2, 4, and 6 or 12 months of age, depending on the vaccine used.  **Hepatitis B prophylaxis for infants born to hepatitis B surface antigen-positive mother**, IM:  **Neonate**: One dose of vaccine with hepatitis B immunoglobulin (in the opposite thigh) within 12 hours of birth (yet preferably immediately afterbirth), then three subsequent doses as per primary immunization (as above).  **Post-exposure prophylaxis (other than at birth),** IM:  **Child all ages:** Administer vaccine at age-appropriate dose, with the second dose given at 1 month and the third dose given at 2 months after the initial dose; for those at continued risk, a fourth dose should be given 12 months after the first dose.  **Percutaneous/ocular/mucous membrane exposure,** IM:  **Child all ages:** Administer first dose of vaccine within 7 days and hepatitis B immunoglobulin within 72 hours.  **Sexual exposure**, IM:  **Child all ages**: Administer first dose of vaccine and hepatitis B immunoglobulin within 14 days.  ***Note****: Two types of hepatitis B vaccines are available: plasma-derived and recombinant vaccines. Both types are highly effective, but the recombinant vaccine is most commonly used. Hepatitis B vaccine is available as a monovalent or a fixed-combination vaccine with other antigens such as Haemophilus influenzae type b, poliomyelitis, diphtheria, pertussis and tetanus. Combination hepatitis B vaccines should not be used for the birth dose. This dose should beprovided using the monovalent hepatitis B vaccine.* |
| Contraindications | Severe allergic reaction (e.g., anaphylaxis) after a previous dose of any hepatitis B vaccine or to any vaccine component, including yeast. |
| Drug interactions | Azathioprine, budesonide, hydrocortisone, prednisone, prednisolone, methylprednisolone, sirolimus, tacrolimus. |
| Side effects | Local reactions (pain, erythema, swelling), headache, myalgia, transient fever, fainting, fatigue, nausea, diarrhea. Rarely; anaphylactic reactions. |
| Cautions | Allergic reactions, acute febrile illness (postpone all vaccinations until patient is well). A reduced immunogenicity of the vaccine may occur in individuals with immunodeficiency including advanced HIV infection, diabetes, chronic liver disease or chronic renal failure. May not prevent hepatitis B infection in individuals who have an unrecognized hepatitis B infection at the time of vaccine administration (i.e., Hepatitis B has a long incubation period). |
| Storage condition | Store between 2° to 8°C. Do not freeze; discard if product has been frozen. Do not dilute to administer. |
| **Human papilloma virus (HPV) Vaccine, (Quadrivalent)** | |
| Pharmacological class | Vaccines |
| Dosage form | Injection: 0.5ml |
| Indications | Prevention of cervical cancer, genital warts, and other pre-cancerous lesions caused by human papilloma virus (HPV) types 6, 11, 16, and 18. |
| Dose and administration | **Females aged 9-14 years**: 0.5ml by intramuscular at the deltoid muscle of upper arm. |
| Contraindications | Hypersensitivity to papillomavirus recombinant vaccine or any component of the formulation. |
| Drug interactions | Immunosuppressants |
| Side effects | Local reactions (pain, redness, swelling), fever, dizziness, headache, syncope, nausea, vomiting anaphylaxis is rare. |
| Cautions | Impaired immune response, thrombocytopenia or any coagulation disorder, pregnancy andlactation. |
| Storage condition | Store between 2 to 8°C. Do not freeze. Protect from light. |
| **Inactivated poliomyelitis vaccine (IPV), Trivalent Type I, II, and III** | |
| Pharmacological class | Vaccines |
| Dosage form | Injection: 0.5 ml |
| **Indications** | Immunization against poliomyelitis. |
| Dose and administration | **Pediatric**:0.5 ml by intramuscular injection on the right anterolateral (outer) mid-thigh at 14 weeks (IPV 1) and at 9 months (IPV 2). There should be minimum of 2.5cm apart from PCV injections. |
| Contraindications | History of anaphylaxis to any component of the vaccine. |
| Drug interactions | Immunosuppressant medicines (e.g. corticosteroids and anticancer medicines). |
| Side effects | Transient injection site reactions (pain, redness, itching, swelling or burning, transient fever, fainting. |
| Cautions | Acute febrile illness (postpone all vaccinations until patient is well). A reduced immunogenicity of the vaccine may occur in individuals with immunodeficiency including advanced HIV infection, diabetes, chronic liver disease or chronic renal failure. |
| Storage condition | Store between 2°C to 8°C. Protect from light. Do not freeze. |
| **Influenza vaccine (seasonal)** | |
| Pharmacological class | Vaccines |
| Dosage form | Injection: 0.25 ml, 0.5ml, 5ml |
| **Indications** | Immunization against influenza |
| Dose and administration | **Adult**: 0.5 ml as a single dose IM injection, annually  **Pediatric**:  **Infant or child 6 months–3 years**: 0.25 ml (one or two doses)  **Child over 3 years**: 0.5 ml (one or two doses)  **Child over 9 years**: 0.5 ml as a single dose |
| Contraindications | Hypersensitivity to influenza virus vaccine or any component, allergy to egg or egg products, chicken, chicken feathers or chicken dander, presence of acute respiratory disease or other active infections or illnesses (delay immunization). |
| Drug interactions | Asparaginase, azathioprine, betamethasone, bleomycin, chlorambucil, ciclosporin, cyclophosphamide, cytarabine, dacarbazine, dactinomycin, daunorubicin, dexamethasone doxorubicin, etoposide, fluorouracil, hydrocortisone, mercaptopurine, prednisolone, procarbazine, vincristine. |
| Side effects | Transientinjection site reactions (pain, redness, itching, swelling or burning), headache, fatigue, fever, malaise, myalgia, transient fever, fainting. |
| Cautions | History of febrile convulsions or Guillain Barré syndrome, acute febrile illness. |
| Storage condition | Store between 2 to 8°C. Do not freeze. |
| **Malaria vaccine, R21** | |
| Pharmacological class | Vaccine |
| Dosage form | Injection: 1-ml vial (2 doses). |
| **Indications** | Active immunization of children aged 5 to 36 months against malaria caused by *Plasmodium falciparum.* |
| Dose and administration | **Vaccination in children from 6 weeks up to 17 months of age** (at first dose): Three doses, each of 0.5 ml, should be given at monthly intervals. A fourth dose is recommended 18 months after the third dose. |
| Contraindications | Hypersensitivity to the active substances or to any of the excipients, hypersensitivity to hepatitis B vaccines. |
| Drug interactions | No sufficient data. |
| Side effects | Febrile seizures, fever, irritability, injection site reactions such as pain and swelling. |
| Cautions | Do not administer the vaccine intravascularly, intradermally or subcutaneously. Individuals with thrombocytopenia or any coagulation disorder. |
| Storage condition | Store between 2°C to 8°C. Do not freeze. Protect from light. |
| **Measles virus vaccine, live attenuated** | |
| Pharmacological class | Vaccines |
| Dosage form | Powder for injection: 0.5ml |
| **Indications** | Immunization against measles |
| Dose and administration | **Pediatric**: 0.5ml by subcutaneous injection (SC) on left upper arm at 9 months of age (MCV 1) and at 15 months of age (MCV 2). Dosing is according to immunization schedule under NIP. |
| Contraindications | Hypersensitivity to any component (e.g., gelatin or neomycin), pregnancy, febrile respiratory illness or active febrile infection, patients on immunosuppressive therapy, HIV-positive patients with immunosuppression, severe primary immunodeficiency, patients with blood dyscrasias, malignant neoplasms affecting the bone marrow or lymphatic systems. |
| Drug interactions | Other live vaccines, immune globulin. |
| Side effects | Pain and tenderness at the site of injection, fever, transient rash, hypersensitivity reactions, such as urticaria at the injection site. |
| Cautions | Moderate or severe acute illness (with or without fever), cerebral injury or history of convulsions, hypersensitivity to eggs. |
| Storage condition | Store between 2°C and 8°C. Protect from sunlight. |
| **Oral cholera vaccine (Euvichol-plus)** | |
| Pharmacological class | Vaccines |
| Dosage form | Oral suspension: 1.5ml |
| **Indications** | Prevention of Cholera caused by *Vibrio cholerae*. |
| Dose and administration | **Anyone above the age of 1 year, who are travelling to endemic orepidemic areas**: 2 doses,1.5 ml p.o.; two doses of the vaccine should be given at an interval of two weeks. |
| Contraindications | Persons with either known hypersensitivity to any componentof the vaccine or having shown signs of severe reaction due to the previously taken dose. |
| Drug interactions | Ciclosporin, dexamethasone, hydrocortisone, oral typhoid vaccine, chloroquine |
| Side effects | Headache, fever, diarrhea, nausea/vomiting, myalgia |
| Cautions | The vaccine should not be administered parenterally (intramuscularly, subcutaneously or intravenously). The vaccine is only recommended for oral administration.The vaccine is presented as a suspension and hence rigorous shaking is required before administration. |
| Storage condition | Store between 2℃-8℃. Do not freeze. |
| **Oral Poliomyelitis Vaccine, Trivalent Type I, II, and III** | |
| Pharmacological class | Vaccines |
| Dosage form | Oral: 0.5ml, 10ml, and 20ml |
| **Indications** | Immunization against poliomyelitis. |
| Dose and administration | **Pediatric**: 0.1ml (two drops) by oral at birth, 6, 10 and 14 weeks of age. Dosing is according to local and WHO recommendations. |
| Contraindications | Anaphylactic reaction to previous dose or to any constituent, hypersensitivity to erythromycin and kanamycin, acute or developing infectious diseases, leukemia, lymphoma or generalized malignancy, acquired or congenital immunodepression, acute intestinal diseases. |
| Drug interactions | Immunosuppressant medicines (e.g. corticosteroids and anticancer medicines, asparaginase, azathioprine). |
| Side effects | Rarely, vaccine-associated paralysis, fever, anaphylaxis, Guillain-Barre syndrome, paralytic poliomyelitis. |
| Cautions | Not to be taken with food this contains a preservative, hypersensitivity to any antibiotic present in vaccine, pregnancy.  Postpone vaccination if the child has moderate to severe illness (with temperature =39 °C or more). |
| Storage condition | Store between 2°C–8°C. OPV is very heat sensitive. |
| **Pentavalent (Toxoid (Diphtheria, Tetanus), acellular (Pertussis), Conjugate polysaccharide (Haemophilus Influenzae type b), Recombinant DNA (hepatitis B)) vaccine** | |
| Pharmacological class | Vaccine |
| Dosage form | Injection : 0.5 ml |
| **Indications** | Immunization against Diptheria, Pertussis, Tetanus, Hemophilus Influenzae type B and Hepatitis B virus infection. |
| Dose and Administration | **Pediatric**: 0.5 ml by intramuscular route at 6, 10, and 14 weeks of birth. Dosing is according to Immunization Schedule under NIP. |
| Contraindications | Convulsant or non-convulsant progressive encephalopathy. Children who have experienced a strong reaction within 48 hours following a previous vaccination: fever 40°C or more, persistent crying syndrome, febrile or non-febrile convulsion, hypotonus-hyporeactivity syndrome. Hypersensitivity to neomycin, streptomycin, polymyxin B. |
| Drug interactions | Not known |
| Side effects | Injection site reactions (such as pain, erythema, and inflammation), fever, malaise, febrile seizures, prolonged crying or restlessness, vomiting, loss appetite, fatigue. |
| Cautions | Do not administer IV/intradermal. Postpone vaccination in children with fever or acute disease. Guillain-Barré syndrome (GBS); altered immunocompetence or patients on immunosuppressive treatment or with immune deficiency. DTP containing vaccine not usually given over 6 years of age. |
| Storage condition | Store between 2°C–8°C. It should never be frozen. |
| **Pneumococcal conjugated vaccine (PCV)** | |
| Pharmacological class | Vaccines |
| Dosage form | Injection: 0.5ml |
| Indications | Immunization against disease caused by the pneumococcalserotypes causing pneumococcal pneumonia and meningitis. |
| Dose and administration | **Pediatrics**: 0.5 ml given IM into right mid anterolateral (outer) thigh at 6, 10, and 14 weeks of age. |
| Contraindications | History of anaphylaxis to any component of the vaccine. |
| Drug interactions | No known interactions |
| Side effects | Transient injection site reactions (pain, redness, itching, swelling or burning), transient fever, fainting, seizures, angioedema, allergic reactions including anaphylaxis. |
| Cautions | Acute febrile illness: postpone all vaccinations until patient is well. |
| Storage condition | Store in a refrigerator (2°C - 8°C). Do not freeze. |
| **Rabies (Human Diploid Cell) vaccine** | |
| Pharmacological class | Vaccines |
| Dosage form | Injection: 2.5IU/ml in 2 ml |
| **Indications** | Pre-exposure and post-exposure vaccination against rabies. |
| Dose and administration | **Adult and Child:** 1ml by IM. Dosing is according to product insert based on patient’s needs (pre- and post-exposure).  **Post-exposure dosage for previously unimmunized persons**: 5 intramuscular doses (1 ml each), one dose immediately after exposure (Day 0) and one dose 3, 7, 14, and 28 days later.  **Post-exposure dosage for previously immunized persons**: receive two intramuscular doses (1.0 ml, each), one dose immediately after the exposure and one dose 3 days later. |
| Contraindications | Known life-threatening hypersensitivity to vaccine, neomycin, or any component of a vaccine (pre-exposure prophylaxis), pregnancy, acute febrile illness |
| Drug interactions | Corticosteroids, other immunosuppressive agents, anti-malarial drugs, immunosuppressive illnesses. |
| Side effects | Local reactions (e.g., pain at the injection site, redness, swelling, induration), mild systemic reactions (e.g., fever, headache, dizziness, gastrointestinal symptoms), serum sickness. |
| Cautions | Allergy to neomycin, any type of infection or severe illness. Avoid injectionintogluteal area. |
| Storage condition | Store between 2 to 8°C. Do not freeze. |
| **Rotavirus vaccine** | |
| Pharmacological class | Vaccines |
| Dosage form | Oral solution: 2ml |
| **Indications** | Immunization against gastroenteritis-caused by rotavirus. |
| Dose and administration | **Pediatric:** 1 ml given orally at 6,10, and14 weeks. |
| Contraindications | Severe hypersensitivity to any of their components, severe allergic reaction (e.g. anaphylaxis) after a previous dose, infants with a history of uncorrected congenital malformation of the gastrointestinal tract, infantswith Severe Combined Immunodeficiency Disease (SCID), immunosuppression, infants aged <6 weeks and >32 weeks, and infants with a history of intussusception. |
| Drug interactions | Immunosuppressive therapies including irradiation, antimetabolites, alkylating agents, cytotoxic drugs and corticosteroids. |
| Side effects | Abdominal cramps, abdominal pain, diarrhea, nausea, vomiting, fever, irritability, decreased activity level, decreased appetite. |
| Cautions | Do not reconstitute or dilute, postpone vaccination in patients with acute gastroenteritis/diarrhea, fever with moderate to severe illness, caution with history of GI disorders, not for use in adults. |
| Storage condition | Store between 2°C–8°C. Do not freeze. |
| **Tetanus toxoid** | |
| Pharmacological class | Vaccines |
| Dosage form | Injection: 0.5ml, 1ml |
| **Indications** | Post-exposure tetanus prophylaxis for recent wounds that may have been contaminated with tetanus spores in subjects who have not had any primary vaccination or for whom primary vaccination is incomplete or uncertain,  Neonatal tetanus prophylaxis in non-immunized women either of childbearing age or pregnant in countries where neonatal tetanus is frequent,   * Primary vaccination, * Booster injections. |
| Dose and administration | **Primary Immunization**: Whenever adults must be vaccinated, the schedule includes 2 successive injections one or two months apart followed by a booster dose 6 to 12 months after the second injection. |
| Contraindications | Hypersensitivity reaction or neurological disorder after a previous injection of vaccine. Delay if acute/febrile illness. |
| Drug interactions | No known interaction |
| Side effects | Lymphadenopathy, type I hypersensitivity reactions, dizziness, hypotension, allergic-like symptoms, such as urticaria, generalized pruritus, or erythema, myalgia, arthralgia |
| Cautions | Vaccination should preferably be postponed in case of fever, acute disease or chronic progressive illness.  Immunosuppressive treatment or an immunodeficiency condition may induce a decrease in the immune response to the vaccine |
| Storage condition | Store in a refrigerator (2°C -8°C). Do not freeze. |
| **Yellow fever vaccine** | |
| Pharmacological class | Vaccines |
| Dosage form | Injection: 0.5ml |
| **Indications** | Immunization against yellow fever |
| Dose and administration | **By deep subcutaneous injection**:  **Child 6–8 months** (administered on expert advice): Infants  under 9 months should be vaccinated only if the risk of yellow fever is high and unavoidable (consult product literature or local protocols)  **Child 9 months–17 years**: 0.5 ml for 1 dose  **Adult**: 0.5 ml for 1 dose |
| Contraindications | Age<6 months; age 6–8 months except during epidemics; known allergy to egg antigens or to a previous dose; severe immunosuppression (e.g., symptomatic HIV infection (AIDS stage)), history of thymus dysfunction, acute or febrile disease. |
| Drug interactions | Ifosfamide, melphalan, methotrexate, oxaliplatin, procarbazine. |
| Side effects | Headache, muscle pain, fever, crying (in children), drowsiness (in children), irritability |
| Cautions | Pregnancy, breastfeeding women, syncope, people with weakened immunity and in those aged 60 years or older. Children aged under 9 months are at higher risk of vaccine associated encephalitis, with the risk being inversely proportional to age. Postpone immunization in acute or febrile illness. |
| Storage condition | Store between 2°C–8°C. Do not freeze. |

# Antidotes and Other Substances Used in Poisoning

Overdoses and accidental poisonings are common, and antidotes are used to counteract toxins by preventing absorption, neutralizing poisons, or blocking their effects. Antidotes can reduce free toxin levels through binding agents like activated charcoal or specific binders (e.g., chelating agents). Enhanced elimination methods include urinary alkalization or hemadsorption. Antidotes work via mechanisms such as competitive inhibition (e.g., ethanol for methanol poisoning), receptor blockade (e.g., naloxone for opioids), and reducing toxic metabolite formation (e.g., N-acetylcysteine for paracetamol poisoning). Vitamins like vitamin K and pyridoxine counteract toxic effects of drugs like warfarin and isoniazide.

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| **Acetylcysteine** | |
| Pharmacological class | Antidote |
| Dosage form | Injection: 200 mg/ml in 10 ml ampoule  Oral liquid: 10%, 20% |
| Indications | Antidote for paracetamol poisoning/overdosage. |
| Dose and Administration | By IV infusion:  **Adult (body-weight 40 kg and above)**: 150 mg/kg over 1 hour, dose to be administered in 200 ml glucose 5%, then 50 mg/kg over 4 hours, to be started immediately after completion of first infusion, dose to be administered in 500 ml glucose 5%, then 100 mg/kg over 16 hours, to be started immediately after completion of second infusion, dose to be administered in 1 litre glucose 5%.  **Child (body weight 20–39 kg)**: Initially 150 mg/kg over 1 hour, dose to be administered in 100 ml glucose 5%, followed by 50 mg/kg over 4 hours, dose to be administered in 250 ml glucose 5%, then 100 mg/kg over 16 hours, dose to be administered in 500ml glucose 5%.  **Child (body weight up to 20 kg)**: Initially 150 mg/kg over 1 hour, dose to be administered in 3 ml/kg glucose 5%, followed by 50 mg/kg over 4 hours, dose to be administered in 7 ml/kg glucose 5%, then 100 mg/kg over 16 hours, dose to be administered in 14 ml/kg glucose 5%. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | Charcoal, carbamazepine, nitro-glycerine, penicillin G, tetracycline |
| Side effects | Hypersensitivity reactions including bronchospasm, angioedema, rashes and pruritis, hypotension or occasionally hypertension, nausea, vomiting, tachycardia, flushing |
| Cautions | Asthma and/or history of bronchospasm, atopy, increase INR, increase prothrombin time, history of peptic ulceration, pregnancy |
| Storage condition | Store unopened vials between 15 and 30°C. Protect from light. |
| **Activated charcoal** | |
| Pharmacologic class | Non-specific antidote |
| Dosage form | Tablet: 250 mg  Activated granules: 50 g |
| Indications | Emergency treatment of acute oral poisoning and drug overdose. |
| Dose and administration | **Adult and child 12 years and above**:  **Acute poisoning**: 50 to 100g in suspension.  **Severe poisoning**: 50 to 100g as an initial dose followed by 20g every 4 to 6 hours.  **Child up to 12 years**: 1 g/kg/dose (Maximum: 50 g/dose). Dose may be repeated every 4 to 6 hours as needed. |
| Contraindications | An unprotected airway, presence of intestinal obstruction, active GI hemorrhage or perforation. |
| Drug interactions | Acarbose, carbamazepine, digoxin, frusemide, olanzapine, phenytoin |
| Side effects | Black stools, gastrointestinal disturbances, constipation, diarrhea. |
| Cautions | Comatose patient, drowsy patient, reduced gastrointestinal motility |
| Storage condition | Store below 300C |
| **Atropine Sulphate** | |
| Pharmacological class | Anticholinergics |
| Dosage form | Injection: 1 mg/ml in 1 ml ampoule |
| **Indications** | Symptomatic bradycardia due to acute overdosage of beta-blockers, poisoning by organophosphorus insecticides or nerve agents or other cholinergic agents |
| Dose and administration | **Symptomatic bradycardia due to acute overdosage of beta-blockers,** by intravenous injection:  **Child**: 0.02 mg/kg (max. per dose 1.2 mg), repeat doses may be necessary  **Adult**: 0.5–1.2 mg, repeat doses may be necessary  **Treatment of poisoning by organophosphorus insecticide or nerve agent (in combination with pralidoxime chloride),** by intravenous injection:  **Adult**: 2 mg every 5–10 minutes until the skin becomes flushed and dry, the pupils dilate, and bradycardia is abolished, frequency of administration dependent on the severity of poisoning.  **Child**: 20 mcg/kg every 5–10 minutes (max. per dose 2 mg) until the skin becomes flushed and dry, the pupils dilate, and bradycardia is abolished, frequency of administration dependent on the severity of poisoning. |
| Contraindications | Hypersensitivity to the drug or other anticholinergic agents, primary glaucoma or predisposition to narrow anterior chamber angle glaucoma, GI obstruction |
| Drug interactions | Amitriptyline, chlorpheniramine, chlorpromazine, haloperidol, metoclopramide, neostigmine, pyridostigmine, ipratropium, potassium chloride |
| Side effects | Abdominal distension, anhidrosis, anxiety, arrhythmias, bronchial secretion decreased, dysphagia, gastrointestinal disorders, hallucination, hyperthermia, movement disorders, mydriasis, speech disorder, taste loss, thirst. |
| Cautions | Obstructive disease of the GIT (e.g., pyloroduodenal stenosis, achalasia), cardiospasm, paralytic ileus or intestinal atony, reflux esophagitis, ulcerative colitis, prostatic enlargement, tachycardia, toxemia of pregnancy, myasthenia gravis, hepatic impairment, renal impairment, pregnancy, breast feeding |
| Storage condition | Store between 15 0C and 30 0C. Protect from excessive heat. |
| **Calcium gluconate** | |
| Pharmacological class | Minerals, Antidotes |
| Dosage form | Injection, 10% in 10ml ampoule |
| **Indications** | Magnesium toxicity, severe acute hypocalcaemia or hypocalcemic tetany, acute severe hyperkalaemia not due to digoxin toxicity, calcium channel blockers toxicity, beta-blocker toxicity. |
| Dose and administration | **Severe acute hypocalcaemia or hypocalcemic tetany,** initially by slow intravenous injection:  **Adult**: Initially 10–20 ml, calcium gluconate injection 10% (providing approximately 2.25–4.5 mmol of calcium) should be administered with plasma-calcium and ECG monitoring, and either repeated as required or, if only temporary improvement, followed by a continuous intravenous infusion to prevent recurrence, alternatively (by continuous intravenous infusion), initially 50 ml/hour, adjusted according to response, infusion to be administered using 100ml of calcium gluconate 10% diluted in 1 litre of glucose 5% or sodium chloride 0.9%.  **Acute severe hyperkalaemia** (plasma-potassium concentration 6.5 mmol/litre or greater, or in the presence of ECG changes), by slow intravenous injection:  **Adult**: 30 ml, calcium gluconate 10% (providing approximately 6.8 mmol of calcium) should be administered as a single dose, repeat dose if no improvement in ECG within 5 to 10 minutes.  **Adult:**  **Beta-blocker toxicity**, IV:60 mg/kg over 5-10 minutes (max. 3-6g/dose); may repeat every 10-20 minutes for 3-4 additional doses.  **Beta-blocker toxicity**, IV infusion: 60-120 mg/kg/hour.  **Urgent correction of acute hypocalcaemia, hyperkalaemia or hypermagnesemia, CCB toxicity**, by slow IV:  **Neonate, infant, or child**: 50 mg/kg as a single dose; maximum dose 200 mg (20 ml); repeat dose after 10 minutes if necessary; if ineffective, consider IV infusion.  **Maintenance correction of acute hypocalcaemia, hyperkalaemia or hypermagnesemia, maintenance treatment of CCB toxicity**, continuous IV infusion:  **Neonate**: 200 mg/kg daily over 24 hours, adjusted to response  **Infant or child under 2 years**: 500 mg/kg daily (usual maximum 4 g) over 24 hours  **Child over 2 years**: 4 g over 24 hours |
| Contraindications | Hypersensitivity to the drug, digitalis toxicity, primary or secondary hypercalcemia, hypercalciuria, calcium renal calculi, sarcoidosis, IM/SC administration. |
| Drug interactions | Cardiac glycosides, tetracyclines, vitamin D, verapamil, phenytoin, calcium acetate, bisphosphonates, ceftriaxone, dolutegravir, multivitamins with flouride, phosphate supplements, quinolones, thyroid drugs |
| Side effects | Arrhythmias, circulatory collapse, feeling hot, hyperhidrosis, hypotension, vasodilation, vomiting |
| Cautions | Conditions associated with hypercalcaemia and hypercalciuria, digoxin therapy, renal impairment. |
| Storage condition | Store below 300C |
| **Deferoxamine mesylate (Deferoxamine)** | |
| Pharmacological class | Iron chelating agent, Antidote |
| Dosage form | Powder for injections: 500mg in vial |
| **Indications** | Iron poisoning, aluminium overload in dialysis patients, chronic iron overload |
| Dose and administration | **Iron poisoning; by continuous intravenous infusion**:  **Adult**: Initially up to 15 mg/kg/hour, max. 80 mg/kg in 24 hours, dose to be reduced after 4–6 hours, in severe cases.  **Chronic iron overload**, by SC or IV infusion: Lowest effective dose (usually within range of 20–60 mg/kg/day) 4–7 days a week  **Aluminium overload in end-stage renal failure,** by IV infusion: 5 mg/kg, once a week during last hour of dialysis; diagnosis of iron overload, by IM injection, 500 mg  **Diagnosis of aluminium overload**, by IV infusion: 5 mg/kg during last hour of dialysis  **Child:** The preferred route of administration is IV.  **Acute iron poisoning, slow IV infusion:**  **Neonate, infant,** or **child:** Initially 15 mg/kg/hour, reduced after 4–6 hours so that total dose does not exceed 80 mg/kg in 24 hours; maximum dose 6 g/day  **Acute iron poisoning, by IM:** 50 mg/kg/dose every 6 hours; maximum dose 6 g/day  **Chronic iron overload**, SC or IV infusion:  **Infant** or **child:** Initially up to 30 mg/kg over 8–12 hours, on 3–7 days per week; for established iron overload, the dose is usually between 20 and 50 mg/kg daily; the dose should reflect the degree of iron overload; use the lowest effective dose  Diagnosis of iron overload, by IM:  **Child:** 500 mg |
| Contraindications | Severe renal disease or anuria, pregnant women or women who may become pregnant. |
| Drug interactions | Acetylsalicylic acid (aspirin), valproate sodium (valproic acid), ciprofloxacin, vitamin C (ascorbic acid), multivitamins with fluoride. |
| Side effects | Injection site reactions including redness, pain, swelling, rashes and itch, hypotension (especially when given too rapidly by IV injection), fever, arthralgia, myalgia, rash, anaphylactoid reactions, renal failure, non-cardiogenic pulmonary oedema, disturbances of hearing and vision (including lens opacity and retinopathy), anaphylaxis, acute respiratory distress syndrome, neurological disturbances. |
| Cautions | Impaired renal function, aluminium-related encephalopathy (may exacerbate neurological dysfunction), pregnancy. |
| Storage condition | Store at 20°C to 30°C, excursions permitted between 15°C and 30°C. |
| **Digoxin Immune Fab (Ovine)/ Digoxin-specific, Antibody fragments** | |
| Pharmacological class | Digoxin-specific antibody, Antidotes |
| Dosage form | Powder for injection: 40mg |
| **Indications** | Treatment of known or strongly suspected life-threatening digoxin toxicity associated with ventricular arrhythmias or bradyarrhythmia unresponsive to atropine |
| Dose and administration | **Acute ingestion of unknown quantity**, by IV infusion:  Administer 20 vialsor consult product literature.  *Note****:*** *Each vial of digi fab (40mg) binds 0.5mg digoxin.* |
| Contraindications | Hypersensitivity to the drug or any of the excipients. |
| Drug interactions | Amiodarone, arsenic trioxide, calcium channel blockers, beta blockers, cholesterol medications |
| Side effects | Hypokalaemia, hyperkalaemia, headache, confusional state, nausea, vomiting, diarrhoea, constipation, abdominal distension, fatigue, infusion site phlebitis, renal failure, influenza-like illness. |
| Cautions | Renal or cardiac failure, pregnancy, breast feeding. |
| Storage condition | Store between 2 and 8°C. Do not freeze. Protect from light. |
| **Flumazenil** | |
| Pharmacological class | Benzodiazepine antagonist, Antidote |
| Dosage form | Injection: 0.1 mg/ml in 5 ml ampoule |
| **Indications** | Diagnosisand/or management of benzodiazepine overdose, reversal of sedation following anaesthesia with benzodiazepine |
| Dose and administration | **Reversal of sedative effects of benzodiazepines in anaesthesia and clinical procedures**; **by intravenous injection**:  **Adult:**  200 mcg, dose to be administered over 15 seconds, then 100 mcg every 1 minute if required; usual dose 300–600 mcg; maximum 1 mg per course.  **Reversal of sedative effects of benzodiazepines in intensive care**: 300 mcg, dose to be administered over 15 seconds, then 100 mcg every 1 minute if required; maximum 2 mg per course.  **Reversal of sedative effects of benzodiazepines in intensive care (if drowsiness recurs after injection):** 100–400 mcg/hour, adjusted according to response, alternatively (by intravenous injection) 300 mcg, adjusted according to response.  **Paediatric,** by intravenous injection:  **Reversal of sedative effects of benzodiazepines**:  **Neonate**: 10 mcg/kg every 1 minute, dose to be administered over 15 seconds.  **Child**: 10 mcg/kg every 1 minute (max. per dose 200 mcg); dose to be administered over 15 seconds, maximum 1 mg per course, maximum 50 mcg/kg per course.  **Reversal of sedative effects of benzodiazepines** (if drowsiness recurs after injection):  **Neonate**: 2–10 mcg /kg/hour, adjusted according to response  **Child**: 2–10 mcg /kg/hour (max. per dose 400 mcg /hour), adjusted according to response  **Reversal of sedative effects of benzodiazepines in intensive care**:  **Child**: 10 mcg/kg every 1 minute (max. per dose 200 mcg), dose to be administered over 15 seconds, maximum 2 mg per course, maximum 50mcg/kg per course.  Notes: For continuous IV infusion, dilute with glucose 5% or sodium chloride 0.9%. |
| Contraindications | Patients given benzodiazepines for the management of raised intracranial pressure, status epilepticus |
| Drug interactions | Zolpidem, tricyclic antidepressants. |
| Side effects | Seizure, anxiety, diplopia, dry mouth, eye disorders, flushing, headache, hiccups, hyperhidrosis, hyperventilation, hypotension, insomnia, nausea, palpitations, paraesthesia, speech disorder, tremor, vertigo, vomiting |
| Cautions | Rapid injection following major surgery or in high-risk or anxious patients, benzodiazepine dependence, elderly, head injury, history of panic disorders, hypersensitivity to benzodiazepines, hepatic impairment, risk of respiratory failure, breast-feeding |
| Storage condition | Stored between 15 to 30°C |
| **Lipid Emulsion** | |
| Pharmacological class | Antidote |
| Dosage form | Injection: 20% (200 to 500ml) |
| Indications | Local anaesthetic, systemic toxicity |
| Dose and administration | By IV route:  **Adult:** initial bolus dose of 1.5 ml/kg over 1 minute, followed by an infusion of 15 ml/kg/hour. After 5 minutes, if cardiovascular stability has not been restored or circulation deteriorates, give a maximum of two further bolus doses of 1.5 ml/kg over 1 minute, 5 minutes apart, and increase the infusion rate to 30 ml/kg/hour. Continue infusion until cardiovascular stability and adequate circulation are restored or maximum cumulative dose of 12 ml/kg is given. |
| Contraindications | Hypersensitivity to the drug, severe liver damage, acute shock |
| Drug interactions | Heparin, soya-bean oil, coumarin derivatives |
| Side effects | Cholestasis, increase in blood bilirubin, cytolytic hepatitis, cholecystitis, abnormalities in liver function tests, increase in pancreatic enzymes |
| Cautions | Fat overload syndrome may occur, usually reversible upon discontinuation. |
| Storage condition | Store below 30 °C. |
| **Methylene Blue (Methylthioninium chloride)** | |
| Pharmacological class | Antidotes |
| Dosage form | Injection: 10 mg/ml in 10 ml ampoule. |
| Indications | Drug-induced methemoglobinemia. |
| Dose and administration | **Drug- or chemical-induced methemoglobinemia**, by slow IV injection:  **Adult**: Initially 1–2 mg/kg, then 1–2 mg/kg after 30–60 minutes if required, to be given over 5 minutes; maximum 7 mg/kg per course.  **Child 3 months–17 years**: Initially 1–2 mg/kg, then 1–2 mg/kg after 30–60 minutes if required, to be given over 5 minutes; maximum 7 mg/kg per course. |
| Contraindications | Cyanide poisoning, renal insufficiency. |
| Drug interactions | Selective serotonin reuptake inhibitors, bupropion, buspirone, clomipramine, mirtazapine, venlafaxine, tramadol, fentanyl, pethidine, dextromethorphan, alcohol, amphetamine, alpha1 agonists, atropine, carbamazepine, linezolid, methyldopa, metoclopramide, TCAs, dopamine. |
| Side effects | Abdominal pain, anxiety, chest pain, dizziness, headache, hyperhidrosis, nausea, pain in extremity, paraesthesia, skin reactions, urine discoloration, vomiting. |
| Cautions | Chlorate poisoning, G6PD deficiency, methemoglobinemia, renal impairment, pregnancy, breastfeeding |
| Storage condition | Store below 30°C. Do not refrigerate or freeze. Protect from light. |
| **Naloxone Hydrochloride** | |
| Pharmacological class | Opioid receptor antagonist, antidote for opioid toxicity |
| Dosage form | Injection: 400 mcg (hydrochloride) in 1 ml ampoule. |
| Indications | For the complete/partial reversal of narcotic depression including respiratory depression induced by opioids, diagnosis of suspected acute opioids overdosage. |
| Dose and administration | **Acute opioid overdose–high-dose regimen** (when rapid titration with naloxone is necessary to reverse potentially life-threatening effects), by intravenous injection:  **Adult:** Initially 400 mcg, then 800 mcg for up to 2 doses at 1-minute intervals if no response to preceding dose, then increased to 2 mg for 1 dose if still no response (4 mg dose may be required in seriously poisoned patients), then review diagnosis.  **Neonate**: Initially 100 mcg/kg, if no response, repeat at intervals of 1 minute to a total maximum of 2 mg.  **Child 1 month–11 years**: Initially 100 mcg/kg (max. per dose 2 mg), if no response, repeat at intervals of 1 minute to a total maximum of 2 mg. |
| Contraindications | Hypersensitivity to opioids, respiratory depression |
| Drug interactions | Clonidine, alfentanil, butorphanol, codeine, methadone, oxycodone |
| Side effects | Arrhythmias, dizziness, headache, hypertension, hypotension, nausea, vomiting, diarrhoea, dry oral, hyperhidrosis, hyperventilation, tremor |
| Cautions | Dependence may precipitate withdrawal symptoms, pre-existing cardiac disease, narcotic dependency, neonates, pregnancy, lactation |
| Storage condition | Store below 30°C in airtight containers. Protect from light. |
| **Penicillamine** |  |
| Pharmacological class | Chelating agent, Antidotes |
| Dosage form | Capsule/tablet: 125mg, 250mg |
| Indications | Treatment of heavy metal poisonings (arsenic, lead, copper), Wilson's disease, rheumatoid arthritis. |
| Dose and administration | **Heavy metal poisoning**: 900mg-1800mg daily. Duration of treatment is dictated by the urinary heavy metal excretion. Simultaneous **oral** vitamin B6 replacement with at least 40mg daily is essential  **Wilson's disease**: 0.25g - 1.5g daily in divided doses on an incremental basis. Maximal daily dose: 2g. Maintenance dose: 0.75g - 1g daily.  **Severe active rheumatoid arthritis**:  **Adult**: Initially 125–250 mg daily for 1 month, then increased in steps of 125–250 mg, at intervals of not less than 4 weeks; maintenance 500–750 mg daily in divided doses, may be increased further if no response and patient tolerate; then reduced in steps of 125–250 mg every 12 weeks, dose reduction attempted only if remission sustained for 6 months; maximum 1.5 g per day  **Elderly**: Initially up to 125 mg daily for 1 month, then increased in steps of up to 125 mg, at intervals of at least 4 weeks; maximum 1 g per day  *Note: Doses should be administered 1 hour before meals and at bedtime.* |
| Contraindications | Hypersensitivity to the drug, aplastic anaemia/agranulocytosis, myasthenia gravis, rheumatoid arthritis, renal insufficient, abnormalities of the haemopoietic system, glomerulonephritis, pregnancy, lactation |
| Drug interactions | Aluminium hydroxide or phosphate, potassium sulfate, magnesiumsulfate or carbonate or hydroxide or oxide or trisilicate or chloride or supplement, sodium bicarbonate, iron preparations, digoxin, aurothioglucose, antimalarials, immunosuppressants, phenylbutazone, promazine, tenofovir, zinc, gold, antimalarial, cytotoxic drug |
| Side effects | Nausea, vomiting, diarrhea, myelosuppression, taste alterations, proteinuria, cutaneous reactions, myasthenia gravis, optic neuritis, tinnitus, thrombocytopenia, renal toxicity |
| Cautions | Allergy to penicillin, renal dysfunction, lupus erythematosus, serious, pregnancy, breast feeding |
| Storage condition | Store below 30°C. Protect from light. Do not freeze. |
| **Physostigmine** | |
| Pharmacological class | Cholinesterase inhibitor, antidote. |
| Dosage form | Injectable solution:1 mg/ml |
| Indications | Reversal of anticholinergic effects (e.g. atropine poisoning). |
| Dose and administration | **Adult**: Initail, 0.5-2mg slow IV/IM injection (not to exceed 1mg/minute), dose may be repeated every 20 minutes as needed if no response.  **Child**:0.02 mg/kg (not to exceed 0.5 mg/minute), dose may be repeated every 5-10 minutes as needed if no response; and cumulative dose not to exceed 2mg. |
| Contraindications | known hypersensitivity to the drug or any ingredient, asthma, gangrene, diabetes, cardiovascular disease, mechanical obstruction of the intestinal or urogenital tract, vagotonic state. |
| Drug interactions | Triamcinolone acetonide, vitamins, methacholine, bethanechol, succinylcholine, salicylate allergy. |
| Side effects | Nausea, vomiting, diarrhea, epigastric pain, miosis, salivation, sweating, lacrimation, dyspnea, bronchospasm, seizure, bradycardia, CV collapse, hallucinations. |
| Cautions | Epilepsy, parkinsonian syndrome, bradycardia, cholinergic crisis, pregnancy, breast feeding. |
| Storage condition | Store between 15 and 30°C. |
| **Phytomenadione (Vitamin K1)** | |
| Pharmacological class | Haemostatic, vitamin |
| Dosage form | Injection: 1 mg/ml; 10 mg/ml in ampoule.  Tablet: 10 mg. |
| Indications | Coagulation disorders |
| Dose and administration | **Major bleeding in patients on warfarin** (in combination with dried prothrombin complex or fresh frozen plasma), by slow IV injection:  **Adult**: 5 mg to 10mg for 1 dose, stop warfarin treatment  **Prophylaxis of hemorrhagic disease of the newborn**, IM:  **Child:** 0.5–1 mg as single dose at birth  **Prophylaxis of hemorrhagic disease of the newborn**, oral:  **Child:**2 mg followed by a second dose after 4–7 days and, for breastfed babies, a third dose after 1 month  **Prophylaxis of hemorrhagic disease of the newborn**, IV:  **Child:** Pre-term neonate: 400 mcg/ kg (maximum 1 mg).  **Warfarin-induced hypoprothrombinemia with no or minor bleeding**, IV: **Child 1 month–12 year**s: 15–30 mcg/ kg (maximum 1 mg) as a single dose, repeated as necessary  **Warfarin-induced hypoprothrombinemia**: Reversal of anticoagulation or if significant bleeding, treatment of hemorrhage associated with vitamin K deficiency, IV: Child 1 month–12 years: 250–300 mcg/kg (maximum 10 mg) as a single dose |
| Contraindications | Hypersensitivity To the drug, menadione (K3) administration in glucose-6-phosphate dehydrogenase deficiency |
| Drug interactions | Warfarin, NSAIDs |
| Side effects | Anaphylaxis, dyspnoea, cyanosis, pain, swelling, phlebitis at the injection site, diaphoresis, dizziness, hypotension, allergic reactions after SC and IM injection. |
| Cautions | G6PD deficiency, hepatic impairment, pregnancy, breast feeding, |
| Storage condition | Store below 30°C. Protect from light. Do not freeze. |
| **Pralidoxime Chloride** | |
| Pharmacological class | Cholinesterase reactivator, antidote |
| Dosage form | Powder for injection: 1 g in vial |
| Indications | Treatment of organophosphate poisoning, overdosage by anticholinesterase drugs used in the treatment of myasthenia gravis |
| Dose and administration | **Adjunct to atropine in the treatment of poisoning by organophosphorus insecticide or nerve agent,** by IV Infusion:  **Adult**: Initially 30 mg/kg, to be given over 20 minutes, followed by 8 mg/kg/hour; maximum 12 g per day  **Child**: Initially 30 mg/kg, to be given over 20 minutes, followed by 8 mg/kg/hour; maximum 12 g per day. |
| Contraindications | Poisoning with carbamates, poisoning with organophosphorus compounds without anticholinesterase activity. |
| Drug interactions | Succinylcholine, barbiturates, morphine, theophylline, aminophylline, reserpine, phenothiazine-type tranquilizers |
| Side effects | Drowsiness, dizziness, disturbances of vision, nausea, tachycardia, headache, hyperventilation, and muscle weakness; laryngospasm, muscle rigidity (due to rapid IV injection of pralidoxime) |
| Cautions | Renal impairment, myasthenia gravis |
| Storage condition | Store below 30°C. |
| **Protamine Sulphate** | |
| Pharmacological class | Antidote |
| Dosage form | Injection: 10mg/ml in 5ml ampoule |
| Indications | Heparin overdose, neutralization of heparin administered during extracorporeal circulation |
| Dose and administration | If heparin was given IV less than 15 minutes ago, the dose is 1 mg of protamine sulfate per 100 units of heparin. For heparin given between 30 to 60 minutes ago, the dose is reduced to 0.5 to 0.75 mg of protamine sulfate per 100 units of heparin. If more than 2 hours have passed, only 0.25 to 0.375 mg per 100 units of heparin is needed. For SC heparin, the dose is typically 1 mg of protamine sulfate per 100 units of heparin.  *Note: Protamine sulphate usually is administered by very slow IV injection over 10 minutes. No more than 50mg of the drug should be administered in any 10-minute period.* |
| Contraindications | Hypersensitivity to the drug, bleeding without heparin use |
| Drug interactions | There are no significant drug interactions |
| Side effects | Anaphylaxis, transient neutropenia, bradycardia, flushing, systemic hypotension, pulmonary hypertension, dyspnoea, nausea, vomiting. |
| Cautions | Anticoagulant effect, fish allergies, rapid administration or high dose, monitor aPTT |
| Storage condition | Store at 2-80C. Don’t freeze. |
| **Prussian Blue (Ferric hexacyanoferrate (II)** | |
| Pharmacological class | Antidotes (Other Ion-removing Agents) |
| Dosage form | Capsule for oral administration (powder): 500mg |
| Indications | Known or suspected internal contamination with radioactive cesium and/or radioactive or nonradioactive thallium following accidental exposure and/or intentionfal exposure from radioactive terrorism or warfare. |
| Dose and administration | **Poisoning and Radioactive Exposure**  **Cesium Poisoning,** oral:  **Adult:** 3 g 3 times daily. Once internal radiation has decreased substantially, reduce dosage to 1 or 2 g 3 times daily (to improve GI tolerance). Continue for a minimum of 30 days. Duration of therapy based on level of contamination and clinical judgment.  **Thallium Poisoning,** oral:  **Adult:** 3 g 3 times daily. Duration of therapy based on level of contamination and clinical judgment.  **Poisoning and Radioactive Exposure**  **Cesium Poisoning,** oral:  **Children 2–12 years of age**: 1 g 3 times daily. Children ≥13 years of age: 3 g 3 times daily. Once internal radiation has decreased substantially, reduce dosage to 1 or 2 g 3 times daily (to improve GI tolerance). Continue for a minimum of 30 days. Duration of therapy based on level of contamination and clinical judgment.  **Thallium Poisoning,** oral:  **Children 2–12 years of age**: 1 g 3 times daily. Children ≥13 years of age: 3 g 3 times daily. Duration of therapy based on level of contamination and clinical judgment. |
| Contraindications | There are no known contraindications |
| Drug interactions | Tetracycline |
| Side effects | Constipation, GI distress, hypokalemia. |
| Cautions | Hypokalaemia, hepatic impairment, blue discoloration of sweat and tears, pregnancy. |
| Storage condition | Store between 15 and 30°C in dark place |
| **Snake venom antiserum polyvalent** | |
| Pharmacological class | Snake antivenom |
| Dosage form | Injection: 10ml |
| Indications | To treat snake bites by venomous snakes. |
| Dose and administration | Administered diluted in saline IV over 20 minutes. Rapid IV push can be given if the patient is hemodynamically unstable or in cardiac arrest. |
| Contraindications | Hypersensitivity to the drug to equine sera |
| Drug interactions | There are no known contraindications |
| Side effects | Anaphylaxis, serum sickness characterized by fever, rash, arthralgia, myalgia, abdominal pain. |
| Cautions | Sensitisation to heterologous protein |
| Storage condition | Store below 30°C. Protect from light. |
| **Sodium bicarbonate** | |
| Pharmacological class | Urine alkalinizing agent, antidote |
| Dosage form | Tablet:**325 mg,** 650 mg  Injection: 4%, 4.2%, 7.5%, 8.4% (1 mmol/ml) |
| **Indications** | For acceleration of excretion in drug intoxication (where excretion of the drug into the urine is accelerated by elevated urine pH), metabolic acidosis secondary to underlying diseases |
| Dose and administration | **Alkalinisation of urine, relief of discomfort in mild urinary-tract infections,** oral:  **Adult:**  3 g every 2 hours until urinary pH exceeds 7, to be dissolved in water.  **Maintenance of alkaline urine,** oral:  **Adult:**5–10 g daily, to be dissolved in water  **Chronic acidotic states such as uraemic acidosis or renal tubular acidosis; oral:**  **Adult:** 4.8 g daily, (57 mmol each of Na+ and HCO3–), higher doses may be required and should be adjusted according to response  **Severe metabolic acidosis,** by slow IV injection:  **Adult**: Administer an amount appropriate to the body base deficit, to be given by slow intravenous injection of a strong solution (up to 8.4%), or by continuousIV infusion of a weaker solution (usually 1.26%).  **Child**: Continuous IV infusion with 1.4% solution co-infused withisotonic sodium chloride or by slow infusion of 8.4% solution. |
| Contraindications | Hypokalaemia, salt restricted diet, conditions associated with sodium retention, history of urinary calculi, hypernatremia, hypocalcaemia, hypochlorhydria, metabolic or respiratory alkalosis, abdominal pain. |
| Drug interactions | Amphetamine, aspirin, chlorpropamide, dextroamphetamine, ephedrine, itraconazole, ketoconazole, lithium, pseudoephedrine, flecainide |
| Side effects | Gastrointestinal cramps, flatulence, metabolic alkalosis, hypokalemia, hypernatremia, edema, tissue necrosis, ulcerationwith extravasation |
| Cautions | Renal impairment, peptic ulcer, congestive heart failure, oedema, cirrhosis, hypertension, ensure adequate ventilation during cardiopulmonary resuscitation. |
| Storage condition | Store below 300C. Protect from light and moisture |
| **Sodium Nitrite** |  |
| Pharmacological class | Antidote for cyanide poisoning |
| Dosage form | Injection: 30 mg/ml in 10 ml ampoule |
| Indications | Cyanide poisoning (in conjunction with sodium thiosulphate). |
| Dose and administration | **Adult**: 300 mg sodium nitrite IV over 3 minutes followed after 5 minutes with 12.5g sodium thiosulphate IV administered over 10 minutes.  **Child**: 4 - 10 mg/kg of sodium nitrite (max: 300 mg) followed by 400 mg/kg of sodium thiosulfate, as a 25 or 50% solution (max: 12.5 g). If symptoms of cyanide toxicity recur, the doses of nitrite and thiosulfate may be repeated after 30 min at half the initial doses. |
| Contraindications | Hypersensitivity to the drug |
| Drug interactions | There are no significant drug interactions |
| Side effects | Arrhythmias, dizziness, headache, hypotension, methemoglobinemia, palpitations, nausea, vomiting, abdominal pain, flushing, cyanosis, dyspnoea, blurred vision |
| Cautions | Hypotension, methaemoglobin formation. Monitor to ensure adequate perfusion and oxygenation. |
| Storage condition | Store below 30°C; excursions permitted from 15 to 30°C. |
| **Sodium Thiosulphate** | |
| Pharmacological class | Antidote for cyanide poisoning |
| Dosage form | Injection: 250 mg/ml in 50 ml ampoule. |
| **Indications** | Poisoning with cyanides (used in conjunction with sodium nitrite) |
| Dose and administration | IV:  **Adult**: To be given after 300 mg of sodium nitrite has been admin over 5-20 minutes: 12.5 g of sodium thiosulfate (50 ml of a 25% solution or 25 ml of a 50% solution) given over 10 minutes. If symptoms of cyanide toxicity recur, the doses of nitrite and thiosulfate may be repeated after 30 min at half the initial doses.  **Child**: To be given after 4-10 mg/kg of sodium nitrite (max: 300 mg) has been admin: 400 mg/kg of sodium thiosulfate, as a 25 or 50% solution (max: 12.5 g). If symptoms of cyanide toxicity recur, the doses of nitrite and thiosulfate may be repeated after 30 min at half the initial doses. |
| Contraindications | Hypersensitivity to the drug or any other components. |
| Drug interactions | Cisplatin |
| Side effects | Diarrhoea, allergic contact dermatitis, hypenatraemia, hypokalemia, hypophosphatemia, hypermagnaemia, hypotension, nausea, vomiting, diuresis, metabolic acidosis |
| Cautions | Congestive heart failure, liver cirrhosis, renal impairment, toxaemia of pregnancy, oedematous sodium-retaining conditions. |
| Storage condition | Store between 20°C and 25°C; excursions permitted from 15 to 30°C. Protect from direct light. |