FOREWORD

The publication of the 8th edition of National Essential Medicines Formulary (NEMF) by the Essential Medicines and Technology Division (EMTD) is an important milestone in promoting rational use of medicine and sustainability of free essential medicines from all health centres in the country. The 8th edition of the Bhutan Essential Medicines Formulary has been developed following the changes in the National Essential Medicines List (NEML) 2016.

The formulary gives ready reference on the essential medicines supplied through the Department of Medical Supplies and Health Infrastructure (DMSHI). It will give clinicians and other health professionals a better understanding of the indications, the dosages, side effects, cautions and contraindications of the essential medicines. I urge all the clinicians and medical colleagues to adhere to them for the benefit of the patient and the country.

I hope this revised formulary will be of great use and informative. The Department of Medical Services is grateful to World Health Organization for funding the revision and publication of this edition.

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Director
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PREFACE

The first edition of the NEMF was published in the year 1994. Since then subsequent editions were brought out as per changes in the NEML and the current edition is based on the NEML, 2016. The revision has been made with the objective to keep pace with the advancement in medicine information and to meet the challenges of modern healthcare in Bhutan.

As in the previous editions, the medicines in NEMF, 2016 is arranged according to therapeutic groups. For each medicine, latest information on the uses, the dosage, side effects, cautions and contraindications are provided. Information under appendix including medicine interactions, protocol for malaria treatment, immunization schedule and emergency treatment of poisoning has also been updated. Further, the editors have adopted the World Health Organization (WHO) recommendation to replace the word "drug" with "medicine".

It is hoped that these changes and additions would provide the necessary information to all the health professionals inorder to provide better healthcare to all those who are in need.

ACKNOWLEDGEMENTS

The Essential Medicine and Technology Division (EMTD) is grateful to individuals and organisations that have provided advice and information to the National Essential Medicine Formulary and also to World Health Organization (WHO) for the financial assistance ..

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Special thanks are also due to the Chairperson and the members of National Medicine Committee (NMC) for the review and endorsing the formulary.

The NEMF 2016 has been developed over a period of several years and with input of a large number of individuals whose help is also gratefully acknowledged.

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Contents

General guidance on prescribing

Medicines should only be prescribed when they are necessary, and in all cases the benefit of administering the medicine should be considered in relation to the risk involved. Bad prescribing habits lead to ineffective and unsafe treatment, prolongation of illness, distress and harm to the patient, and higher cost.

Rational approach to therapeutics:

1. Define the patient's problem

Whenever possible, making the right diagnosis is based on integrating many pieces of information: the complaint as described by the patient; a detailed history; physical examination; laboratory tests; and X-rays and other investigations. This will help in rational prescribing, always bearing in mind that diseases are evolutionary processes.

2. Specify the therapeutic objective

Clincians must clearly state their therapeutic objectives based on the pathophysiology underlying the clinical situation. Very often physicians must select more than one therapeutic goal for each patient.

3. Select the therapeutic strategies

The selected strategy should be agreed with the patient; this agreement on outcome, and how it may be achieved, is termed concordance. The selected treatment can be non-pharmacological and/or pharmacological; it also needs to take into account the total cost of all therapeutic options.

a. Non-pharmacological treatment

It is very important to bear in mind that the patient does not always need a medicine for treatment of their condition. Very often, health problems can be resolved by a change in lifestyle or diet, use of physiotherapy or exercise, provision of adequate psychological support, and other non-pharmacological treatments; these have the same importance as a prescription medicines, and instructions for such treatments must be written, explained, and monitored in the same way.

b. Pharmacological treatment

Selecting the correct group of medicines: Knowledge about the pathophysiology involved in the clinical situation of each patient and the pharmacodynamics of the chosen group of medicines, are the two fundamental principles for rational therapeutics.

Selecting the medicine from the chosen group: The selection process must consider benefit/risk/cost information. This step is based on evidence about maximal clinical benefits of the medicine for a given indication (efficacy) with the minimum production of adverse effects (safety). It must be remembered that each medicine has adverse effects and it is estimated that up to 10% of hospital admissions in industrialized countries are due to adverse effects. Not all medicine-induced injury can be prevented but much of it is caused by inappropriate selection of medicines. In cost comparisons between medicines, the cost of the total treatment and not only the unit cost of the medicine must be considered.

Verifying the suitability of the chosen pharmaceutical treatment for each patient: The prescriber must check whether the active substance chosen, its dosage form, standard dosage schedule, and standard duration of treatment are suitable for each patient. Medicine treatment should be individualized to the needs of each patient.

Prescription writing: As the prescription is the link between the prescriber, the pharmacist (or dispenser), and the patient, it is vital to the successful management of the presenting medical condition.

Giving information, instructions, and warnings: This step is important to ensure patient adherence and is covered in detail in a following section with medicine treatment).

Monitoring treatment: Evaluation of the follow-up and the outcome of treatment allows the stopping of it (if the patient's problem is solved) or its reformulation it when necessary. This step gives rise to important information about the effects of medicines, contributing to the building up of the body of knowledge of pharmacovigilance, which is needed to promote the rational use of medicines.

Variation in dose–response

Success in medicine treatment depends not only on the correct choice of medicine but on the correct dose regimen. Unfortunately, medicine treatment frequently fails because the dose is too small or produces adverse effects because it is too large. The concept of a standard or "average" adult dose for every medicine is firmly rooted in the mind of most prescribers. After the initial "dose ranging" studies on new drugs, manufacturers recommend a dosage that appears to produce the desired response in the majority of subjects. These studies are usually done on healthy, young male Caucasian volunteers, rather than on older men and women with illnesses and of different ethnic and environmental backgrounds. The use of standard doses in the marketing literature suggests that standard responses are the rule, but in reality there is considerable variation in medicine response. There are many reasons for this variation which include adherence, medicine formulation, body weight and age, composition, variation in medicie absorption, distribution, metabolism, and excretion, variation in pharmacodynamics, disease variables, and genetic and environmental variables.

Medicine formulation: Enteric-coated medicines have been known to pass through the gastrointestinal tract intact. In medicines with a narrow therapeutic to toxic ratio, changes in absorption can produce sudden changes in medicine concentration.

Body weight and age: Although the concept of varying the dose with the body weight or age of children has a long tradition, adult doses have been assumed to be the same irrespective of size or shape. Yet adult weights vary 2- to 3-fold, while a patient with a large fat mass can store large excesses of highly lipid soluble medicines compared with a lean patient of the same weight. Age changes can also be important. Adolescents may oxidize some medicines relatively more rapidly than adults, while the elderly may have reduced renal function and eliminate some medicines more slowly.

Dose calculation in children: Children's doses may be calculated from adult doses by using age, body weight, or body surface area, or by a combination of these factors.

Body weight may be used to calculate doses expressed in mg/kg. Young children may require a higher dose per kilogram than adults because of their higher metabolic rates. Other problems need to be considered. For example, calculation by body weight in an overweight child may result in much higher doses being administered than necessary; in such cases, dose should be calculated from an ideal weight, related to height and age.

Body Surface Area (BSA) estimates are more accurate for calculation of pediatric doses than body weight because many physiological phenomena correlate better with body surface area. The average body surface area of a 70kg human is about 1.8m^2. Thus, to calculate the dose for a child the following formula may be needed

Approximate dose for patient =

$$\frac{\text{Surface area of child } (m^2)}{1.8} \times \text{adult dose}$$

Where the dose for children is not readily available, prescribers should seek specialist advice before prescribing for a child.

Age	Weight		Height		Body surface area (m^2)
	Kg	Lb	Cm	Inch	
New born	3.5	7.7	50	20	0.23
1 month	4.2	9	55	22	0.26
3 month	5.6	12	59	23	0.32
6 month	7.7	17	67	26	0.4
1 year	10	22	76	30	0.47
3 years	15	33	94	37	0.62
5 years	18	40	108	42	0.73
7 years	23	51	120	47	0.88
12 yrs	39	86	148	58	1.25
Adult					
Male	68	150	173	68	1.8
Female	56	123	163	64	1.6

Physiological and pharmacokinetic variables: Medicine absorption rates may vary widely between individuals and in the same individual at different times and in different physiological states. Medicines taken after a meal are delivered to the small intestine much more slowly than in the fasting state, leading to much lower medicine concentrations. In pregnancy gastric emptying is also delayed, while some medicines may increase or decrease gastric emptying and affect absorption of other medicines.

Medicine distribution: Medicine distribution varies widely: fat-soluble medicines are stored in adipose tissue, water-soluble medicines are distributed chiefly in the extracellular space, acidic medicines bind strongly to plasma albumin, and basic drugs to muscle cells. Hence variation in plasma albumin concentration, fat content or muscle mass may all contribute to dose variation. With very highly albumin-bound medicines like warfarin, a small change of albumin concentration can produce a big change in free medicine and a dramatic change in medicine effect.

Medicine metabolism and excretion: Medicine metabolism is affected by genetic, environmental, and disease-state factors. Medicine acetylation shows genetic polymorphism, whereby individuals fall clearly into either fast or slow acetylator types. Medicine oxidation, however, is polygenic, and although a small proportion of the population can be classified as very slow oxidizers of some medicines, for most medicines and most subjects there is a normal distribution of medicine metabolizing capacity.

Many medicines are eliminated by the kidneys without being metabolized. Renal disease or toxicity of other medicines on the kidney can therefore slow excretion of some medicines.

Pharmacodynamic variables: There is significant variation in receptor response to some medicines, especially central nervous system responses, for example pain and sedation. This can be because of genetic factors, tolerance, medicine interactions, and medicine dependence.

Disease variables: Both liver disease and kidney disease can have major effects on medicine response, chiefly through the effect on metabolism and elimination, respectively (increasing toxicity), but also through their effect on plasma albumin (increasing free drug and thus toxicity). Heart failure can also affect metabolism of drugs with rapid hepatic clearance (for example lignocaine, propranolol). Respiratory disease and hypothyroidism can impair medicine oxidation.

Environmental variables: Many medicines and environmental toxins can induce the hepatic microsomal enzyme oxidizing system or cytochrome P450 oxygenases, leading to more rapid metabolism and elimination, and thus less effective treatment. Environmental pollutants, anaesthetic medicines, and other compounds such as pesticides can also induce metabolism. Diet and nutritional status also affect pharmacokinetics. For example, in infantile malnutrition and in malnourished elderly populations medicine oxidation rates are decreased, while high protein diets, charcoal cooked foods, and certain other foods act as metabolizing enzyme inducers. Chronic alcohol use induces oxidation of other medicines, but in the presence of high circulating alcohol concentrations, medeicine metabolism may be inhibited.

Adherence with the medicine treatment

It is often assumed that once the appropriate medicine is chosen, the prescription correctly written, and the medication correctly dispensed, that it will be taken correctly and treatment will be successful. Unfortunately, this is very often not the case, and physicians overlook one of the most important reasons for treatment failure – poor adherence (compliance) with the treatment plan.

Difficulties in compliance with medicine treatment occur rehardless of age. Factors contributing to poor compliance with prescribed medicines include:

- Prescription not collected or not dispensed;
- Purpose of medicine not clear;
- Perceived lack of efficiacy;
- Real or perceived side effects;
- Patients' perception of the risk and severity of adverse effects may differ from that of the prescriber;
- Instruction for administration not clear;
- Physical difficulty in taking medicines (e.g. with swallowing the medicines);
- Unattractive formulation (e.g. unpleasant taste); and
- Complicated regimen.

The prescriber and the patient should agree on the health outcomes that the patient desires and on the strategy for achieving them ('concordance').

Taking the time to explain to the patient (and relatives) the rationale and the potential adverse effects of treatment may improve adherence. Reinforcement and elaboration of the physician's instructions by the pharmacist and other

members of the healthcare team also helps. Advising the patient of the possibility of alternative treatments may encourage the patient to seek advice rather than merely abandon unacceptable treatment.

Simplifying the medicine regimen may help; the need for frequent administration may reduce adherence, although there appears to be little difference in adherence between once-daily and twice-daily administration.

Adverse effects and interactions

Adverse reactions to medicines: An adverse reaction to medicines may be defined as "any response to a medicine which is noxious, unintended and occurs at doses normally used for prophylaxis, diagnosis, or therapy. Adverse reactions are therefore unwanted or unintended effects of a medicine, which occur during its proper use. They differ from accidental or deliberate excessive dosage or administration.

Adverse reactions may be directly linked to the properties of the medicine in use, known as "A" type reactions. E.g. hypoglycaemia caused by antidiabetic medicines. Adverse reactions may also be unrelated to the known pharmacology of the medicine, known as "B" type reactions. e.g. anaphylaxis with penicillin.

Major factors predisposing to adverse effects are:

Extremes of age: The very young and very old are more susceptible to adverse reactions. For e.g. medicines commonly causing problems in elderly are hypnotics, diuretics, NSAIMs, antihypertensives, psychotropics and digoxin.

All children, and particularly neonates, differ from adults in their response to medicines. Some medicines are likely to cause problems in neonates (e.g. morphine), but are generally tolerated in children. Other medicines (e.g. valproic acid) are associated with increased risk of adverse reactions in children of all ages. Other medicines associated with problems in children include chloramphenicol (grey baby syndrome), antiarrhythmics (worsening of arrhythmias), and acetylsalicylic acid (Reye's syndrome).

Inter current illness: Besides the condition being treated, if the patient is suffering from another disease such as liver, kidney or heart disease, special precautions may be necessary to prevent adverse reactions.

Medicine interactions (*appendix 1*): It is one of the commonest causes of adverse reactions to medicines. It may occur between medicines which compete for the same receptor or which act on the same physiological system. They may also occur indirectly when a medicine-induced disease or a change in fluid or electrolyte balance alters the response to another medicine. In addition, interactions
may occur when one medicine alters the absorption, distribution or elimination of another medicine, such that the amount which reaches the site of action is increased or decreased.

Medicine-medicine interactions are some of the commonest causes of adverse effects. When two medicines are administered to a patient, they may either act independently of each other, or interact with each other. Interaction may increase or decrease the effects of the medicines concerned and may cause unexpected toxicity. As newer and more potent medicines become available, the number of serious medicine interactions is likely to increase. Remember that interactions which modify the effects of a drug may involve non-prescription medicines, non-medicinal chemical agents, and social drugs such as alcohol, marijuana, tobacco, and traditional remedies, as well as certain types of food for example, grapefruit juice. The physiological changes in individual patients, caused by such

factors as age and gender, also influence the predisposition to adverse reactions to medicines resulting from medicine interactions.

Incompatibilities between medicines and Intravenoous fluids: Medicines should not be added to blood, amino acid solutions or fat emulsions. Certain medicines, when added to intravenous fluids, may be inactivated by pH changes, by precipitation or by chemical reaction. Benzylpenicillin and ampicillin lose potency after 6-8 hours if added to dextrose solutions, due to the acidity of these solutions. Some medicines bind to plastic containers and tubing, for example diazepam and insulin. Amino glycosides are incompatible with penicillin and heparin. Hydrocortisone is incompatible with heparin, tetracycline, and chloramphenicol.

Note***: please report any adverse reactions to medicines by filling up the ADR reporting forms and sending it to the Pharmacy Department, JDWNRH or to the Drug Regulatory Authority. The forms may be downloaded from the website: www.dra.gov.bt***

PRESCRIPTION WRITING

Prescriptions should be:

- Written legibly in ink
- Should be dated
- Should state the full name, address, age and gender of the patient
- Should state the name of the medicine in generics with route, dose and frequency, except for syrups and combination medicines.
- Should be signed in ink by the prescriber along with their name and BHMC registration number. It is recommended that they use their seal if they have one.

CONVERSION TABLE

1 kg	= 1000 mg
1 mg	= 1000 mcg
1 mcg	= 0.000001 kg
1 litre	= 1000 ml or cc
1% w/v	= 1g solid/medicine dissolved 100 ml of solution
1% v/v	= 1 ml liquid in 100 ml solution
1% w/w	= 1g solid/medicine in 100g of ointment

1. Antidotes and other substance use in poisoning

1.1 General

CHARCOAL

Activated powder, 450g NRH/RRH/DH/BHU

Therapeutic group general antidote

Indications to bind poisons in the stomach to prevent absorption; to enhance elimination of some medicines after absorption

Contraindications poisoning by corrosive substances (strong acid or alkali); concurrent administration with specific oral antidotes or oral emetics

Cautions drowsy or comatose patient (risk of aspiration); reduced GI motility (risk of obstruction); not for poisoning with petroleum distillates, corrosive substances, alcohols, clofenotane (dicophane, DDT), malathion, and metal salts including iron and lithium salts; ensure adequate fluid intake after administration if poison has diuretic properties

Side effects vomiting, constipation or diarrhoea; black stool

Dose **binding poisons** (particularly useful to prevent absorption of highly toxic poisons): *by oral administration,* ADULT, 50-100g; CHILD 1-2yrs, 25-50g; INFANT: 1g/kg (approx 5ml/kg) as single dose; **active elimination** (To enhance elimination of aspirin, carbamazepine, dapsone, digoxin, phenytoin, phenobarbitone & aminophylline): ADULT, 50g then 25g every 4 hours; CHILD under 1 year, 1 g/kg (approx. 5 ml/kg) every 4-6 hours; CHILD 1-12 years, 25-50 g every 4–6 hours

Refer Appendix 4, under treatment of poisoning

Administration *aqueous slurry of charcoal should be made by suspending in a glass of water and should be administered; following administration of charcoal (after about 2 hours) a cathartic should be administered to enhance removal of poison charcoal complex promptly and to prevent enhanced toxicity; catharsis should occur within 4 to 8 hours after the use of activated charcoal*

1.2 Specific

ATROPINE SULPHATE

Injection, 0.6mg/ml (1ml) NRH/RRH/DH/BHU

Therapeutic group specific antidote; antispasmodic medicines (antimuscarinic)

Indications poisoning with insecticides or mushroom; pre-anaesthetic drying of respiratory tract; reversal of competitive neuromuscular blockade (with neostigmine); relaxation of acute smooth muscle spasm

Contraindications severe tachycardia, cardiovascular disease (IHD)

Cautions lactation (small amount in milk)

Side effects tachycardia, flushing and pupillary dilatation

Dose **poisoning:** *by IM injection,* 2mg repeated every 20 minutes until atropine side effects are seen; **pre-medication**: *by IM injection,* ADULT, 0.3-0.6mg 1 hour before induction; CHILD, 0.02mg/Kg, 1 hour before induction; **reversal of blockade:** *by IV injection,* 1mg with neostigmine 2. 5mg; **spasmolytic:** *by IM injection,*1mg with appropriate analgesia

NOTE *organophosphorous insecticides may be absorbed through the skin; the patient should wash contaminated skin with plenty of water to prevent further absorption*

ANTI-SNAKE VENOM SERUM

Injection, powder for reconstitution (10ml) NRH/RRH/DH/BHU

Therapeutic group specific antidote

Indications treatment of bite from viper, cobra and krait

Contraindications known hypersensitivity to anti-serum, unless the danger to life outweighs the risk; bite by non-poisonous snake, or when puncture marks are not seen

Cautions history of previous serum injections (including antitetanus, antidiphtheria); history of allergy, asthma or eczema; test dose of 0.1ml serum in 0.9ml 0.9% sodium chloride to be injected SC and patient observed for 30 minutes; antihistamine and corticosteroid cover may be required, and adrenaline injection must always be at hand

Side effects local flare or general anaphylactic reaction may be seen after the test dose or during the full dose. Pallor, sweating, nausea, vomiting, urticaria and hypotension are the features of anaphylaxis. Injection of Adrenaline 1ml IM should be given immediately and 0.5ml after 10 minutes if required

Dose *by IV injection,* 10ml immediately; a further 10-20ml may be given after 2 hours or less, and then repeated 6-hourly as required; all injections should be given very slowly, not more than 1ml per minute, and preferably diluted in 100ml sodium chloride 0.9 % and given as a slow IV infusion

NALOXONE

Injection, 0.4mg/ml (1ml) NRH/RRH/DH

Therapeutic group specific antidote

Indications opioid poisoning; reversal of opioid-induced respiratory depression; post-operatively or in the neonate

Cautions patients with pre-existing physical dependence on opioids; cardiac irritability, cardiovascular disease

Side effects nausea, vomiting, tachycardia, fibrillation

Dose **poisoning**: *by IV injection*, ADULT, 0.8-2mg every 2 minutes to a maximum of 10mg; **reversal of respiratory depression**: *by IV injection,* ADULT, 0.1-0.2mg then 0.1mg every 2 minutes; a further 0.1-0.2mg *IM* may be given 1-2 hours later, if required; CHILD, 0.01mg/kg; increase to 0.1mg/kg, if no response (if no IV access, give SC in divided doses); NEONATE: 0.01mg/kg *SC, IM or IV* repeated every 2-3 minutes, or 0.06mg/kg *by IM injection* once only at birth

Note *this medicine is short acting, and repeated injections may be required*

PRALIDOXIME

Injection, 1g NRH/RRH/DH

Therapeutic group antidotes and other substances used in poisoning

Indications adjunct to atropine in the treatment of organophosphorus poisoning or nerve agent

Contraindications poisoning due to carbamates and to organophosphorus compounds without anticholinesterase activity

Cautions renal impairment, myasthenia gravis, pregnancy and lactation

Side effects drowsiness, dizziness, disturbances of vision, nausea, tachycardia, headache, hyperventilation, and muscular weakness

Dose along with resuscitation measures and 2-4 mg atropine injection, administer 1-2 grams of the medicine *IV* as 5% solution in water over not less than 5-10 minutes or as infusion in 100ml sodium chloride 0.9% over 15-30 minutes; repeat therapy if needed; maximum dose, 12g in 24 hrs; *CHILD*, 20-60 mg/kg as required depending on severity of poisoning and response

2. Anaesthetics

2.1. General anaesthetics

HALOTHANE

Inhalational (250ml) NRH/RRH

Therapeutic group general anaesthetic

Indications induction and maintenance of surgical anaesthesia

Contraindications unexplained jaundice following previous halothane anaesthetic ;susceptibility to malignant hyperpyrexia

Cautions enquire about previous exposure/reactions to halothane, heart disease, previous history of post halothane jaundice, head injury, medicines which causes relaxation of the uterus; postpartum haemorrhage may occur

Interactions see appendix 1 under general anaesthetics; avoid concomitant administration with adrenaline due to risk of cardiac failure

Side effects hepatotoxicity (there is an increased risk with frequent exposure to halothane)

Dose **induction**: 1-2 % halothane with or without nitrous oxide and oxygen; gradually introduce halothane up to 2-4% (CHILD: 1.5-2%); **maintenance**: 0.5-2% in gas-flow 8 litres/minute usually adequate

ISOFLURANE

Solution (250ml) NRH/RRH

Therapeutic group general anaesthetic

Indications induction and maintenance of surgical anaesthesia

Contraindications susceptibility to malignant hyperthermia

Cautions pregnancy; interactions

Interactions see appendix 1 under general anaesthetics

Side effects hepatotoxicity in those sensitized with halogenated anaesthetics but the risk is appreciable smaller than with halothane

Dose **induction**: increase gradually from 0.5% to 3%, in oxygen or nitrous oxide-oxygen; **maintenance**: 1-2.5% in nitrous oxide-oxygen; an additional 0.5% -1% may be required when given with oxygen alone; **caesarean section**: 0.5-0.75% in nitrous oxide-oxygen

NITROUS OXIDE

Inhalation gas NRH/RRH

Therapeutic group general anaesthetic and labour analgesia

Indications induction and maintenance of surgical anaesthesia in combination with other anaesthetic agents and muscle relaxants and also analgesia for labour

Contraindications closed collections of air or gas in any body space, including intestinal obstruction, middle ear occlusion, eye surgery and in pneumothorax

Cautions continued post-operative oxygenation may be necessary for elderly patients; fire and explosion may be a risk

Side effects nausea and vomiting; after prolonged administration megaloblastic anaemia and depressed white cell formation; peripheral neuropathy

Dose **anaesthesia**: ADULT and CHILD, nitrous oxide mixed with 25-30% Oxygen; **analgesia**: 50% nitrous oxide mixed with 50% oxygen

OXYGEN

Inhalation gas RH/RH/DH/BHU

Therapeutic group general anaesthetics and oxygen

Indications to maintain oxygen tension in inhalation anaesthesia, ventilatory or cardiac failure, pneumonia, septicemia, pulmonary embolism, severe asthma and respiratory distress syndrome

Cautions fire and explosion may be risk; high oxygen concentrations in incubators have led to the development of retrolental fibroplasia leading to permanent blindness in premature infants

Side effects oxygen concentrations above 80% have toxic effect on the lungs leading to pulmonary congestion, exudation and atelectasis

PROPOFOL

Injection, 10mg/ml (10ml) NRH/RRH/DH

Therapeutic group general anaesthetics (short-acting anaesthetic)

Indications induction and maintenance of general anaesthesia; sedation in adult patients undergoing diagnostic procedures, in those undergoing surgery in conjunction with local or regional anaesthesia, and in ventilated adult patients under intensive care

Contraindications porphyria and hypersensitivity; children 16 years or less

Side effects apnoea, hyperventilation, coughing, pulmonary oedema; hypotension and bradycardia; nausea, vomiting, and headache may occur during recovery

Cautions propofol hypersensitivity, hypervolemia, epilepsy, increased intracranial pressure, lipid metabolism disorders, and in the elderly; hepatic and renal impairment; pregnancy

Interactions see appendix 1 under general anaesthetics

Side effects myocardial depression, laryngeal spasm, cough, sneezing, hypersensitivity reactions, rash, injection site reactions; inadvertent administration intra-arterially can lead to gangrene distally

Dose **induction:** *by IV* infusion, ADULT below 55 years and CHILD over 12 years, 1.5-2.5mg/kg at a rate of 20-40mg every 10 seconds; high risk patients including ADULT over 55 years, neurosurgical, and debilitated patients, 20mg every 10 seconds until response; CHILD 1 month to 12 years, *by IV infusion*, 2.5-4mg/kg (most children over 8 years require an induction dose of 2.5 mg/kg; younger children may require a higher dose within the range of 2.5 to 4 mg/kg); **maintenance**: *by IV infusion*, ADULT and CHILD over 12 years, 4 to 12 mg/kg per hour (or 3 to 6 mg/kg per hour for elderly and debilitated patients) OR *intermittent bolus injections* of 20-50mg; CHILD 1 month to 12 years, *by IV infusion*, 9-15mg/kg/hour; **induction of sedation in diagnostic and surgical**

procedures: ADULT and CHILD over 12 years, initially *by IV injection*, over 3-5 minutes, 0.5-1mg/kg; dose and rate of administration to be adjusted according to response; CHILD 1 month-12 years, 1-2mg/kg; **maintenance of sedation in diagnostic and surgical procedures:** *by IV infusion*, ADULT and CHILD over 12 years, 1.5-4.5mg/kg/hour; dose and rate of administration to be adjusted according to level of sedation; high risk patients including ADULT over 55 years, neurosurgical, and debilitated patients may require lower dose (high risk patients usually require a 20% reduction in the maintenance dose); CHILD 1 month to 12 years *by IV infusion*, 1.5-9mg/kg/kg; **sedation of ventilated patients in intensive care**: *by IV infusion*, ADULT and CHILD over 16 years, 0.3 to 4 mg/kg/hour; if the duration of sedation is in excess of 3 days, lipid concentrations should be monitored

Note: *Propofol is not recommended for use in obstetrics including caesarean section; repeated dose can lead to prolonged recovery and should not be used for maintenance; it has no analgesic activity and supplementary analgesia may be required*

THIOPENTAL SODIUM

Injection, 1g NRH/RRH

Therapeutic group general anaesthetics

Indications induction of general anaesthesia; intractable seizures

Contraindications porphyria and hypersensitivity

Cautions hypotension, reduce induction dose in heart disease, elderly and shock

Overdosage respiratory depression progresses through hypotension to circulatory collapse; repeated dose can lead to prolonged recovery, therefore it should not be used for maintenance

Side effects myocardial depression, laryngeal spasm, cough, sneezing, hypersensitivity reactions, rash, injection site reactions; inadvertent administration intra arterially can lead to gangrene distally

Dose **induction**: *by IV injection,* usually as 2.5% solution over 10-15 seconds, ADULT 4-5mg/kg (reduce in elderly or debilitated patients); CHILD induction 2–7 mg/kg

Note: *after dilution, do not store unused injection for more than 24 hours*

KETAMINE

Injection, 50mg/ml (10ml) NRH/RRH/DH

Therapeutic group general anaesthetic

Indications induction and maintenance of general anaesthesia; used mainly for paediatric anaesthesia

Contraindications hypertension, congestive cardiac failure, stroke, alcoholism, eye injury and glaucoma; psychotic and convulsive disorders

Cautions ADULTs have a high incidence of hallucinations; excessive salivation may occur; always use atropine premedication

Interactions see appendix 1 under general anaesthetics

Side effects hallucinations, irrational behaviour, transient elevation of pulse rate and blood pressure; dysrhythmias and hypotension occasionally reported

Dose *by IM injection*, 10 mg/kg body weight; *by IV injection*, 1-2mg/ kg body weight

Note: *diazepam administered before, during or after anaesthetic reduces incidence of hallucinations*

MIDAZOLAM

Injection 1mg/ml (10ml) NRH/RRH/DH

Therapeutic group general anaesthetic (benzodiazepine)

Indications sedation with amnesia; sedation in intensive care; premedication, induction of anaesthesia

Contraindications marked neuromuscular respiratory weakness including myasthenia gravis; severe respiratory depression; acute pulmonary insufficiency

Cautions cardiac and respiratory disease, myasthenia gravis; history of medicine or alcohol abuse; reduce dose in elderly; avoid prolonged use (and abrupt withdrawal thereafter)

Side effects GI disturbances, increased appetite, jaundice, hypotension, cardiac arrest, heart rate changes, anaphylaxis, thrombosis, laryngospasm and bronchospasm; respiratory depression (and respiratory arrest with high doses or on rapid infusion); drowsiness, confusion, ataxia, amnesia, euphoria, hallucination, dizziness, vertigo, paradoxical excitement and aggression; urinary retention, incontinence, changes in libido, blood disorders, muscle weakness, visual disturbances; skin reactions; on IV injection, pain and thrombophlebitis

Dose **conscious sedation**: *by slow IV injection,* (approx. 2mg/min), initially 2-2.5mg (ELDERLY 0.5-1mg), increase if necessary in steps of 1mg (ELDERLY 0.5-1mg); *by IV injection,* over 2-3 minutes, CHIDL 6 months-5 years, initially, 50-100mcg/ kg, dose increased if necessary in steps (max. 6mg), CHILD 6-12 years, initially 25-50mcg/kg, dose increased in steps (max. 10 mg)*; By IM injection,* CHILD 1-15 years, 50-150mcg/kg (max. 10 mg); **sedative in combined anaesthesia**: *by IV injection*, 30-100 mcg/kg repeated as required; CHILD not recommended; **premedication**: *by deep IM injection*, 70-100 mcg/kg, 20 to 60 minutes before induction; CHILD 1-15 years 80-200 mcg/kg; **induction**: *by slow IV injection,* 150-200 mcg/kg; doses increased in steps not greater than 5 mg every 2 minutes (max. 600 mcg/kg); CHILD over 7 years, 150 mcg/kg; **sedation in intensive care**: *by slow IV injection*, initially 30-300 mcg/kg given in steps of 1-2.5 mg every 2 minutes, then *by slow IV injection* or *IV infusion*, 30-200 mcg/kg/hour; reduce dose (or omit initial dose) in hypervolemia, vasoconstriction, or hypothermia; lower doses may be adequate if opioid analgesic also used; NEONATE under 32 weeks gestational age, *by IV infusion*, 30 mcg/kg/hour, NEONATE over 32 weeks gestational age and CHILD under 6 months, 60mcg/kg/hour; CHILD over 6 months, *by slow IV injection*, initially 50-200 mcg/kg, then *by IV infusion* , 60-120 mcg/kg/hour

2.2. Local anaesthetics

BUPIVACAINE

Injection, 0.5% (plain) (20ml) NRH/RRH
Injection, 0.5% (heavy) (4ml) NRH/RRH

Therapeutic group local anaesthetics

Indications infiltration anaesthesia; peripheral nerve block; spinal and epidural anaesthesia

Contraindications hypovolaemia, complete heart block

Cautions epilepsy, hepatic or renal impairment, impaired cardiac condition, bradycardia, porphyria

Side effects confusion, respiratory depression, convulsions, hypotension, ventricular fibrillation especially in pregnancy, known hypersensitivity and anaphylactic shock

Dose **local infiltration**: 0.25%; **peripheral nerve block**: 0.25%-0.5%; **epidural block**: 0.1-0.5%; **caudal**: 0.25-0.5%; (max. 2mg/kg without adrenaline in 24 hrs; 3mg/kg body weight with adrenaline in 24 hrs)

LIGNOCAINE

Injection, 2%-with preservative (30ml)	NRH/RRH/DH/BHU
Injection, 2%-preservative free (50ml)	NRH/RRH
Injection, 5% (heavy) (2ml)	NRH/RRH

Therapeutic group local anaesthetic

Indications (a): infiltration anaesthesia, peripheral nerve block, and regional anaesthesia; (b): 5% heavy injection is used for spinal anaesthesia

Contraindications see under bupivacaine (section 2.2)

Cautions see under bupivacaine (section 2.2)

Side effects see under bupivacaine (section 2.2)

Dose **infiltration**: 1-2%; **perineal infiltration**: 0.5%; **nerve block**: 1-2%; **epidural**: 2%; **spinal**: 5%; **caudal**: 2%; (max. 3mg/kg without adrenaline; 7mg/kg with adrenaline)

LIGNOCAINE

Injection, 2% + adrenaline 1 in100, 000 (30ml)	NRH/RRH/DH/BHU
Injection, 2% + adrenaline 1 in 200,000 (30ml)	NRH /RH
Injection, 2% + adrenaline 1:80000 (1.8ml)	NRH/RRH/DH

Therapeutic group local anaesthetic

Indications dental anaesthesia; infiltration anaesthesia, nerve block

Contraindications avoid if there is known or suspected hypersensitivity; avoid spinal or epidural anaesthesia in patient on anticoagulant therapy and abnormal bleeding tendency; contraindicated in arterial hypertension, coronary disease and valvular cardiac disease (particularly squeal to acute rheumatic fever)**;** *see bupivacaine also*

Cautions lignocaine with adrenaline when used together with halothane; *see under bupivacaine*

Side effects see under bupivacaine

Dose *see above under lignocaine;* **Dental:** ADULT**,** a single cartridge is generally sufficient; 2 are used in case of large interventions; do not exceed 3 cartridges; ADOLESCENTS 14-17 years and ELDERLY, usual dose 1.8ml (1 cartridge); do not exceed 3.6ml (2 cartridges) in usual cases; CHILD 6-14years, usual dose 1.35ml (3/4 of a cartridge); do not exceed 2.7ml (1 ½ cartridge) in usual cases; CHILD 3-6 years, 0.9 to 1.8ml (1/2 to 1 cartridge); do not use under 3 years of age

Note***:*** *the addition of vasoconstrictor such as adrenaline diminishes local blood flow, slows the rate of absorption of local anaesthetic and prolongs its local effect*

LIGNOCAINE

Solution, 4% (30ml)	NRH/RRH/DH

Spray, 10% (80ml) NRH

Therapeutic group local anaesthetic

Indications surface anaesthesia of mucosa: pharynx, larynx, trachea and urethra

Contraindications known or suspected hypersensitivity

Cautions absorption from inflamed or highly vascular surfaces may cause systemic effects

Side effects see under bupivacaine

Dose **lignocaine 10%: dental practice**: 1-5 doses; **procedure in pharynx, larynx and trachea**: up to 20 doses; **lignocaine 4%**: **bronchoscopy**: 1-7.5ml with suitable spray; **biopsy in mouth:** 3-4ml with suitable spray or swab

ETHYL CHLORIDE

Spray (100ml) NRH/RRH/DH

Therapeutic group local anaesthetic

Indications local anaesthesia

Contraindications avoid in the presence of diethyl amine because it is highly inflammable

Dose**:** *open drop:* 3-20ml may be required**;** *vaporiser:* 3-4.5% in inhaled gases

3. Analgesics, antipyretics, NSAIMs and medicines used to treat gout

3.1 Non-opioids

PARACETAMOL

Injection, 150mg/ml (2ml)	NRH
Suppository, 250mg	NRH/RRH
Syrup, 125mg/5mL (60ml)	NRH/RRH/DH/BHU
Tablet, 500mg	NRH/RRH/DH/BHU

Therapeutic group analgesic; antipyretic

Indications symptomatic relief of mild to moderate pain and fever; febrile convulsions

Contraindications hepatic failure

Cautions hepatic and renal impairment; alcohol dependence

Over dosage acute liver failure, (acute overdose: 150mg/kg of body weight or 10-15gms within 24 hours may result in severe liver damage, hypoglycaemia and acute renal tubular necrosis)

Dose *by oral administration***,** ADULT, 500-1000mg repeated as required every 4-6 hours for 3-5 days (max. 4000mg daily); CHILD up to 2 months, 60mg for post immunisation pyrexia otherwise under 3 months 10mg/kg (5mg/kg, if jaundiced); CHILD 1-5 years, 120-250mg; CHILD 6-12 years: 250-500mg; these doses may be repeated every 4-6 hours when necessary (max. 4 doses in 24 hours**);** *by IV infusion,* over 15 minutes, ADULT over 50 kg, 1000 mg every 4–6 hours (max. 4000mg daily); ADULT 33–50 kg, 15 mg/kg every 4-6 hours (max. 60 mg/kg daily); b*y rectum,* ADULT, 0.5-1g; CHILD 1-5 years, 125-250mg; CHILD 6-12 years, 250-500mg every 4-6 hours

IBUPROFEN

Tablet, 400mg NRH/RRH/DH/BHU

Therapeutic group nonsteroidal anti-inflammatory medicines (NSAIMs)

Indications pain and inflammation in rheumatic disease (including juvenile arthritis) and other musculoskeletal disorders; mild to moderate pain; fever and pain in children

Contraindications active peptic ulcer disease, severe congestive cardiac failure

Cautions allergic disorders, pregnancy (after 32 weeks); coagulation defects in patients with renal, cardiac or hepatic impairment; use with caution in elderly since use of NSAIMS may result in deterioration of renal function after prolonged use

Interactions see appendix 1 under NSAIMs

Side effects GI discomfort, nausea, diarrhoea, occasional bleeding and peptic ulceration may occur; hypersensitivity, headache and vertigo may also occur

Dose *by oral administration,* ADULT, 400mg 3-4 times daily; may be increased to 800mg 3 times daily if required; **juvenile arthritis** (CHILD over 7kg): 30-40mg/kg in 3-4 divided doses; not recommended for children under 7Kg

Counseling take after food

Note**:** *evidence on the relative safety of NSAIMS indicates difference in the risks of serious upper GI side effects; ibuprofen is safer than indomethacin, diclofenac and aspirin*

INDOMETHACIN

Capsule, 25mg NRH/RRH

Therapeutic group non-steroidal anti-infammatory medicine (NSAIM)

Indications pain and moderate to severe inflammation in rheumatic disease and other acute musculoskeletal disorders; acute gout and dysmenorrhoea

Contraindications see under ibuprofen

Cautions see under ibuprofen; dizziness may affect performance of skilled tasks like driving

Interactions see appendix 1 under NSAIMs

Side effects see under ibuprofen

Dose **rheumatic diseases**: *by oral administration,* 50-200mg daily in divided dose till the alleviation of symptoms; **acute gout**: 150-200mg daily in divided doses till alleviation of symptoms; **dysmenorrhoea**: up to 75mg, three times daily for 3-5 days; *not recommended for children*

Counseling *take after food; if you become dizzy, you must not drive or operate any machinery*

DICLOFENAC SODIUM

Injection, 25mg/ml (3ml) NRH/RRH/DH/BHU

Therapeutic group non-opioid analgesics

Indications pain and inflammation in rheumatic disease (including juvenile arthritis) and other musculoskeletal disorders, ankylosing spondylitis

Contraindications and cautions see ibuprofen

Interactions see appendix 1 under NSAIMs

Side effects see ibuprofen

Dose **acute exacerbations of pain and postoperative pain**: *by IM injection,* 75 mg once daily (twice daily in severe cases) for a max. of 2 days; **ureteric colic:** *by IM injection,* 75mg then a further 75mg after 30 minutes if necessary;

by IV infusion, 75 mg repeated if necessary after 4-6 hours for max 2 days; **prevention of postoperative pain**: *by IV infusion* initially after surgery, 25-50 mg over 15-60 minutes then 5 mg/hour for max. 2 days

MEFENAMIC ACID

Tablet, 500mg NRH/RRH

Therapeutic group non-steroidal anti-inflammatory medicines

Indications dysmenorrhoea and menorrhagia

Contraindications and caution see ibuprofen

Interactions see appendix 1 under NSAIMs

Side effects see ibuprofen

Dose**:** *by oral administration,* 500mg three times daily, preferably after food

Counseling *take after food*

ASPIRIN

Tablet, 325mg NRH/RRH/DH

Therapeutic group non-steroidal Anti-inflammatory Medicines (NSAIMs)

Indications secondary prevention of thrombotic cerebrovascular or cardiovascular disease; osteoarthritis and rheumatoid arthritis

Contraindications hypersensitivity to aspirin or other NSAIMs; use other than as an antiplatelet in children and adolescents under 16 years (Reye's syndrome); active peptic ulceration; haemophilia and other bleeding disorders

Cautions asthma, uncontrolled hypertension, pregnancy and breastfeeding

Interactions acetazolamide, ACE inhibitors, warfarin, heparin, beta blockers, diuretics, probenecid, methotrexate, NSAIMs, phenytoin, valproates; see appendix 1

Side effects bronchospasm; gastrointestinal haemorrhage; vomiting, upset stomach; heartburn; drowsiness; or headache.

Dose *by oral administration,* 325mg three to four times daily; maximum 4g daily; *not recommended in children below 16 years*

Counseling *to be taken after or with meals*

3.2 Opioid analgesics

CODEINE PHOSPHATE

Tablet, 15mg NRH/RRH/DH

Therapeutic group opioid analgesic

Indications mild to moderate pain, control of chronic diarrhoea (e.g. due to cytotoxic), dry irritating cough

Contraindications avoid in raised intracranial pressure or head injury, liver disease and ventilatory failure

Cautions hypotension, hypothyroidism, asthma (avoid during attack), pregnancy and breastfeeding; reduce dose or avoid in renal impairment, dependence; use of cough suppressants containing opioid analgesics not recommended in children and should be avoided altogether in those under 1 year; hepatic and renal impairment; history of medicine abuse

Interactions see appendix 1 under opioid analgesics

Side effects nausea and vomiting, constipation, and drowsiness; larger doses produce hypotension and respiratory depression; for over dosage, naloxone is a specific antagonist

Dose *by oral administration,* ADULT, 30-60mg every 4 hours up to a max of 240mg in a day; CHILD 1-12 years, 3mg/Kg daily in divided doses; *not recommended for diarrhoea in children*

Counseling *this medicine may cause drowsiness, and you should not drive or operate machinery while taking it*

Note *tolerance and dependence may occur with prolonged use; in terminal care, this should not inhibit treatment, but simultaneous administration of laxative medicines may be required; chronic diarrhoea should be investigated before any attempt to suppress it with codeine phosphate*

MORPHINE

Injection, 15mg/ml (1ml) NRH/RRH/DH
Tablet,10mg NRH/RRH/DH

Therapeutic group opioid analgesic

Indications moderate to severe pain especially in pain associated with cancer, myocardial infarction, and surgery

Contraindications see codeine phosphate

Cautions see codeine phosphate

Interactions see appendix 1

Side effects see codeine phosphate

Dose **acute pain***: by IM injection*, 10mg (ELDERLY or frail, 5 mg) every 4 hours; NEONATE, initially 100 mcg/kg every 6 hours; CHILD 1-6 months, 100-200 mcg/kg every 6 hours; CHILD 6 months-2 years, 100-200 mcg/kg every 4 hours; CHILD 2-12 years, 200mcg/kg every 4 hours; CHILD 12-18 years, 2.5-10 mg every 4 hours; *by slow IV*, initially 5 mg (reduce dose in ELDERLY or frail) every 4 hours; NEONATE initially 50 mcg/kg every 6hours; CHILD 1–6 months initially 100 mcg/kg every 6 hours; CHILD 6 months-12 years, 100 mcg/kg every 4 hours; **premedication:** *by IM injection*, up to 10 mg 60-90 minutes before operation; CHILD 150 micrograms/kg; **myocardial infarction**: *by slow IV* (1-2 mg/minute), 5-10 mg followed by a further 5-10 mg if necessary; ELDERLY or frail patients reduce dose by half; c**hronic pain:** *by oral administration* or *IM* injection, 5-10 mg every 4 hours, adjusted according to response

PETHIDINE

Injection, 50mg/ml (1ml) NRH/RRH/DH

Therapeutic group opioid analgesic

Indications moderate to severe pain, including labour pain and post-operative analgesia

Contraindications see codeine phosphate

Cautions see codeine phosphate

Interactions see appendix 1 under opioid analgesics

Side effects see codeine phosphate

Dose **acute pain**: *by IM injection*, 25-100 mg (ELDERLY or debilitated, initially 25 mg), repeated after 4 hours; by slow IV, 25-50 mg (ELDERLY or debilitated, initially 25 mg), repeated after 4 hours; o**bstetric analgesia***: by IM injection*, 50-

100 mg, repeated 1-3 hours later if necessary; max. 400 mg in 24 hours; **postoperative pain**: IM, 25-100 mg (ELDERLY or debilitated, initially 25 mg), every 2-3 hours if necessary; CHILD, under 18 years not recommended

Note *in the postoperative period, the patient should be closely monitored for pain relief as well as for side effects, especially respiratory depression*

TRAMADOL HYDROCHLORIDE

Injection, 50mg/ml NRH/RRH/DH

Therapeutic group opioid analgesic

Indications moderate to severe pain

Contraindications see codeine phosphate

Cautions see codeine phosphate

Interactions see appendix 1 under opioid analgesics

Side effects see codeine phosphate; hypotension; occasionally hypertension; anaphylaxis; hallucinations, and confusion

Dose *by IM* or *IV injection* or *by IV infusion* (over 2-3 min), 50-100mg every 4-6 hours; **post-operative pain**: 100mg initially, then 50mg every 10-20 min if necessary during the first hour up to max of 250mg; then 50-100 mg every 4-6 hours; *Not recommended in children*

FENTANYL CITRATE

Injection, 50 mcg/ml (2ml) NRH/RRH/DH
Patch, 50mcg/hr (72 hours) NRH/RRH

Therapeutic group opioid analgesics

Indications analgesia during surgery, enhancement of anaesthesia; respiratory depressant in assisted respiration; epidural analgesia in combination with bupivacaine

Contraindications see under codeine phosphate

Cautions see under codeine phosphate

Interactions see appendix 1 under opioid analgesics

Side effects see under codeine phosphate; also myoclonic movements, less commonly laryngospasm; rarely asystole, insomnia

Dose *by IV injection*, *with spontaneous respiration*, 50-200mcg as required; CHILD 1-5 mcg/kg, then 1mcg/kg as required; *with assisted ventilation*, 0.3-3.5 mg, then 100-200 mcg as required; CHILD 5-10mcg/kg, then 1-3 mcg/ kg as required; b*y transdermal delivery (patch),* 25-100mcg/hr, applied every 72 hrs

Note *avoid excessive dosage in obese patient; dose may need to be calculated on the basis of ideal body weight*

3.3 Antigout medicines

ALLOPURINOL

Tablet, 100mg NRH/RRH/DH

Therapeutic group medicine used to treat gout (xanthine oxidase inhibitor)

Indications gout

Contraindications not a treatment for acute gout but continue if attack develops when already receiving allopurinol, and treat attack separately

Cautions prophylactic administration of a NSAIMs (not aspirin) is recommended until a month after the uric acid level becomes normal; adequate fluid intake must be ensured (2-3 litres/day); caution is needed in hepatic and renal impairment; in pregnancy, use only if no safer alternative and the disease carries risk for mother and child

Interactions see appendix 1

Side effects rashes, sometimes with fever, may be seen. (If mild, withdraw therapy and then re-introduce cautiously at a very low dose & increase gradually; discontinue immediately if recurrence occurs)

Dose *by oral administration,* ADULT, initially 100 mg daily, preferably after food, then adjusted according to plasma uric acid concentration; usual maintenance dose in mild conditions: 100-200 mg daily; in moderately severe conditions: 300-600 mg daily; in severe conditions: 700-900 mg daily; doses over 300 mg daily given in divided doses; CHILD under 15 years (in neoplastic conditions, enzyme disorders): 10-20 mg/kg daily (max. 400 mg daily)

Counseling Take after food with plenty of fluids

4. Disease Modifying Anti-Rheumatic Medicines (DMARMs)

METHOTREXATE

Tablet, 2.5mg NRH/RRH/DH

Therapeutic group antineoplastic medicines

Indications maintenance therapy for rheumatoid arthritis and other mixed connective tissue disorder

Contraindications significant renal impairment and haematological failure; to be avoided if significant pleural effusion or ascites is present; Liver impairment; pregnancy and lactation

Cautions blood counts should be monitored

Interactions see appendix 1

Side effects ulcerative stomatitis, leucopoenia, hepatotoxicity, nausea, abdominal distress, malaise, fatigue, chills, fever, dizziness, decreased resistance to infection, rash, bone marrow depression, gingivitis, renal failure, headache, blurred vision; uncommon with low dose maintenance therapy

Dose **active rheumatoid arthritis (RA):** *by oral administration*, 7.5mg once weekly (as a single dose or divided into 3 doses of 2.5mg given at intervals of 8 hr) adjusted according to response; max total weekly dose: 20mg; **psoriasis**:10-25mg once weekly, adjusted according to response; c*hild not recommended; reduce dose in elderly*

Note*: pulmonary toxicity may be a special problem in RA. Patient to seek advice if dyspnoea, cough or fever develops*

CHLOROQUINE

Tablet, 150mg NRH/RRH/DH/BHU

Therapeutic group antimalarial; DMARMs

Dose *by oral administration*, ADULT, 150mg (base) daily; max. 2.5mg/kg daily; CHILD, up to 3mg/kg daily

For details see chloroquine under antimalarial

HYDROXYCHLOROQUINE

Tablet, 200mg NRH/RRH

Therapeutic group disease modifying antirheumatoid medicines (DMARMs)

Indications treatment of systemic and discoid lupus erythematosus and rheumatoid arthritis; also used in the treatment of light-sensitive skin eruptions

Cautions hepatic and renal impairment; concurrent use of hepatotoxic medicines should be avoided; epilepsy and myasthenia gravis; G-6-PD deficiency

Side effects headache, skin eruptions, pruritus, nausea, vomiting, and diarrhea; visual disturbances such as blurred vision (common with higher doses and long term use)

Dose *by oral administration,* initially, 400mg daily in divided doses; maintenance 200-400mg daily

Counseling report if there are any visual disturbances and get the vision checked

5. Anti-allergies and medicines used in anaphylaxis

CETIRIZINE

Tablet, 10mg NRH/RRH/DH/BHU

Therapeutic group antiallergies

Indications symptomatic relief of allergy such as hay fever, urticaria

Contraindications pregnancy and breastfeeding

Side effects incidence of sedation is low; drowsiness is a significant side effect with most of the older anti-histamines although paradoxical stimulation may occur rarely, especially with high doses or in children and the elderly; drowsiness may diminish after a few days of treatment and is considerably less of a problem with the newer antihistamines

Dose *by oral administration,* ADULT & CHILD over 6 years, 10g daily or 5mg twice a day; CHILD 2-6 years, 5mg daily or 2.5mg twice a day

Counseling *may cause drowsiness, do not drive or operate machinery; avoid alcohol*

PROMETHAZINE

Injection, 25mg/ml (2ml) NRH/RRH/DH/BHU
Tablet,10mg NRH/RRH/DH/BHU

Therapeutic group antiallergies (sedating antihistamines)

Indications allergic phenomena; nausea and vomiting; pre-medication and emergency treatment of anaphylactic reactions

Side effects sedation, dizziness and other CNS symptoms are common at the start of treatment, but tolerance usually develops; GI irritation and anti-cholinergic effects are occasionally seen

Dose *by oral administration,* ADULT, 10-20mg 2-3 times daily for 3 days; 20mg at night may be preferable in seasonal rhinitis; CHILD, 1mg/kg per day, in divided doses by mouth; by *IM injection,* ADULT, 25-50mg; CHILD, 2-5 Years, 5-15mg; 5-10 years, 5-25mg; *By slow IV injection* in emergencies, 25-50 mg as a solution containing 2.5 mg/ml in water for injection; max. 100 mg; *child under 2 years not recommended*

Counseling *may cause drowsiness, do not drive or operate machinery; avoid alcohol*

ADRENALINE

Injection, 1mg/ml (1ml) NRH/RRH/DH/BHU

Therapeutic group vasoconstrictor sympathomimetic

Indications anaphylactic shock, asthma and cardiac arrest, severe angioedema

Cautions hyperthyroidism, diabetes mellitus, heart disease, hypertension, arrhythmias, cerebrovascular disease, angle-closure glaucoma, second stage of labour, elderly patients

Interactions see appendix 1 under sympathomimetic

Side effects anxiety, tremor, tachycardia, arrhythmias, headache, cold extremities; also hypertension (risk of cerebral haemorrhage) and pulmonary oedema (on excessive dosage or extreme sensitivity); nausea, vomiting, sweating, weakness, dizziness and hyperglycaemia

Overdosage sudden extreme hypertension may lead to cerebral haemorrhage; reversal by vasodilatation with isosorbide dinitrate may be attempted

Dose **anaphylaxis**: *By IM injection,* as given below:

Age	Volume
< 1-year	0.05ml
2 years	0.2ml
3-4 years	0.3ml
5 years	0.4ml
6-12 years	0.5ml
ADULT	0.5-1.0ml

Doses may be repeated every 10 minutes, according to blood pressure and pulse, until improvement occurs (may be repeated several times); **asthma:** *by IM injection,* ADULT, 0.1-0.5mg at 15-20 minute intervals as required; CHILD, 0.01mg/kg SC, repeated after 4 hours if required; **cardiac arrest:** 1mg intra-cardiac injection in extremis; then IV as for anaphylaxis (for IV injection, dilute 1:10 in water for injection)

DEXAMETHASONE

Injection, 4mg/ml (2ml) NRH/RRH/DH/BHU
Tablet, 4mg NRH/RRH

Therapeutic group corticosteroids

Indications allergic conditions; inflammation, cerebral oedema; shock

Cautions prolonged use of steroids increases susceptibility to infections and severity of infections; see under prednisolone

Interactions see appendix 1 under corticosteroids

Side effects none in short term emergency use

Dose *by oral administration,* ADULT, 1-4mg two to three times daily; CHILD, 0.5-2mg/kg two to three times daily; *By IM injection,* ADULT, 4-8mg repeated up to a total of 20mg if required; CHILD: 1-3mg 6 hourly

PREDNISOLONE

Tablet, 5mg and 20mg NRH/RRH/DH

Therapeutic group antiallergic; adrenal hormones and synthetic substitutes

Indications suppression of inflammatory and allergic disorders, inflammatory bowel disease, asthma, immuno-suppression, rheumatic disease, nephrotic syndrome

Cautions none in short term emergency use; flare up of pre-existing infection with prolonged use, Cushingoid syndrome may be seen, also growth suppression in children; high doses in pregnancy or breastfeeding may lead to adrenal suppression in the foetus/infant; withdrawal of steroids after prolonged administration needs care to avoid Addisonian crisis; this will occur acutely, or during illness/ operation/labour, even several months later

Interactions see appendix 1 under corticosteroids

Side effects GI effects include dyspepsia, peptic ulceration (with perforation), abdominal distension, acute pancreatitis, oesophageal ulceration and candidiasis; musculoskeletal effects include proximal myopathy, osteoporosis, vertebral and long bone fractures, avascular osteonecrosis, tendon rupture; endocrine effects include adrenal suppression, menstrual irregularities and amenorrhoea, Cushing's syndrome (with high doses, usually reversible on withdrawal), hirsutism, weight gain, negative nitrogen and calcium balance, increased appetite; increased susceptibility to and severity of infection; neuropsychiatric effects include euphoria, psychological dependence, depression, insomnia, and increased intracranial pressure with papilloedema in children (usually after withdrawal), psychosis and aggravation of schizophrenia, aggravation of epilepsy; ophthalmic effects include glaucoma, papilloedema, posterior subscapular cataracts, corneal or scleral thinning and exacerbation of ophthalmic viral or fungal disease; other side-effects include impaired healing, skin atrophy, bruising, striae, telangiectasia, acne, myocardial rupture following recent myocardial infarction, fluid and electrolyte disturbance, leucocytosis, hypersensitivity reactions (including anaphylaxis), thromboembolism, nausea, malaise and hiccups

Dose **initial**: *by oral administration,* 10-20 mg daily, may increase to 1mg/kg (severe disease up to 60 mg daily), preferably taken in the morning after breakfast; **maintenance**: 2.5-15 mg daily can be increased with need; CHILD, 1-2mg/kg (max 60mg); Cushing's side effects increasingly likely with doses above 7.5 mg daily

Counseling *to be taken after or with meals*

Note *in acute asthma, tail off steroids within 7-10 days to avoid adrenal suppression*

BUDESONIDE

Spray, 50mcg/puff (200MDIs) NRH/RRH

Therapeutic group corticosteroids

Indications prophylaxis and treatment of rhinitis; management of nasal polyps

Side effects systemic absorption following nasal use may lead to adrenal suppression

Dose *by nasal administration,* ADULT and CHILD over 12 years, 1 spray into each nostril one to two times daily; treatment can be continued for up to 3 months

6. Medicines for Meniere's disease

BETAHISTINE DIHYDROCHLORIDE

Tablet, 16mg NRH/RRH

Therapeutic group medicines for Meniere's disease

Indications vertigo, tinnitus, hearing loss associated with Meniere's disease

Contraindications pheochromocytoma

Cautions asthma, history of peptic ulcer, pregnancy and breastfeeding

Side effects GI disturbances, headache, rashes, pruritis

Dose *by oral administration,* initially 16mg three times a day, preferably with food; maintenance: 32-48mg daily. *Child not recommended*.

Counseling take with or after food

CINNARIZINE

Tablet, 15mg NRH/RRH

Therapeutic group medicines for Meniere's disease

Indications vestibular disorders, such as vertigo, tinnitus, nausea, and vomiting in Meniere's disease; motion sickness; vascular disease

Contraindications porphyria

Cautions hypotension, pregnancy, children, elderly

Interactions enhanced sedative effects

Side effects drowsiness

Dose **vestibular disorders**: *by oral administration,* ADULT, 30 mg 3 times daily; CHILD 5–12 years, 15mg 3 times daily; **motion sickness**: *by oral administration,* ADULT, 30mg 2 hours before travel, then 15mg every 8 hours during journey, if necessary; CHILD 5-12 years, 15mg 2 hours before travel and 7.5mg every 8 hours during the journey if necessary

7. Antimigraine medicines

7.1. Treatment of acute attack

ERGOTAMINE + CAFFEINE

Tablet, (1mg+100mg) NRH/RRH/DH

Therapeutic group antimigraine medicines

Indications symptomatic relief of migraine

Contraindications peripheral or coronary vascular disease, severe hypertension, severe hepatic or renal impairment; pregnancy

Cautions risk of overuse by patients, leading to vascular insufficiency; breastfeeding

Interactions see appendix 1 under ergotamine and ergometrine

Side effects and over dosage malaise, nausea and vomiting may occur; chronic self-poisoning can lead to sustained vasoconstriction and eventual gangrene; the medicine should be immediately and totally withdrawn. Acute over dosage may occur with only 2-3 times the normal dose; symptoms include vomiting, diarrhoea, thirst, paraesthesia, cold extremities, rapid and weak pulse, confusion, convulsion and coma. Lavage followed by vasodilators or dextran 40 infusions should be done

Dose *by oral administration,* 1-2 tablet at the onset of symptoms (max of 4 tabs in 24 hours), one more after ½ an hour if needed; not to be repeated at intervals of less than 4 days; Maximum dose: 8 tablets per week: n*ot recommended in children*

Note *only use ergotamine if the headache is unresponsive to simple analgesics*

7.2. Prophylaxis

AMITRIPTYLINE

Tablet, 25mg NRH/RRH/DH

Therapeutic group tricyclic antidepressant

Indications depression with agitation or insomnia, anxiety, neuropathic pain and migraine prophylaxis

Contraindications see amitriptylline under section 12.2

Cautions see amitriptylline under section 12.2

Interactions see appendix 1 under anti-depressants, tricyclic

Side effects see amitriptylline under section 12.2

Dose *by oral administration*, 12.5-25mg daily at bed time; up to 100mg daily

PROPRANOLOL

Tablet, 40mg NRH/RRH

Therapeutic group antimigraine; antiarrhythmic; antiangina and antithyroid medicines

Indications**:** prophylaxis of migraine, treatment of angina, arrhythmias, and hyperthyroidism

Contraindications asthma, uncontrolled heart failure, cardiogenic shock, marked bradycardia, metabolic acidosis

Cautions pregnancy and breastfeeding, diabetes, liver disease; avoid abrupt withdrawal in angina

Interactions**:** see appendix 1 under beta-blockers

Side effects bradycardia, heart failure, bronchospasm, peripheral vasoconstriction, GI disturbance, fatigue and sleep disturbance may sometimes occur

Dose *by oral administration,* 40mg 3-4 times daily; maintenance 80-160 mg daily

Counseling *take this medicine regularly; do not stop without doctor's instruction*

8. Antiepileptics

DIAZEPAM

Injection, 5mg/ml (2ml) NRH/RRH/DH/BHU
Tablet, 5mg NRH/RRH/DH/BHU

Therapeutic group antiepileptics; anxiolytics

Indications short-term use in anxiety and insomnia; adjunct in alcohol withdrawal; status epilepticus, febrile convulsions

Contraindications respiratory depression, severe hepatic impairment, chronic psychosis

Cautions muscle weakness; pregnancy and breastfeeding; reduce dose in elderly and hepatic impairment; renal impairment; avoid prolonged use and abrupt withdrawal

Interactions see appendix 1 under anxiolytics

Side effects drowsiness and light-headedness, persisting until next day; confusion and ataxia in the elderly; tolerance, amnesia, muscle weakness; hypotension and apnoea

Dose *by IV injection*, ADULT, 10-20mg at a rate of 1ml/minute repeated if necessary after 30-60 minutes; may be followed *by IV infusion* to max. 3 mg/kg over 24 hours; CHILD, 200-300mcg/Kg

CLONAZEPAM

Tablet, 0.5mg NRH

Therapeutic group antiepileptic; antianxiety (benzodiazepines)

Indications all forms of epilepsy; myoclonus; status epilepticus

Contraindications respiratory depression, severe hepatic impairment, chronic psychosis; myasthenia gravis

Caution muscle weakness, pregnancy and breast-feeding; reduce dose in elderly and hepatic impairment, renal impairment; history of medicine and alcohol abuse; Avoid prolonged use and abrupt withdrawal

Interactions see Appendix 1 under benzodiazepines

Side effects drowsiness, fatigue and light-headedness, persisting until next day; confusion and ataxia in the elderly; salivary hypersecretion in infants; tolerance, amnesia, muscle weakness; hypotension and apnoea

Dose *by oral administration,* ADULT,1mg (ELDERLY 500 mcg) initially at night for 4 nights, increase according to response over 2-4 weeks to usual maintenance dose of 4-8 mg usually at night in 3-4 divided doses; CHILD up to 1 year, initially 250mcg increased as above to usual maintenance dose of 0.5-1mg; CHILD 1-5 years, initially 250mcg increased as above to 1-3mg; CHILD 5-12 years, initially 500mcg increased as above to 3-6 mg

Counseling *do not drive or operate machineries; avoid alcohol*

PHENOBARBITAL

Injection, 200mg/ml (1ml) NRH/RRH/DH
Tablet, 30mg NRH/RRH/DH/BHU

Therapeutic group antiepileptic

Indications all forms of epilepsy except absence seizures; status epilepticus

Contraindications porphyria

Cautions elderly, debilitated, children, impaired renal (avoid large doses) and hepatic function (may precipitate coma), respiratory depression; pregnancy and breastfeeding; avoid sudden withdrawal

Interactions see appendix 1 under barbiturates

Side effects drowsiness, lethargy, depression, ataxia and allergic skin reactions; paradoxical excitement, restlessness and confusion in the elderly and hyperkinesia in children; megaloblastic anaemia

Dose *by oral administration,* ADULT, 60-180mg at night; CHILD, 5-8mg/kg daily; **control of acute seizures**: *by IM injection,* 200mg, repeated after 6 hours if necessary; CHILD, 15mg/ kg as a single dose; **status epilepticus**: *by IV*

injection (dilute injection 1 in 10 with water for injection), 10mg/kg at a rate of not more than 100mg/min; max 1g

Counseling *may cause drowsiness; do not drive or operate machinery; do not stop taking this medicine without the doctor's advice*

SODIUM VALPROATE

Tablet, 200mg NRH/RRH

Therapeutic group antiepileptics

Indications all forms of epilepsy

Contraindications active liver disease, family history of severe hepatic dysfunction; pregnancy

Cautions monitor liver function before therapy and during first 6 months; benefit of treatment outweighs risk in pregnancy; folic acid supplement is however needed; monitor platelet function before surgery; may give false positive test for ketonuria in diabetes

Interactions see appendix 1 under valproate

Side effects gastric irritation and nausea, ataxia and tremor; transient hair loss; increased appetite; thrombocytopenia; impaired liver function (withdraw immediately if evidence of hepatitis)

Dose *by oral administration,* ADULT, initially, 600 mg daily given in 2 divided doses, increasing by 200 mg/day at 3-day intervals to a max of 2.5 g daily in divided doses; usual maintenance 1-2 g daily (20-30 mg/kg daily); CHILD up to 20 kg, initially 20 mg/kg daily in divided doses, may be increased provided plasma concentrations monitored; CHILD over 20 kg, initially 400 mg daily in divided doses increased until control (usually in range of 20-30 mg/kg daily); max. 35mg/kg daily

Counseling *do not stop taking this medicine without the doctor's advice; do not take indigestion remedies at the same time; take the tablet whole preferably after food*

PHENYTOIN

Injection, 50mg/ml (2ml) NRH/RRH/DH
Tablet, 100mg NRH/RRH/DH/BHU

Therapeutic group antiepileptics

Indications all forms of epilepsy except absence seizures

Cautions breastfeeding; reduce dose in hepatic impairment; benefit in pregnancy outweighs any risk

Interactions see appendix 1

Side effects GI disturbances including constipation; CNS symptoms including ataxia and confusion; Stevens-Johnson syndrome; visual disturbances (diplopia) are often associated with peak plasma concentrations. Generalized erythematous rash occasionally, gingival hypertrophy and many other symptoms have been reported with high doses

Dose *by oral administration,* ADULT, initially 100-200 mg 1-2 times daily, increased slowly to usual dose of 800-1200mg daily in divided doses; in some cases, 1600-2000mg daily may be needed; ELDERLY reduce initial dose; CHILD (in divided doses) up to 1 year, CHILD 100-200mg/day; CHILD 1-5 years, 200-400mg/day; CHILD 5-10 years, 400-600mg/day; CHILD 10-15 years, 600-1000mg/day; **status epilepticus:** *by slow IV injection or infusion*, ADULT,

15mg/kg loading dose (not more than 50mg/min); **maintenance**: by slow IV or oral, 100mg every 6-8 hours; CHILD, 15mg/kg loading dose

Counseling continue the treatment until advised to stop; take the tablets immediately after food; may cause drowsiness; if affected, do not drive or operate machinery

LAMOTRIGINE

Tablet, 50mg NRH/RRH

Therapeutic group antiepileptics

Indications monotherapy and adjunctive treatment of partial seizures and primary and secondarily generalised tonic-clonic seizures; seizures associated with Lennox-Gastaut syndrome

Cautions closely monitor (including hepatic, renal and clotting function) and consider withdraw if rash, fever, or other signs of hypersensitivity syndrome develop; avoid abrupt withdrawal (taper off over 2 weeks or longer) unless serious skin reactions occurs

Interactions see under appendix 1

Side effects rash (see skin reactions below); hypersensitivity syndrome (possibly including rash, fever, lymphadenopathy, hepatic dysfunction, blood disorders, disseminated intravascular coagulation and multi-organ dysfunction); nausea, vomiting, diarrhoea, hepatic dysfunction; headache, fatigue, dizziness, sleep disturbances, tremor, movement disorders, agitation, confusion, hallucinations; blood disorders (including leucopenia, thrombocytopenia, pancytopenia); lupus erythematosus-like effect; photosensitivity; diplopia, blurred vision, conjunctivitis; **serious skin reactions** including Stevens Johnson syndrome and toxic epidermal necrolysis (rarely with fatalities) have been reported in children; most rashes occur in the first 8 weeks; rash is sometimes associated with hypersensitivity syndrome; consider withdrawal if rash or signs of hypersensitivity syndrome develop

Dose **monotherapy**: *by oral administration,* initially 25mg daily for 14 days, increase to 50mg daily for further 14 days, and then increase by max of 50-100mg daily every 7-14 days; usual maintenance as monotherapy, 100-200mg daily in 1-2 divided doses (up to 500mg); CHILD under 12 years, not recommended; **adjunctive therapy with valproate**: *by oral administration,* initially 25mg every other day for 14 days then 25mg daily for further 14 days, thereafter increase by max of 25-50mg daily every 7-14 days; usual maintenance dose, 100-200mg daily in 1-2 divided doses; CHILD 2-12 years, initially 150 mcg/kg daily for 14 days (those weighing under 13 kg may receive 2mg on alternate days for the first 14 days) then 300 mcg/kg daily for further 14 days, thereafter increased by maximum of 300 mcg/kg daily every 7-14 days; usual maintenance 1-5 mg/kg daily in 1-2 divided doses; **adjunctive therapy (with enzyme inducing) without valproate**: *by oral administration*, initially 50mg daily for 14 days then 50mg twice daily for further 14 days, thereafter increase by max. of 100mg daily every 7-14 days; usual maintenance 200-400mg daily in 2 divided doses (up to 700mg daily); CHILD 2-12 years, initially 600 mcg/kg in 2 divided doses for 14 days, then 1.2 mg/kg daily in 2 divided doses for further 14 days, thereafter increased by maximum of 1.2mg/kg daily every 7-14 days; usual maintenance 5-15 mg/kg daily in 2 divided doses

Counseling *seek medical attention if rash or signs of symptoms of hypersensitivity syndrome develop*

LEVETIRACETAM

Tablet, 500mg NRH

Therapeutic group antiepileptic

Indications monotherapy and adjunctive treatment of partial seizures with or without secondary generalization; adjunctive therapy of myoclonic seizure and primary generalized tonic-clonic seizures

Cautions renal and hepatic impairment; pregnancy and lactation; patient undergoing haemodialysis; avoid abrupt withdrawal

Interactions see appendix 1 under anti-epileptics

Side effects nausea, vomiting, dyspepsia, diarrhoea abdominal pain and anorexia; drowsiness, somnolence, asthenia, depression, insomnia, anxiety, aggression and irritability; tremor, ataxia, amnesia, myalgia, thrombocytopenia, pruritus, rash

Dose **monotherapy for partial seizures with or without secondary generalization:** *by oral administration*, ADULT and CHILD over 16 years, initially 250mg twice daily, increasing according to response to 500mg twice daily after 2 weeks; max. 3g/day; CHILD 4-15 years or body weight over 50kg, initially 10mg/kg twice daily; ADOLESCENT 16yrs and above or >50kg, initially 500mg twice daily; **adjunctive therapy in partial seizure, myoclonic seizure, and general tonic-clonic seizure**: *by oral administration*, ADULT and CHILD over 12 years or body weight over 50kg, 500mg twice daily, adjusted in steps of 500mg twice daily every 2-4 weeks; CHILD 12-18 years or body weight over 50kg, initially 10mg/kg twice daily, adjusted in steps of 10mg/kg twice daily every 2 weeks; max. 30mg/kg twice daily

Counseling *do not drive or operate machineries; this medicine is to be taken whole after meals preferably*

GABAPENTIN

Tablet 300mg NRH

Therapeutic group antiepileptics; antineuropathic

Indications monotherapy and adjunctive treatment of partial seizures with or without secondary generalization; neuropathic pain

Cautions history of psychosis; renal impairment; elderly; pregnancy and breastfeeding; diabetes mellitus**;** avoid abrupt withdrawal

Interactions antacids containing aluminium and magnesium salts may reduce absorption from gastrointestinal tract

Dose **epilepsy**: *by oral administration,* ADULT, 300 mg by mouth on the first day of treatment, 300 mg twice daily on the second day, and 300 mg three times daily on the third day; thereafter the dose may be increased in increments of 300 mg daily every 2-3 days until effective antiepileptic control is achieved which is usually within the range of 0.9 to 3.6g daily; maximum daily dose: 3.6g; CHILD 6 to 12 years, 10 mg/kg on the first day of treatment, 20 mg/kg on the second day, and 25 to 35 mg/kg on the third day; **neuropathic pain**: *by oral administration,* ADULT over 18 years, 300mg on the first day, 300 mg twice daily on the second day, and 300 mg three times daily on the third day; thereafter the dose may be increased in increments of 300 mg daily in every 2-3 days; max. 3.6g

Counseling *take consistently at the same time of the day; continue until advised to stop*

9. Antiparkinson medicines

LEVODOPA + CARBIDOPA

Tablet, (250mg + 25mg) NRH/RRH/DH

Therapeutic group antiparkinson medicines

Indications idiopathic and post-encephalitic parkinsonism, but not medicine-induced extra-pyramidal symptoms

Contraindications closed-angle glaucoma

Cautions pregnancy, breast feeding, elderly patients, post-encephalitic cases, pulmonary disease, peptic ulceration, diabetes mellitus, patients with affective disorders, and those with cerebral or coronary vascular disease; urine may give false positive test for ketones; avoid rapid dose increase and abrupt withdrawals

Interactions see appendix 1 under levodopa

Side effects dose-dependent effects are common, especially gastric intolerance (adjust dose, take after food, use antiemetic if necessary), postural hypotension at the start of treatment and abnormal involuntary movements. Serious dysrhythmias and a wide range of psychiatric conditions may be seen; in over dosage, monitoring and treatment of dysrhythmias is particularly important

Dose *by oral administration,* ADULT, initially 100-125mg 3-4 times daily, adjust according to response; maintenance dose 750-1500mg daily in divided doses

Counseling *take with or after food; it may colour your urine*

TRIHEXYPHENIDYL

Tablet, 2mg NRH/RRH/DH

Therapeutic group antiparkinson (antimuscarinic medicines)

Indications parkinsonism, medicine-induced extrapyramidal symptoms

Contraindications untreated urinary retention, closed angle glaucoma, GI obstruction

Cautions cardiovascular disease, hepatic or renal impairment; elderly; avoid abrupt discontinuation of treatment

Interactions see appendix 1 under antimuscarinic

Side effects dry mouth, GI disturbances, dizziness, blurred vision, less commonly urinary retention, tachycardia, hypersensitivity, nervousness; mental confusion, excitement and psychiatric disturbances in some susceptible patients (at high doses)

Dose *by oral administration,* 1mg daily gradually increased; usual maintenance dose 5-15mg daily in 3-4 divided doses (max of 20mg daily); ELDERLY, lower end of the range

10. Muscle relaxants and anticholinesterase inhibitors

10.1. Centrally acting

BACLOFEN

Tablet, 10mg NRH

Therapeutic group muscle relaxant (centrally acting)

Indications muscle spasticity of cerebral and spinal origin

Side effects transient drowsiness, dizziness, weakness, fatigue

Cautions reduce dose in impaired renal function, avoid abrupt withdrawal (hallucinations and seizures may occur); pregnancy

Contraindications children below 12 years

Dose *by oral administration,* ADULT, 5 mg three times daily; dose may be increased by 5mg/dose every 3 days (max. daily dose 80mg)

Counseling**:** *avoid taking with alcohol and other CNS depressants*

10.2. Peripherally acting

Non-depolarizing Muscle relaxants**:** they are also known as competitive muscle relaxants. They compete with the acetylcholine for receptor sites at the neuromuscular junction and their action may be reversed with anticholinesterase such as neostigmine.

Depolarizing muscle relaxants**:** they act by mimicking acetylcholine at the neuromuscular junction but hydrolysis is much slower than acetylcholine; depolarising is therefore prolonged resulting in neuromuscular blockade. Unlike the non-depolarizing muscle relaxants, its action cannot be reversed and recovery is spontaneous; anticholinesterases such as neostigmine potentiate the neuromuscular block.

10.2.1. Non-depolarising muscle relaxant

ATRACURIUM BESYLATE

Injection, 10mg/ml (2.5ml) NRH/RRH

Therapeutic group non-depolarising muscle relaxant (benzylisoquinolinium)

Indications muscle relaxation (short to intermediate duration) for surgery or during intensive care

Cautions allergic cross-reactivity between neuromuscular blocking agents has been reported; caution is advised in cases of hypersensitivity to these medicines. Their activity is prolonged in patients with myasthenia gravis and in hypothermia, therefore lower doses are required; resistance may develop in patients with burns who may require increased doses

Side effects benzylisoquinolinium non-depolarising muscle relaxants are associated with histamine release, which can cause skin flushing, hypotension, tachycardia, bronchospasm and rarely, anaphylactic reactions; most amino steroid muscle relaxants produce minimal histamine release

Dose **intubation:** *by IV injection,* 0.8mg/kg; maintenance: 0.5mg/kg, a top up of dose of 0.2mg/kg body as required

Note**:** *atracurium undergoes non-enzymatic metabolism which is independent of liver and kidney function, thus allowing its use in patients with hepatic or renal impairment*

VECURONIUM

Injection, 4mg/ml (2ml) NRH/RRH

Therapeutic group non-depolarising muscle relaxant (amino steroid)

Indication muscle relaxation (intermediate duration) for surgery

Cautions allergic cross-reactivity between neuromuscular blocking agents has been reported; caution is advised in cases of hypersensitivity to these medicines. Their activity is prolonged in patients with myasthenia gravis and in hypothermia, therefore lower doses are required. Resistance may develop in patients with burns who may require increased doses; low plasma cholinesterase activity in these patients requires dose titration for mivacurium.

Side effects duration is prolonged in hypothermia, hypothyroidism, and myasthenia gravis and in conjunction with aminoglycosides. The effect is slightly prolonged in renal and liver diseases.

Dose **intubation**: *by IV injection*, 0.1mg/kg; maintenance, 0.03 mg/kg 0.03mg/kg body as required

10.2.2 Depolarising muscle relaxant

SUXAMETHONIUM

Injection, 50mg/ml (2ml) NRH/RRH

Therapeutic group depolarising muscle relaxant

Indications suxamethonium is a depolarizing, short-acting muscle relaxant, which is ideal for intubation; repeated doses can be given to allow longer procedures

Contraindications hyperkalaemia, patients with burns; neuropathic or bed ridden patients, known malignant hyperpyrexia, known hypersensitivity and known atypical plasma pseudo-cholinesterase enzymes

Cautions pregnancy; patients with cardiac, respiratory or neuromuscular disease; raised intraocular pressure; severe sepsis

Side effects repeated dosing may lead to a paradoxical prolonged non-depolarizing effect; partial and temporary reversal with neostigmine may be possible, but ventilation must be controlled and monitored until spontaneous breathing is fully re-established; patient may experience muscular pain following recovery from anaesthesia

Dose *by IV injection*, 1-1.5mg/kg body weight

10.3 Cholinesterase inhibitors

NEOSTIGMINE

Injection, 0.5mg/ml (1ml) NRH/RRH/DH

Therapeutic group muscle relaxants

Indications to counteract the effect of non-depolarising muscle relaxants administered during surgery

Contraindications known hypersensitivity and mechanical obstruction of the intestinal or urinary tract

Cautions adequate ventilation must be maintained and complete recovery must be ensured before the patient is transferred to the ward

Interactions see appendix 1

Side effects nausea and vomiting increase salivation, diarrhoea, abdominal cramps, cardiac dysrhythmias, syncope and hypotension; progressive paralysis may occur; management is by artificial ventilation and IV atropine

Dose *by IV bolus*, 0.05mg/kg body weight in combination with atropine 0.025mg/kg body weight

11. Psychotherapeutic medicines

11.1 Medicines used in psychotic disorders

CHLORPROMAZINE

Injection, 25mg/ml (2ml) NRH/RRH/DH
Tablet, 100mg NRH/RRH/DH

Therapeutic group psychotherapeutic medicines

Indications psychosis, mania, agitation, violent behaviour; also, nausea and vomiting, intractable hiccup, vertigo

Contraindications bone marrow depression, closed-angle glaucoma, and coma due to CNS depressants

Cautions cardiovascular and cerebrovascular disorders; respiratory disease; parkinsonism; epilepsy; acute infections, pregnancy; renal impairment (avoid if severe); hepatic impairment (avoid if severe); history of jaundice; leukopenia (monitor blood counts if unexplained fever or infection occur); hypothyroidism, myasthenia gravis; prostatic hypertrophy; angle-closure glaucoma; the elderly (particularly in very hot or very cold weather; reduce dose); avoid abrupt withdrawal; patients should remain supine and blood pressure monitored for 30 minutes after intramuscular injection (risk of hypotension)

Interactions see appendix 1 under anti-psychotics

Side effects extrapyramidal symptoms and on prolonged administration, occasionally potentially irreversible tardive dyskinesias; hypothermia (occasionally pyrexia), drowsiness, apathy, pallor, nightmares, dizziness, excitement, insomnia, headache, confusion, depression; more rarely, agitation, EEG changes, convulsions, and nasal congestion; anticholinergic symptoms including dry mouth, constipation, blurred vision, and difficulty in micturition; hypotension, tachycardia, and arrhythmias; respiratory depression; menstrual disturbances, galactorrhoea, gynaecomastia, impotence, weight gain; sensitivity reactions such as agranulocytosis, leukopenia, leukocytosis, haemolytic anaemia, photosensitization, contact sensitization and rash, jaundice, and alterations in liver function; neuroleptic malignant syndrome; lupus erythematosus-like syndrome; corneal and lens opacities, and purplish pigmentation of the skin, cornea, and retina (with prolonged high dosage); intramuscular injection may be painful and cause hypotension and tachycardia (see cautions) and nodule formation

Withdrawal withdrawal of antipsychotic medicines after long-term therapy should always be gradual and closely monitored to avoid the risk of acute withdrawal syndromes or rapid relapse

Dose *by oral administration,* ADULT, 25mg 3 times daily (or 75mg at night); normal maintenance dose 75-300mg daily, maximum (psychosis) 1 g daily; CHILD 1-5 years, 0.5mg/kg 6 hourly, maximum 40mg daily; CHILD 6-12 years, 1/3 to 1/2 adult dose, maximum 75mg daily; ELDERLY: 1/3 to 1/2 adult dose; **intractable hiccup**: 25-50mg 3-4 times daily; *by deep IM injection*, ADULT, 25-50mg 3-4 times daily; CHILD, dose same as by oral administration

Counseling**:** *tablet should not be crushed and solution should be handled with care owing to the risk of contact sensitization; the medication may cause drowsiness; avoid alcohol*

HALOPERIDOL

Injection, 5mg/ml (1ml) NRH/RRH/DH

Therapeutic group psychotherapeutic medicines

Indications psychosis, mania, agitation, violent behavior

Contraindications bone marrow depression, closed-angle glaucoma, coma due to CNS depressants, Parkinsonism

Cautions cardiovascular and cerebrovascular disease, respiratory disease, parkinsonism, epilepsy, pregnancy and breast-feeding, history of jaundice; caution in elderly patients who are susceptible to postural hypotension and to hyper- and hypothermia in very hot or very cold weather

Interactions see appendix 1 under antipsychotics

Side effects extrapyramidal effects are common at higher dosage; hypothermia, drowsiness, insomnia, depression; occasional reactions like agranulocytosis, leucopoenia and photosensitivity may occur

Dose *by oral administration,* ADULT, 1.5-15mg daily, in divided doses, maximum 100mg if required; ELDERLY and debilitated, half adult dose; CHILD, 25-50 mcg/kg daily, maximum 10mg daily if required; by *IM injection,* 2-10mg 4 hourly or more often, if required

Counseling *may cause drowsiness; if affected do not operate machinery; avoid alcohol*

Note *the wide variation in possible dosage reflects this medicine's range of usefulness from sedative through to major antipsychotic*

FLUPHENAZINE DECANOATE

Injection, 25mg/ml NRH/RRH

Therapeutic group psychotherapeutic medicines

Indications see under dose

Contraindications antipsychotic medicines may be contraindicated in comatose states, CNS depression, and phaeochromocytoma. Most antipsychotics are best avoided during pregnancy, unless essential and it is advisable to discontinue breastfeeding during treatment

Cautions**:** antipsychotics should be used with caution in patients with hepatic impairment, renal impairment, cardiovascular disease, Parkinson's disease (may be exacerbated by antipsychotics), epilepsy (and conditions predisposing to epilepsy), depression, myasthenia gravis, prostatic hypertrophy, or a personal or family history of angle-closure glaucoma (avoid chlorpromazine, pericyazine and prochlorperazine in these conditions). Caution is also required in severe respiratory disease and in patients with a history of jaundice or who have blood dyscrasias (perform blood counts if unexplained infection or fever develops). Antipsychotics should be used with caution in the elderly, who are particularly susceptible to postural hypotension and to hyper- or hypothermia in very hot or cold weather. Serious consideration should be given before prescribing these medicines for elderly patients. As photosensitisation may occur with higher dosages, patients should avoid direct sunlight.

Interactions see appendix 1 under antipsychotics

Side effects see under chlorpromazine

Dose *by deep IM injection,*12.5-25mg every 2-4 weeks

Counseling *drowsiness may affect performance of skilled tasks (e.g. driving or operating machinery) especially at start of treatment; effects of alcohol are enhanced*

RISPERIDONE

Tablet, 2mg NRH/RRH/DH

Therapeutic group psychotherapeutic medicines

Indications acute and chronic psychoses, mania

Contraindications breastfeeding

Cautions parkinson's disease; pregnancy hepatic impairment, renal impairment

Interactions see appendix 1 under antipsychotics

Side effects**:** see notes above on chlorpromazine; also insomnia, agitation, anxiety, headache, drowsiness, impaired concentration, fatigue, blurred vision,

constipation, nausea and vomiting, dyspepsia, abdominal pain, hyperprolactinaemia (with galactorrhoea, menstrual disturbances, amenorrhoea, gynaecomastia), sexual dysfunction, priapism, urinary incontinence, tachycardia, hypertension, rash, rhinitis; cerebrovascular accidents, neutropenia and thrombocytopenia have been reported; rarely, seizures, hyponatraemia, abnormal temperature regulation, oedema

Dose **psychoses**: *by oral administration,* ADULT, 2 mg in 1-2 divided doses on first day then 4 mg in 1-2 divided doses on second day (slower titration appropriate in some patients); usual dose range 4-6 mg daily; doses above 10 mg daily only if benefit considered to outweigh risk (max. 16 mg daily); ELDERLY (or in hepatic or renal impairment), initially 500 mcg twice daily increased in steps of 500 mcg twice daily to 1-2 mg twice daily; CHILD under 15 years not recommended; **mania**: *by oral administration,* ADULT, initially 2 mg once daily, increased if necessary in steps of 1 mg daily; usual dose range 1-6 mg daily; ELDERLY (or in hepatic or renal impairment) initially 500mcg twice daily increased in steps of 500mcg twice daily to 1-2 mg twice daily

OLANZAPINE

Tablet, 10mg NRH

Therapeutic group psychotherapeutic medicines

Indications schizophrenia

Contraindications angle-closure glaucoma; breast-feeding

Cautions see under fluphenazine; also pregnancy, prostatic hypertrophy, paralytic ileus, hepatic impairment, renal impairment, diabetes mellitus (risk of exacerbation or ketoacidosis), low leucocyte or neutrophil count, bone marrow depression, hypereosinophilic disorders, myeloproliferative disease, parkinson's disease, increased appetite, raised triglyceride concentration, oedema

Interactions see appendix 1 under antipsychotics

Side effects mild, transient antimuscarinic effects; drowsiness, speech difficulty, exacerbation of parkinson's disease, akathisia, asthenia, increased appetite, raised triglyceride concentration, oedema, hyperprolactinaemia (but clinical manifestations rare)

Dose **schizophrenia, combination therapy for mania, preventing recurrence in bipolar disorder**: *by oral administration,* ADULT over 18 years, 10 mg daily adjusted to usual range of 5-20 mg daily; doses greater than 10 mg daily only after reassessment; max 20mg daily

Note***:*** *when one or more factors are present that might result in slower metabolism (e.g. female gender, elderly, non-smoker) consider lower initial dose and more gradual dose increase*

QUETIAPINE

Tablet, 50mg NRH

Therapeutic group psychotherapeutic medicine (atypical)

Indications schizophrenia; treatment of episodes of mania either alone or with mood stabilizers

Contraindications breastfeeding

Caution should be used with caution in hepatic or renal impairment; cardiovascular disease or other conditions predisposing to hypotension, with cerebrovascular disease; pregnancy

Interactions increased risk of drowsiness and postural hypotension when used with alcohol; should be used with caution with medicines that cause significant prolongation of QT interval

Side effects constipation, dyspepsia, dry mouth; somnolence and dizziness; mild asthenia, anxiety, fever, rhinitis, peripheral oedema, and raised liver enzyme values are also relatively common; orthostatic hypotension associated with dizziness, reflex tachycardia

Dose **schizophrenia**: *by oral administration,* ADULT, initially 25mg twice daily on day 1, 50mg twice daily on day 2,100mg twice daily on day 3, 150mg twice daily on day 4; usual dose range: 300-450mg daily; max dose: 750 mg daily; ELDERLY, initially 25mg daily, increase in step of 25-50mg daily in 2 divided dose; CHILD, 12-18 years initially 25mg twice daily, adjusted in steps of 25-50mg according to response; **mania**: 50mg twice daily on day 1, 100mg twice daily on day 2, 150mg twice daily on day 3, 200mg twice daily on day 4; usual dose range: 400-800mg daily in 2 divided dose, max up to 800mg; ELDERLY, initially 25mg daily as a single dose, increased in steps of 25-50mg twice daily; CHILD under 18 years, not recommended for mania

11.2 Medicines used in mood disorder

AMITRIPTYLINE

Tablet, 25mg NRH/RRH/DH

Therapeutic group psychotherapeutic medicines

Indications depression with agitation or insomnia, anxiety, chronic daily headache and neuropathic pain

Contraindications recent myocardial infarction, heart block, mania, severe liver disease and children

Cautions diabetes, heart disease with arrhythmia, epilepsy, pregnancy (use only if potential benefit outweighs risk), breast feeding, elderly, hepatic impairment, thyroid disease, co-existing psychosis, closed-angle glaucoma, urinary retention; upon completion of treatment, the medicine should be slowly withdrawn

Interactions see appendix 1 under anti-depressants, tricyclic

Side effects drowsiness and dry mouth, blurred vision, constipation and urinary retention; patients should be encouraged to continue with the treatment, as some side effects will decrease after use

Dose**:** *by oral administration,* ADULT, 50-75mg (ELDERLY and ADOLESCENT-start at 25-50mg) daily in divided doses, or as a single dose at bedtime; increase gradually as necessary; usual maintenance dose: 50-100mg daily, maximum 150-200mg daily; **nocturnal enuresis**: CHILD 7-10 years, 10-20mg; CHILD 11-16 years, 25-50mg at night; max period of treatment (including gradual withdrawal) 3 months; full physical examination should be done before further course

FLUOXETINE

Tablet, 20mg NRH/RRH/DH

Indications see under dose

Cautions see notes above, under chlorpromazine

Contraindications see under chlorpromazine

Side effects possible changes in blood sugar, fever, neuroleptic malignant syndrome-like event; also reported (no causal relationship established)

abnormal bleeding, aplastic anaemia, cerebrovascular accident, ecchymosis, eosinophilic pneumonia, GI haemorrhage, haemolytic anaemia, pancreatitis, pancytopenia, thrombocytopenia, thrombocytopenic purpura, vaginal bleeding on withdrawal, violent behavior; hair loss also reported

Dose **depressive illness**: *by oral administration,* 20 mg once daily increased after 3 weeks if necessary; usual dose 20-60 mg (ELDERLY 20-40 mg) once daily; max. 80 mg (elderly max. 60 mg) once daily; **obsessive-compulsive disorder**: *by oral administration,* initially 20 mg once daily increased after two weeks if necessary, usual dose 20-60 mg (ELDERLY 20-40 mg) once daily; max. 80 mg (ELDERLY max. 60 mg) once daily; discontinue if no improvement within 10 weeks; *CHILD and ADOLESCENT under 18 years not recommended*

VENLAFAXINE

Tablet (extended release), 75mg NRH/RRH

Therapeutic group serotonin/noradrenaline reuptake inhibitor; antidepressant

Indications moderate to severe depressive illness generalized by anxiety disorder, social anxiety, panic disorder and attention deficit disorder

Contraindications <18 years; uncontrolled hypertension, high risk of serious ventricular arrhythmia, electrolyte disturbance; pregnancy and lactation

Cautions moderate to severe hepatic and renal impairment; history of MI, bleeding disorder; epilepsy, angle closure glaucoma.

Interactions see appendix 1

Side effects constipation, nausea, dizziness, dry mouth, insomnia, suicidal ideation, nervousness, drowsiness; asthenia, headache, sexual dysfunction, sweating, anorexia, weight changes; diarrhoea, dyspepsia, vomiting, abdominal pain, hypertension, palpitation, vasodilation, changes in serum cholesterol, chills, pyrexia, dyspnoea, abnormal dreams, agitations, confusions, anxiety, hypertonia, paraesthesia, tremor, urinary frequency, menstrual disturbance, mydriasis, tinnits, hypotension, postural hypotension, alopecia, Steven-Johnson syndrome

Dose **depression and generalized anxiety**: *by oral administration*, 37.5-75mg once a day initially, may be increased by 75mg/day every 4 to 7 days; not to exceed 225mg/day; **anxiety**: *by oral administration,* 75mg/day; **panic disorder:** *by oral administration,* 37.5mg/day for 7 days, then 75mg/day; may be further increased by 75 mg/day every 7 days; not to exceed 225mg/day; **attention deficit disorder:** *by oral administration,* 18.75-75mg/day; may be increased to 150mg/day after 4 weeks; **dosing modification in renal impairment;** mild to severe renal impairment: reduce dose by 25 to 50%; mild to moderate hepatic impairment: reduce dose by 50%

Counseling *to be taken after food*

11.3 Anxiolytics

DIAZEPAM

Injection, 5mg/ml (2ml) NRH/RRH/DH/BHU
Tablet, 5mg NRH/RH/DH/BHU

Therapeutic group anxiolytics

Indications anxiety, insomnia, status epilepticus, pre-operative use and febrile surgeries

Contraindications respiratory depression, phobic or obsessional states, chronic psychosis

Cautions babies born to mothers who have received regular diazepam may have respiratory depression and may become dystonic and hypo-thermic; use during breast feeding may cause drowsiness in the baby; continuous use as a hypnotic may lead to dependence, and sudden withdrawal may cause symptoms. IV injection may cause thrombophlebitis, and extravasation can cause skin necrosis

Interactions see appendix 1 under anxiolytics

Side effects and Overdosage drowsiness and light-headedness, persisting until next day; confusion and ataxia in the elderly; amnesia, vertigo and hypotension may occur; apnoea occasionally follows IV use; overdosage results in a long period of sleep, and supportive measures only are indicated

Dose *by oral administration,* ADULT: 2.5-5mg 3 times daily or 5-15mg at bedtime; **night terrors and somnambulism:** CHILD, 1-5mg at bedtime; b*y IV injection***,** ADULT: 10-20mg at a rate of 1ml/minute; CHILD, 0.2-0.3mg/kg

LORAZEPAM

Tablet, 1mg NRH

Therapeutic group antiepileptics; psychotherapeutics

Indications short-term use in anxiety or insomnia, status epilepticus

Contraindications see under diazepam

Cautions see under diazepam

Side effects see under diazepam

Dose **anxiety**: *by oral administration,* ADULT, 1–4 mg daily in divided doses; ELDERLY (or debilitated) half the adult dose; i**nsomnia associated with anxiety**: *by oral administration,* 1-2 mg at bedtime; *CHILD, not recommended*

12. Anti-infective medicines

12.1. Anthelmintics

ALBENDAZOLE

Tablet (Chewable), 400mg NRH/RRH/DH/BHU

Therapeutic group intestinal anthelmintics

Indications single or mixed intestinal parasite infestation caused by roundworms, pinworm, whipworm, threadworm, hookworm, and strongyloides-stercoralis, as adjunct to surgery in hydatid cysts caused by *Echinococcus granulosus* or *E. multilocularis*, or primary treatment if surgery not possible

Contraindications pregnancy before twelve weeks

Cautions liver function tests and blood counts before treatment and twice during each cycle (prolonged treatment)

Interactions fatty meal increases the absorption of albendazole

Side effects GI disturbances, headache, dizziness, increase in liver enzymes, reversible alopecia

Dose **roundworms, pinworm, whipworm and hookworm infestations**: *by oral administration*, ADULT and CHILD above 2 years, 400mg as a single dose; **strongyloides & tapeworm infestation**: *by oral administration*, ADULT and

CHILD above 2 years, 400mg/day for 3 days; ***E. Granulosus****: by oral administration*, ADULT and CHILD above 2 years, 10mg/kg per day for 4-8 weeks; **neurocysticercosis**: 400mg twice daily for 30 days; CHILD 1-2 years, half the adult dose; **hydatid cyst**: ADULT (more than 60kg), 400 mg twice daily for 28 days; repeat after two weeks for up to 3 cycles; ADULT (less than 60 kg) and CHILD less than 6 years: 7.5 mg/kg twice daily (max. 400mg) per dose for 28 days; repeat after two weeks for up to 3 cycles

Counseling *tablet should be crushed thoroughly and washed down with water*; *patients should be advised to take it in empty stomach, if single dose; for systemic infestation such as neurocysticercosis, it may be taken with food for better absorption*

NICLOSAMIDE

Tablet, 500mg NRH/RRH/DH/BHU

Therapeutic group intestinal anthelmintics

Indications tapeworm infestation

Cautions in chronic constipation, a laxative should be given the night before treatment, or a purgative 2 hours after the medication

Side effects light-headedness, pruritus and mild gastro-intestinal disturbances may occur

Dose *by oral administration,* ***Taenia solium*****:** ADULT and CHILD over 6 years, 2g as a single dose on empty stomach followed by magnesium sulphate solution after 2 hours; CHILD under 2 years, 500mg; CHILD 2-6 years, 1000mg; ***Taenia saginate*** **and** ***Diphyllobothrium latum***: as above but half of the dose on empty stomach and remainder one hour later followed by a purgative 2 hours after last dose; ***Hymenolepiss nana***: ADULT and CHILD over 6 years, 2g as a single dose on first day and then 1g daily for 6 days; CHILD under 2 years, 500mg on first day and then 250mg daily for 6 days; CHILD 2-6 years, 1g on first day, then 500mg daily for 6 days

Counseling**:** *tablets should be chewed thoroughly (or crushed) before washing down with water*

12.2. Antibacterials

12.2.1 Penicillin

AMOXICILLIN

Scored tablet/capsule, 250mg NRH/RRH/DH/BHU
Syrup, 125mg/ml (60ml) NRH/RRH/DH/BHU

Therapeutic group antibacterial (penicillin)

Indications urinary tract infections, otitis media, sinusitis, PID, cholera, cholecystitis, peritonitis, bronchitis, pneumonia, dental abscess and other infections depending on culture sensitivity report

Contraindications penicillin hypersensitivity

Cautions history of allergy; renal impairment; erythematous rashes are common in patients with infectious mononucleosis, chronic lymphatic leukaemia and glandular fever

Side effects nausea, vomiting, diarrhea, rash

Dose *by oral administration,* ADULT, 250-500mg 8 hourly, doubled in severe infections; CHILD up to 10 years, 125 to 250 mg every 8 hours; for those under 40 kg: 20 to 40 mg/kg daily in divided doses every 8 hours, or 25 to 45 mg/kg

daily in divided doses every 12 hours; INFANTS less than 3 months old, the maximum dose should be 30 mg/kg daily in divided doses every 12 hours

Counseling *complete the full prescribed course*

AMPICILLIN

Injection, 500mg/vial NRH/RRH/DH/BHU

Therapeutic group antibacterial (penicillin)

Indications board spectrum antibiotic; serious infections with sensitive organisms for conservative treatment of appendicitis, urinary tract infections, endocarditis, meningitis, peritonitis, cholecystitis, pnuemonia, septicaemia, otitis media, sinusitis, chronic bronchitis, invasive salmonellosis

Contraindications penicillin hypersensitivity

Cautions history of allergy; renal impairment; erythematous rashes are common in patients with infectious mononucleosis, chronic lymphatic leukaemia and HIV

Side effects nausea, vomiting, diarrhoea, rashes (discontinue treatment)

Dose **endocarditis**: *by IV injection,* ADULT 2g 4 hourly; CHILD, 50mg/kg; **meningitis**: *by IV injection*, ADULT 2g 4 hourly; NEONATE 50mg/kg 6 hourly; CHILD 3-12 years, 100mg/kg 6 hourly (max 12g daily); **septicaemia**: *by IV injection* 500mg every 4-6 hours; CHILD under 10 years, half the adult dose; NEONATE, 25mg/kg 8 hourly; **peritonitis and cholecystitis**: *by IV injection,* 500mg 6 hourly; **pneumonia**: *by IV injection,* NEONATE: 30mg/kg 12 hourly; 4 months-5 years, 200mg/kg daily divided 6 hourly

BENZATHINE BENZYLPENICILLIN

Injection, 2.4 g (24 lakh units) NRH/RRH/DH/BHU

Therapeutic group antibacterial (penicillin)

Indications syphilis, prophylaxis of rheumatic fever, group A streptococcal pharyngitis

Contraindications penicillin hypersensitivity

Cautions allergy (a test dose should be given), renal impairment, pregnancy, breastfeeding and in hypertensive patients as it contains sodium

Dose *by deep IM injection,* **primary syphilis**: 2.4g on two successive days; **late syphilis**: 2.4g weekly for 3 weeks; **prophylaxis of rheumatic fever**: 1.2g 3 weekly (<10 years: half dose); **congenital syphilis** (for infants born to seropositive mothers): 50000 IU/kg as a single dose

Dose equivalent: 600 mg = 1 million units

PENICILLIN V (phenoxymethylpenicillin)

Tablet 250mg NRH/RRH/DH/BHU

Therapeutic group antibacterial (penicillin)

Indications streptococcal infections; tonsillitis, otitis media, erysipelas; pharyngitis caused by pneumococci and streptococci, gingivostomatitis, pneumococcal infections

Contraindications penicillin hypersensitivity

Cautions history of allergy; renal impairment

Side effects hypersensitivity reactions, including urticaria, fever, joint pains.; anaphylactic shock in hypersensitive patients

Dose *by oral administration,* ADULT: 250-500mg 6 hourly; CHILD under 1 year: 62.5mg 6 hourly; 1-5 years: 125mg 6 hourly; 6-12 years: 250mg 6 hourly

Counseling *take the tablets at least half an hour before food; complete the full course*

PROCAINE BENZYLPENICILLIN

Injection, 3g (10ml) NRH/RRH/DH/BHU

Therapeutic group antibacterial (penicillin)

Indications syphilis and other penicillin-sensitive infections

Contraindications penicillin hypersensitivity

Cautions allergy (a test dose should be given to all patients); renal impairment

Side effects sensitivity reactions, including urticaria, fever, joint pains; anaphylactic shock in hypersensitive patients

Dose *by IM injection,* ADULT, 6 lakh units 1-2 times daily; CHILD, 0.25-0.5 lakh units/kg/day to maximum of 6 lakh units; some children and infants may require up to 1 lakh unit/kg body weight in divided doses, depending on the type and severity of infection; **syphilis:** 1.2 million IU daily

BENZYLPENICILLIN (penicillin G)

Injection, 3g (50 lakh units) NRH/RRH/DH/BHU

Therapeutic group antibacterial (penicillin)

Indications meningococcal, pneumococcal meningitis, throat infections, otitis media, streptococcal endocarditis, osteomyelitis and pneumonia

Contraindications penicillin hypersensitivity; avoid intrathecal route

Cautions renal impairment; history of allergy

Side effects hypersensitivity reactions, including urticaria, fever, joint pains and rashes; anaphylactic shock in hypersensitive patients

Dose *by slow IV injection or infusion,* ADULT, 2 million units 4 hourly; CHILD, 1.5-2 lakhs/kg/day 4 hourly (max 20 million units) per day; **bites and peritonitis:** *by slow IV injection*, 10 lakh units 6 hourly; **neurosyphilis**: *by slow IV injection,* 1.2-2.4 million IU 4 hourly

CLOXACILLIN

Capsule, 250mg NRH/RRH/DH
Injection, powder for reconstitution 250mg NRH/RRH

Therapeutic group antibacterial (anti-staphylococci); osteomyelitis, septic arthritis, staphylococcal endocarditis, meningitis, brain abscess, cellulites, paronychia nail infection

Indications infections due to penicillinase-producing staphylococci

Contraindications penicillin hypersensitivity, jaundice in neonates

Cautions history of allergy; renal impairment, hepatic disease

Side effects hypersensitivity reactions, including urticaria, fever, joint pains, anaphylactic shock in hypersensitive patients

Dose **osteomyelitis, septic arthritis, and staphylococcal endocarditis**: *by slow IV injection or infusion*, ADULT, 2g 6 hourly; CHILD, 50mg/kg; **brain abscess and meningitis**: *by slow IV injection or infusion*, 2g 4 hourly; **cellulitis and paronychia nail infection**: *by oral administration*, 250-500mg orally 6 hourly

Counseling *take the medicine at least half an hour before food; complete the full course*

12.2.2 Cephalosporins

CEPHALEXIN

Tablet, 250mg NRH/RRH

Therapeutic group antibacterial (cephalosporin)

Indications sensitive infections like urinary tract infections, skin and soft tissue infections, bone infections, biliary tract infections, intra-abdominal infections etc

Contraindications cephalosporin hypersensitivity

Cautions penicillin hypersensitivity; renal impairment; false positive urinary glucose if tested for reducing substances; false positive Coombs' test

Interactions see appendix 1 under cephalosporin.

Side effects diarrhoea, colitis, nausea and vomiting; allergic manifestations including rashes, pruritis and urticaria, also fever, arthralgia and anaphylaxis; abdominal discomfort, headache, erythema multiforme, toxic epidermal necrolysis; disturbances in liver enzymes, transient hepatitis and cholesteric jaundice

Dose *by oral administration,* ADULT, 500mg 12 hourly; CHILD under 1 year, 125mg 12 hourly; CHILD 1-5 years, 125mg 8 hourly; CHILD 6-12 years, 250mg 8 hourly; doses should be doubled in severe infections

CEPHAZOLIN

Injection, 500mg NRH/RRH

Therapeutic group antibacterial (2ndgeneration cephalosporin)

Indications respiratory and genito-urinary tract infections that do not respond to penicillins, skin and soft tissue, bone and joint infections, septicaemia, surgical prophylaxis and endocarditis

Contraindications see under cephalexin

Cautions see under cephalexin.

Interactions see appendix 1 under cephalosporin

Side effects see under cephalexin

Dose *by IM or IV injection*, ADULT, 500 to 1000mg every 6-12 hours; CHILD, 25-50mg/kg daily in divided doses, increased to 100mg/kg daily in severe infections

CEFTRIAXONE

Injection, 1g NRH/RRH
Injection, 250mgb NRH/RRH/DH/BHU

Therapeutic group antibacterial (3rdgeneration cephalosporin)

Indications meningitis, pneumonia, septicaemia and gonorrhoea

Contraindications see under cephalexin

Cautions see under cephalexin

Interactions see appendix 1 under cephalosporin

Side effects see under cephalexin; in neonates and preterm infants, displaces bilirubin from albumin and increases risk of encephalopathy

Dose *by deep IM* or IV *injection over at least 2-4 minutes*, or *by IV infusion*, 1g daily; 2-4 g daily in severe infections; *IM doses over 1g should be divided between more than one site*; NEONATE, *by IV infusion over 60 minutes*, 20-50 mg/kg daily (max. 50 mg/kg daily); CHILD under 12 years, *by deep IM injection*, or *by IV injection over 2–4 minutes*, daily in severe infections; doses of 50 mg/kg and over by *IV infusion* only; **uncomplicated gonorrhoea**: *by deep IM injection*, 250 mg as a single dose

CEFOTAXIME

Injection, 1g NRH/RRH

Therapeutic group antibacterial (3rd generation cephalosporin)

Indications infection due to sensitive gram-positive and gram-negative bacteria; surgical prophylaxis; haemophilus epiglottitis, gonorrhoea and meningitis; preferred in neonate and preterm over ceftriaxone

Contraindications see under cephalexin

Cautions see under cephalexin

Interactions see appendix 1under cephalosporin

Side effects see under cephalexin

Dose *by IM or IV injection,* ADULT 1g every 12 hours, increased up to 12g daily in 3-4 divided doses in severe infections; NEONATE 50mg/kg daily in 2-4 divided doses increased to 150-200mg/kg daily in severe infections; CHILD 100-150mg/kg daily in 2-4 divided doses, increased up to 200mg/kg daily in very severe infections; **gonorrhoea**: 1000mg as a single dose

CEFIXIME

Tablet, 200mg NRH/RRH

Therapeutic group antibacterial (3rd generation cephalosporin)

Indications treatment of infections caused by sensitive organisms including upper respiratory tract infections, otitis media, pharyngitis, uncomplicated gonorrhea and uncomplicated urinary tract infection

Contraindications hypersensitivity to cephalosporins

Cautions sensitivity to beta-lactam antibacterial, renal impairment; pregnancy and breast feeding

Interactions see appendix 1

Side effects see under cephalexin

Dose *by oral administration,* **respiratory tract infection**: ADULT, 400mg/day in single daily dose or in two divided dose; **otitis media, pharyngitis/tonsillitis, uncomplicated UTI**: 400mg/day in single daily dose or in 2 divided dose in every 12 hours; CHILD, 6-12months, 8mg/kg/day in single daily dose or in two divided dose every 12 hours; not to exceed 400mg /day: CHILD >12 years, 400mg/day in single dose or in two divided dose every 12 hours; **dosing modification:** renal impairment; CrCl 21-60mL/min: 260mg/day; CrCl <20mL/min: 200mg/day

12.2.3 Aminoglycosides

GENTAMICIN

Injection, 40mg/ml (2ml) NRH/RRH/DH/BHU

Therapeutic group antibacterial (aminoglycosides)

Indications gram-negative septicaemia and neonatal sepsis; meningitis and other CNS infections; biliary tract infection, acute pyelonephritis or prostatitis, endocarditis caused by strep. viridans or *Strep. faecalis* (with penicillin) and surgical prophylaxis

Contraindications myasthenia gravis

Cautions pregnancy; renal impairment, infants, the elderly; avoid prolonged use (beyond 7 days) and high doses in these groups

Interactions see appendix 1 under aminoglycosides

Side effects vestibular and auditory damage, reversible nephrotoxicity, antibiotic associated colitis

Dose *by slow IM or IV injection,* **endocarditis**: 1mg/kg 8 hourly; **endocarditis (culture negative)**: ADULT, 4 to 6 mg/kg daily; CHILD <10 years, 7.5mg/kg; CHILD ≥ 10 years, 6mg/kg; **necrotising fasciitis or synergistic gangrene and peritonitis**: 4-6mg/kg IV daily; **surgical prophylaxis**: *by IV injection,*2mg/kg ; **pneumonia in children**: NEONATE (birth to 1 month), 2.5 to 3mg/kg IV (< 30 weeks gestation) or 3.5 mg/kg (> 30 weeks gestation) IV, daily; **septicaemia**:5mg/kg daily (in divided doses every 8 hours)

AMIKACIN SULPHATE

Injection, 250mg (2ml) NRH/RRH

Therapeutic group antibacterial (aminoglycosides)

Indications serious gram negative infections resistant to gentamicin

Contraindications see under gentamicin

Cautions see under gentamicin; amikacin affects auditory functions to greater extent than gentamicin

Interactions see appendix 1 under aminoglycosides

Side effects see under gentamicin

Dose *by IM or slow IV injection*, ADULT, 15mg/kg daily in 2 divide doses, increased to 22.5mg/kg daily in 3 divided doses in severe infections; max. 1.5g daily for up to 10 days (max. cumulative dose 15 g); CHILD, 15mg/kg daily in 2 divided doses; NEONATE, loading dose of 10 mg/kg then 15 mg/kg daily in 2 divided doses

12.2.4 Fluoroquinolones

CIPROFLOXACIN

Injection, 2mg/ml (100ml) NRH/RRH/DH
Tablet, 500mg NRH/RRH/DH

Therapeutic group antibacterial (fluoroquinolones)

Indications typhoid fever, proven to be resistant to all other conventional medicines; gastroenteritis including cholera, shigellosis, pseudomonal meningitis, gonorrhoea, RTI, UTI, bone and joint infections, septicaemia and skin infections

Contraindications history of convulsive disorders; avoid during pregnancy and lactation

Cautions renal and hepatic impairment; strong sunlight exposure (photosensitivity); false positive urinary glucose if tested for reducing substances; not recommended in children or growing adolescents

Interactions see appendix 1 under quinolones

Side effects nausea, vomiting, diarrhoea, dyspepsia, abdominal pain. dizziness, headache, restlessness; rashes, pruritis; more serious CNS effects (including convulsions); muscle and joint pains, liver and kidney damage and blood disorders

Dose *by oral administration*, ADULT, 250-750mg 12 hourly daily; *by IV infusion,* 200-300mg 12 hourly daily; CHILD, (not recommended, but where benefit outweigh risk), *by oral administration*,10-30mg/kg daily in two divided doses or *by IV infusion*, 8-16mg/kg daily in two divided dose

Counseling *stay out of bright sunlight while taking this medicine; take plenty of fluids*

NORFLOXACIN

Tablet, 400mg NRH/RRH

Therapeutic group antibacterial (fluoroquinolones)

Indications urinary tract infections not responding to other conventional medicines; infectious diarrhoea

Contraindications hypersensitivity to quinolones, children, pregnancy, convulsions

Cautions lactation, moderate renal impairment; history of convulsions, do not exceed the recommended dose; ensure adequate hydration, urinary output

Interactions see appendix 1 under quinolones

Side effects nausea, vomiting, heart burn, constipation/diarrhoea, headache, dizziness, depression, insomnia and seizures, rashes, dry mouth, fever, arthralgia, elevated liver enzymes, urea and creatinine, eosinophilia, neutropenia, thrombocytopenia and anaemia, visual disturbances

Dose *by oral administration*, **urinary tract infections:** 400mg 12 hourly daily for 7-10 days (for 3 days in uncomplicated lower urinary tract infections); **complicated UTI**: 400mg 12 hourly for 10-14 days; **chronic relapsing urinary tract infections**: 400mg twice daily for 12 weeks; may be reduced to 400mg once daily if adequate suppression within first 4 weeks; c**hronic prostatitis**: 400 mg twice daily for 30 days

Counseling *see under ciprofloxacin*

12.2.5 Other antibacterial

CHLORAMPHENICOL

Injection, powder for reconstitution (1g) NRH/RRH/DH
Capsule, 250mg NRH

Therapeutic group antibacterial

Indications typhoid fever, Strep. Pnuemoniae, meningitis, epiglottitis, septicaemia, cerebral abscess, mastoiditis

Contraindications pregnancy, breast feeding (bone marrow toxicity in infant)

Cautions blood counts required before and during treatment; reduce dosage in liver or renal impairment; may cause “grey baby” syndrome in neonates

Interactions see appendix 1

Side effects blood disorder including reversible and irreversible aplastic anaemia may occur; peripheral and optic neuritis, hypersensitivity reactions, erythema multiforme, nausea, vomiting and diarrhoea

Dose *by oral administration or IV injection or infusion*, ADULT, 500mg-1g every 6 hours; CHILD over 1 year: 50-100mg/kg/day; CHILD 2 weeks-1 year,

50mg/kg/day in 4 divided doses; INFANT under 2 weeks, 25mg/kg daily in 4 divided doses; *never give IM as absorption is erratic; switch to oral, if patient can swallow*

Note *this medicine has life-threatening side effects and its use is justified in serious situations only; there should be good clinical or laboratory reasons of suspecting typhoid fever before it is used in PUO (pyrexia of unknown origin)*

Grey Syndrome: *vomiting, greenish diarrhoea, abdominal distension, hypothermia, pallid cyanosis, irregular respiration and circulatory collapse*

SULPHAMETHOXAZOLE + TRIMETHOPRIM (COTRIMOXAZOLE)

Tablet, (400mg + 80mg) NRH/RRH/DH/BHU

Therapeutic group antibacterial (sulphonamides)

Indications upper respiratory infections, urinary tract infection, pneumonia and treatment of PCP in HIV/AIDS

Contraindications pregnancy (1st trimester), babies under 6 weeks old, renal or hepatic failure, jaundice, blood disorders, known sensitivity to sulphonamides

Cautions adequate fluid intake must be maintained to prevent crystallization in the urine; renal impairment, breas feeding, and elderly patients all demand care or re-consideration of the choice of medicine; photosensitivity may occur

Interactions see appendix 1 under cotrimoxazole

Side effects nausea, vomiting, rashes and blood disorders

Dose *by oral administration,* ADULT, 960 mg twice daily, increased to 3 tablet twice daily in severe infections; CHILD over 5 years, 480mg twice daily; CHILD over 6 months to 5 years, 240mg twice daily; CHILD over 6 weeks to 6 months, 120mg twice daily; **prophylaxis of pneumocystis jerovici pneumonia in HIV patients**: 960mg once daily

Counseling *drink plenty of fluids with this medicine; complete the full course*

Note *in case of bacillary dysentery, oral rehydration remains the first requirement of treatment; mild cases may be prolonged by antibiotic treatment*

DOXYCYCLINE

Tablet/capsule, 100mg NRH/RRH/DH/BHU

Therapeutic group antibacterial (tetracycline)

Indications infections caused by chlamydia, sinusitis, acne vulgaris, malaria, pelvic inflammatory disease, rosacea, chronic prostatitis.

Contraindications pregnancy, breast feeding, children under 12 years, systemic lupus erythematosus

Cautions hepatic impairment, antacids, aluminium, zinc, calcium, iron, magnesium salts and milk and milk products reduces the absorption of tetracycline

Interactions see appendix 1 under tetracycline

Side effects nausea, vomiting, diarrhoea (antibiotic-associated colitis reported occasionally), dysphagia, and oesophageal irritation

Dose *by oral administration,* ADULT, 200mg on the first day, then 100mg daily thereafter; severe infections, 200mg daily; **early syphilis**: 100mg 2 times daily for 14 days; **late latent syphilis**: 200mg two times daily for 30 days; **uncomplicated genital chlamydia, non-gonococcal urethritis**: 100mg two times daily for 7 days (14 days in PID)

Counseling *take this medicine with plenty of fluid during meal to reduce gastric irritation; avoid exposure of skin to direct sunlight; do not take indigestion remedies or medicines containing iron or zinc at the same time of day as this medicine; complete the full course*

ERYTHROMYCIN STEARATE

Tablet, 250mg NRH/RRH/DH

Therapeutic group antibacterial (macrolides)

Indications treatment of penicillin-sensitive infections in patients allergic to Penicillin, also *Campylobacter enteritis*, pneumonia, syphilis, chronic prostatitis, acne vulgaris; treatment of *Chlamydia trachomatis* during pregnancy and breastfeeding where doxycycline is contraindicated

Contraindications severe hepatic impairment

Cautions hepatic and renal impairment, pregnancy and breastfeeding

Interactions see appendix 1

Side effects nausea, vomiting, abdominal discomfort, diarrhoea (antibiotic-associated colitis reported); urticaria, rashes and other allergic reactions; reversible hearing loss reported after large doses; cholestatic jaundice, cardiac effects; the estolate salt causes jaundice

Dose *by oral administration,* ADULT, 250-500mg orally 6 hourly; CHILD < 2 years, 125mg 6 hourly; 2-8 years, 250mg 6 hourly; > 8 years, 250-500mg 6 hourly (or 30-50mg/kg daily in 4 divided doses)

CLARITHROMYCIN

Tablet, 250mg NRH

Therapeutic group macrolides

Indications treatment of peptic ulcer disease as a part of 2 or 3 medicines combination regimen

Contraindications hypersensitivity to macrolides; history of QT prolongation and cholestatic jaundice; co-administration with medicines which cause QT prolongation and statins

Caution renal impairment; pregnancy

Side effects GI disturbances including abnormal taste, nausea, abdominal pain, dyspepsia; headache, dizziness, anxiety; hepatiitis, elevated liver function tests, jaundice; leucopenia, neutropenia, pancreatitis; QT prolongation, seizures; rashes, Stevens-Johnson syndrome

Dose *by oral administration*, ADULT, 250-500mg two to three times daily; CHILD, 15mg/kg/day twice daily

NITROFURANTOIN

Tablet, 100mg NRH/RRH/DH

Therapeutic group antibacterial

Indications urinary tract infections caused by *E. coli*. Enterococci, *S. aureus*, *Klebsiella sp.*, *Enterobacter sp.*, and *Proteus sp.*

Contraindications impaired renal function and neonates

Cautions in long-term therapy, monitor lung function and liver function; false positive urinary glucose if tested for reducing substances; urine may be coloured

yellow or brown; use with caution in anaemia, electrolyte imbalance, and vitamin B and folate deficiency

Side effects anorexia, nausea, vomiting and diarrhoea are common; pulmonary reactions and peripheral neuropathy may occur; urticarial rash and pruritis and many other side effects have been noted

Dose **treatment**: *By oral administration,* ADULT, 50-100mg 6 hourly; CHILD over 3 months, 3mg/kg daily in 4 divided doses, 100mg every 6 hourly for 7 days in severe chronic recurrent infection; **prophylaxis**: ADULT, 50-100mg at night; CHILD over 3 months, 1mg/kg at night

Counseling *take this medicine regularly as instructed; take some food or snack with every dose to avoid nausea and vomiting; do not worry if your urine changes colour*

VANCOMYCIN

Injection, 500mg NRH

Therapeutic group antibacterial

Indications prophylaxis and treatment of endocarditis and other serious infections caused by gram-positive cocci

Contraindications**:** risk-benefit should be considered when hypersensitivity and severe renal function impairment exists

Cautions**:** avoid rapid infusion; rotate infusion sites; renal impairment (appendix 3); elderly; avoid if history of deafness; all patients require plasma-vancomycin measurement (after 3 or 4 doses if renal function normal, earlier renal impairment), blood counts, urinalysis, andadrenal function tests; monitor auditory function in elderly or if renal impairment; pregnancy (appendix 4) and breast feeding (appendix 5); interactions; appendix 1 (vancomycin)

Side effects enphrotoxicity including renal failure and interstitial nephritis; ototoxicity (discontinue if tinnitus occurs); blood disorders including neutropenia (usually after 1 week or cumulative dose of 25g), rarely agranulocytosis and thrombocytopenia; nausea; chills, fever; eosinophilia, anaphylaxis, rashes (including exfoliuative dermatitis, Stevens-Johnson syndrome, toxic epidermal necrolysis, and vasculitis); phlebitis (irritant to tissue); on rapid infusion, severe hypotension (including shock and cardiac arrest), wheezing, dyspnoea, urticaria, prurius, flushing of the upper body (red man syndrome), pain and muscle spasm of back and chest)

Dose *by IV infusion,* ADULT 500mg every 6 hours or 1g every 12 hours; CHILD, 20mg/kg 12 hourly

Note plasma concentration monitoring required; pre-dose (trough) concentration should be 5-10mg/L (10-15 mg/L in endocarditis)

12.2.3 Antileprosy medicines

DAPSONE

Tablet, 50mg NRH/RRH/DH/BHU

Therapeutic group antileprosy medicines; antimalarial medicines

Indications leprosy, as part of multi-medicine therapy

Contraindications porphyria

Cautions cardiac or pulmonary disease, anaemia (treat before starting dapsone therapy), pregnancy (give folate supplements); on long-term treatment, patients and their carers should be told how to recognise signs of blood disorders and

advised to seek immediate medical attention if symptoms such as rash, fever, sore throat, mouth ulcers, bruising or bleedings occur

Interactions see appendix 1

Side effects neuropathy; allergic dermatitis; anorexia, nausea, vomiting, headache, insomnia; anaemia, agranulocytosis; hepatitis; *these are dose-related, and uncommon at current recommended doses*

Dose *by oral administration,* 1-2 mg/kg daily

RIFAMPICIN

Tablet, 300mg and 150mg NRH/RRH

Therapeutic group antileprosy and antituberculosis medicines

Indications leprosy, tuberculosis

Contraindications jaundice

Cautions hepatic impairment (reduce dose), pregnancy (risk of neonatal bleeding may be increased); advice patients on oral contraceptives to use additional contraceptives during treatment

Interactions see appendix 1

Side effects GI symptoms including anorexia, nausea, vomiting, diarrhoea, headache, drowsiness

Dose *by oral administration:* **tuberculosis**: 450-600mg daily, as part of combination therapy; **leprosy**: 600mg once monthly, as part of multi-medicine therapy; CHILD (both diseases): 105mg/kg daily

Counseling *take all this medicine regularly as instructed until advised to stop; urine and saliva may become red-coloured; take half to one hour before food*

Note **hepatic disorders***: patients and their carers should be told how to recognize signs of liver disorder, and advise to seek immediate medical attention if symptoms such as persistent nausea, vomiting, malaise or jaundice develop*

CLOFAZIMINE

Capsule, 50mg and 100mg NRH/RRH/DH

Therapeutic group antileprosy

Indications multibacillary leprosy, as part of multi-medicine therapy; type II leprosy reactions (erythema nodosum leprosum)

Cautions hepatic and renal impairment, pregnancy and breastfeeding, avoid if persistent abdominal pain and diarrhoea

Side effects nausea, vomiting, abdominal pain, headache, tiredness

Dose *by oral administration:* **treatment**: 300mg once monthly and 50mg daily between monthly doses; **ENL Reactions**: up to 300mg daily for a maximum of 3 months; CHILD 6-12 years: ½ ADULT dose; CHILD under 6 years: 1/4 ADULT dose

Counseling *take all this medicine regularly as instructed until advised to stop; you may find that your urine and saliva become red-coloured; take with or after food*

12.2.4. Antituberculosis medicines

As per the National Guideline for Management of Tuberculosis, basic principles of TB treatment include administration of combination of medicines to kill different bacterial populations; for right duration, in right dosages to achieve therapeutic but not toxic effect. TB treatment has been standardized so that all

patients in a defined group receive the same treatment regime. Fixed dose combinations (FDCs) are available for treatment of both new and re-treatment cases. Single formulations are to be reserved in case patients develop serious adverse effects to FDCs.

4-FDC (HRZE)

Tablet, (75mg+150mg+400mg+275mg) NRH/RRH/DH

Therapeutic group antituberculosis medicines

Indications treatment of tuberculosis (intensive phase)

Side effects nausea, vomiting, loss of appetite; as for individual medicine components

Contraindications if allergic to any of these medicines in the combination; medicine induced liver diseases

Counseling *take the medicine half to one hour before food and preferably at the same time of the day consistently; reassure if patient complains of mild intolerance such as nausea and loss of appetite*

3-FDC (HRZ)

Tablet, (50mg+75mg+150mg) NRH/RRH/DH

Therapeutic group antituberculosis

Indications treatment of tuberculosis (intensive phase) in pediatric patients

Side effects nausea, vomiting, loss of appetite; as for individual medicine components

Contraindications allergy to any of the medicine in the combination; hepatic and renal impairment, epilepsy, history of psychosis, alcohol dependence, malnutrition, diabetes

Counseling take the medicine half to one hour before food and preferably at the same time of the day consistently; reassure if patient complains of mild intolerance such as nausea and loss of appetite

3-FDC (HRE)

Tablet, (75mg+150+275mg) NRH/RRH/DH

Therapeutic group antituberculosis

Indications treatment of tuberculosis in continuation phase for retreatment cases

Side effects nausea, vomiting, loss of appetite; as for individual medicine components

Contraindications allergy to any of the medicine in the combination; hepatic and renal impairment, epilepsy, history of psychosis, alcohol dependence, malnutrition, diabetes

Counseling take the medicine half to one hour before food and preferably at the same time of the day consistently; reassure if patient complains of mild intolerance such as nausea and loss of appetite

2-FDC (RH)

Tablet, (150mg+ 75mg) NRH/RRH/DH
Tablet (60mg + 60mg) NRH/RRH/DH
Tablet (75mg + 50mg) NRH/RRH/DH

Therapeutic group antituberculosis

Indications treatment of tuberculosis (continuation phase)

Side effects as for individual medicine components

Contraindications allergy to any of the medicines in the combination; hepatic and renal impairment, epilepsy, history of psychosis, alcohol dependence, malnutrition, diabetes. Isoniazid is not advisable during pregnancy or for those suffering from alcoholism or liver disease and jaundice; lactating mother

Interactions rifampicin accelerates the metabolism of several medicines, including oral anticoagulants, oral contraceptives, glucocorticoids, digitoxin, quinidine, methadone, ART, macrolides, azole, antifungals, hypoglycemic, and barbiturates; no interactions by isoniazid as such

Side effects nausea and vomiting, skin rash, psychotic problems, depression, seizures, peripheral neuropathy may develop by isoniazid; red or orange urine by rifampicin

Dose given according to the weight band; *refer Guidelines for the Management of Tuberculosis*

ISONIAZID

Tablet, 100mg and 300mg NRH/RRH

Therapeutic group antituberculosis

Indications tuberculosis in combination with other medicines

Contraindications medicine induced liver disease

Cautions hepatic and renal impairment, epilepsy, history of psychosis, alcohol dependence, malnutrition, diabetes

Interactions see appendix 1

Side effects nausea, vomiting, constipation, dry mouth, peripheral neuritis with high dose, optic neuritis, convulsions

Dose ADULT: 300mg daily; CHILD: 4-6mg/kg daily to a maximum of 300mg; *refer Guidelines for the Management of Tuberculosis*

STREPTOMYCIN

Injection, 1g NRH/RRH/DH

Therapeutic group antituberculosis

Indications tuberculosis (initial phase of re-treatment cases with HRE)

Contraindications pregnancy, myasthenia gravis

Cautions renal impairment; infants and the elderly

Side effects tinnitus, vertigo and deafness may precede permanent vestibular damage: reversible nephrotoxicity

Dose ADULT: 1g daily IM, but use 750mg or 500mg in patients under 50kg or over 40 years old; CHILD: 15-20mg/kg daily IM; *refer Guidelines for the Management of Tuberculosis*

ETHAMBUTOL

Tablet, 400mg NRH/RRH/DH

Therapeutic group antituberculosis

Indications used to replace a medicine that is causing toxicity or intolerance; or to be added to the normal combination treatment if medicine resistance is suspected

Contraindications optic neuritis, poor vision

Cautions reduce dose in renal impairment and creatinine clearance less than 30ml/minute; elderly and pregnancy

Side effects optic neuritis, reversible if medicine withdrawn promptly: peripheral neuritis, red/green colour blindness, pruritis, urticaria, and thrombocytopenia

Dose ADULT and CHILD over 6 years: 15-25mg/Kg when used in initial phase, 15mg/Kg when used in maintenance phase; *refer Guidelines for Management of Tuberculosis*

Counseling *if you get any trouble with your eyes while on this medicine, stop immediately and report to the hospital; do not stop this treatment unless the doctor advises you so*

PYRAZINAMIDE

Tablet, 500mg NRH/RRH

Therapeutic group antituberculosis

Indications tuberculosis (in combination with other medicines)

Contraindications liver damage

Cautions impaired hepatic function, diabetes, pregnancy, and gout (avoid in acute attack)

Side effects hepatitis, jaundice, and liver failure; nausea, vomiting, and arthralgia; anaemia, urticaria

Dose ADULT, 2g daily, reducing to 1.5g in patients under 50kg; CHILD, 35mg/kg daily; *refer National TB guideline*

Counseling *take all this medicine regularly as instructed as well as the other medicines you have been given; seek medical attention if there are signs of liver disorder: persistent nausea, vomiting, malaise or jaundice*

KANAMYCIN

Injection, 500mg NRH

Therapeutic group antituberculosis

Indications medicine-resistant tuberculosis, in combination with other medicines

Contraindications pregnancy; myasthenia gravis

Cautions renal impairment; infants and elderly; avoid prolonged use (beyond 7 days) and high doses in these groups

Side effects vestibular damage, nephrotoxicity

Dose *by IM injection,* ADULT, 250mg 6-hourly or 500mg 12-hourly; *By IV injection,* 15-30mg/Kg daily in divided doses every 8-12 hours

ETHIONAMIDE

Tablet, 250mg NRH

Therapeutic group antituberculosis

Indications medicine-resistant tuberculosis, in combination with other medicines

Contraindications severe liver disease; serious neurological or psychiatric disease

Cautions epilepsy, psychiatric symptoms

Side effects nausea, vomiting, liver damage, neuropathy, mental disturbance

Dose *by oral administration,* ADULT, 500-750mg daily in divided doses; CHILD, 12mg/Kg daily to a maximum of 500mg

Counseling *take all this medicine regularly as instructed, as well as the other medicines you have been taking*

RIFAMPICIN

Tablet, 300mg and 150mg NRH/RRH

Therapeutic group antileprosy; antituberculosis

Indications leprosy, tuberculosis

For details see rifampicin under antileprosy

Dose**:** *by oral administration,* ADULT, **tuberculosis**: 450-600mg daily, as part of short course therapy; **leprosy**: 600mg once monthly, supervised (450mg for adults weighing less than 35kg) as part of multi-medicine therapy; CHILD (both diseases): 105mg/kg daily

CYCLOSERINE

Tablet, 250mg NRH

Therapeutic group antituberculosis

Indications medicine-resistant tuberculosis (in combination with other medicines)

Contraindications epilepsy, depression, severe anxiety, psychotic states, alcohol dependence, severe renal impairment

Cautions reduce dose in renal impairment; monitor haematological, renal and hepatic function. Pregnancy and breastfeeding

Interactions see appendix 1

Side effects mainly neurological including headache, dizziness, drowsiness, tremor, convulsions, psychosis, depression

Dose *by oral administration,* ADULT, initially 250mg 12 hourly for 2 weeks, increased up to a maximum of 500mg 12 hourly daily depending on clinical response; CHILD, initially 10mg/Kg daily, adjusted according to clinical response; *refer TB guidelines for details*

Counseling *take all this medicine regularly as instructed, as well as the other medicines you have been given*

LEVOFLOXACIN

Tablet, 250mg NRH/RRH

Therapeutic group antibacterial (fluoroquinolones)

Indications multi-medicine resistant tuberculosis (MMR-TB)

Contraindications hypersensitivity to quinolones

Cautions G-6-PD deficiency, moderate to severe hepatic and renal failure, seizures, pregnancy and breast-feeding exposure to strong sunlight and UV light

Interactions see appendix 1 under quinolones

Side effects see under ciprofloxacin

Dose *refer guidelines for the management of multi-medicine resistant TB*

Counseling *take all medicines regularly as instructed; if it makes you feel ill consult the doctor immediately*

PARA-AMINOSALICYLATE SODIUM (PAS)

Granules, 60% w/w (4g) (delayed release granules) NRH/RRH

Therapeutic group antituberculosis

Indications for the treatment of MMR-TB in combination with other medicines

Contraindications severe hypersensitivity to amino salicylate sodium and its congeners; patients with severe renal impairment

Cautions hypersensitivity reaction (skin rash and fever accompanied by lymphadenopathy, jaundice and hepatitis, leukocytosis, conjunctivitis, headaches and joint pain), pregnancy, breastfeeding, patients who have GI problems, patients with sodium restricted diets

Interactions isoniazid; vitamin B12 (reduced absorption); patients on therapy of more than one month should be considered for vitamin B12 substitution

Side effects optic neuritis, encephalopathy; GI disorders: nausea, vomiting, abdominal pain; hepatobiliary disorders, jaundice, hepatitis (uncommon)

Dose**:** *by oral administration,* 10-12gm per day

Counseling *GI disturbances may be minimized by taking the medicine with or after meals or with an antacid*

12.3 Antifungal medicines

FLUCONAZOLE

Tablet, 150mg NRH/RRH

Therapeutic group antifungal (triazole)

Indications treatment of systemic fungal infections including histoplamosis, coccidioidomycosis, paracoccidiodomycosis and blastomycosis; treatment and, in immunocompromized patients, prophylaxis of cryptococcal meningitis, oesophageal and oropharyngeal candidiasis, vaginal and systemic candidiasis

Contraindications hypersensitivity; pregnancy; concurrent use of drugs that cause QT prolongation

Cautions hypersensitivity to other azoles; proarrhythmic conditions; hepatic and renal impairment

Interactions see under appendix 1

Side effects nausea, vomitting, flatulence and diarrhoea; headache, taste disturbances, dizziness, seizure, alopecia pruritus; rash, toxic epidermal necrolysis and Stevens-Johnson syndrome; hyperlipidaemia, leucopenia, thrombocytopenia and hypokalaemia

Dose *by oral administration*, **systemic mycoses**: ADULT, 200mg daily up to 6 months; CHILD over 2 years, 3-6mg/kg daily up to 6 months; **cryptococcal meningitis**: 400mg on Day 1, then 200mg daily for up to 8 weeks; CHILD, 6 - 12 mg/kg daily for up to 8 weeks (every 72 hours in neonate up to 2 weeks old); **prophylaxis of cryptococcal meningitis in immunocompromized patients**: 200mg daily; **systemic candidiasis**, 200mg daily for up to 4 weeks; CHILD, 6-12mg/kg daily (every 72 hours in NEONATE up to 2 weeks old); **oesophageal and oropharyngeal candidiaisis:** ADULT, 200mg on Day 1, then 100mg daily for until symptoms resolve; CHILD, 6mg/kg on day 1, followed by 3mg/kg daily (every 72 hours in NEONATE up to 2 weeks old); **vaginal candidiasis**: ADULT, 150mg as a single dose

GRISEOFULVIN

Tablet 125mg NRH/RRH/DH

Therapeutic group antifungal

Indications fungal infections of skin, scalp, hair and nails, where topical therapy has failed or is inappropriate

Contraindications severe liver disease, lupus erythematosus and related conditions; porphyria and pregnancy

Cautions pregnancy (avoid pregnancy during and for 1 month after treatment; men should not father children within 6 months of treatment); Breastfeeding

Interactions see appendix 1 under antifungals

Side effects headache, nausea, vomiting, rashes, photosensitivity; dizziness, fatigue, leucopoenia, systemic lupus erythematosus, erythema multiforme, toxic epidermal necrolysis, peripheral neuropathy, and confusion

Dose *by oral administration,* ADULT, 500-1000mg daily divided doses or as a single dose; CHILD, 10mg/kg daily in divided doses or as a single dose

Counseling *take with or after food; take at regular intervals and complete the full course*

Note *long courses of treatment are needed (6 weeks for skin; 3 months for nails infections)*

CLOTRIMAZOLE

Ointment, 1% (15g) NRH/RRH/DH/BHU
Pessary, 100mg NRH/RRH/DH/BHU

Therapeutic group antifungal

Indications susceptible fungal infections of skin and vagina

Side effects occasionally, local irritation or mild inflammation

Dose **vaginal candidiasis**: *pessary*, 100mg 2 times a day for 3 nights or 100mg before bed time for 6 days; **fungal skin conditions**: *by topical application* (*ointment)*, 2-3 times daily

Counseling **pessaries:** place the pessary high up the vagina just before you go to sleep; **ointment**: apply the ointment thinly as instructed; you should continue for 14 days after the skin has healed to be sure the infection does not come back

Note *tinea of nails and scalp usually needs systemic treatment*

NYSTATIN

Tablet, 500,000 units NRH/RRH/DH
Nystatin oral paste (extemp) NRH/RRH/DH

Therapeutic group antifungal

Indications intestinal and oral candidiasis

Side effects nausea, vomiting and diarrhoea may occur at high doses

Interactions see appendix 1

Dose **intestinal candidiasis**: *by oral administration,* ADULT, 500,000 units tablet 4 times daily, double in severe infections; CHILD, 100,000 units 4 times daily; **oral thrush**: extemporaneously prepared, 4 times daily after food

12.4. Antiprotozoal medicines

12.4.1 Antiamoebic and antigiardiasis medicines

METRONIDAZOLE

Injection, 5mg/ml (100ml) NRH/RRH/DH
Tablet, 400mg NRH/RRH/DH/BHU

Therapeutic group antiprotozoal medicines

Indications anaerobic infections (including dental), protozoal infections, *H. pylori* eradication as a component of triple regimen therapy

Contraindications known hypersensitivity

Cautions disulfiram like reactions with alcohol; hepatic impairment; pregnancy and breastfeeding

Interactions see appendix 1

Side effects nausea, vomiting, unpleasant taste, GI disturbances, rashes, headache, dizziness, ataxia, darkening of urine, erythema multiforme, pruritus, urticaria, angioedema, and anaphylaxis; also reported abnormal liver function tests, thrombocytopenia, aplastic anaemia, myalgia, arthralgia; on prolonged or intensive therapy peripheral neuropathy, transient epileptic form seizures, and leucopoenia

Dose *by oral administration*, **anaerobic infections**: 400mg 3 times a day for 7-10 days; **amoebiasis**: 400-800mg 3 times a day for 5-10 days; **trichomoniasis**: 2g single dose or 200mg 3 times a day for 7 days (treat sexual partners also); **giardiasis**: 2g once in a day for 3 days or 400mg 3 times a day for 5-10 days; **bacterial vaginosis**: 2g single dose or 500mg 2 times a day for 7 days; **anaerobic infections**: 500mg 4 times a day for 7 days; **acute dental infections**: 200mg 3 times a day for 3-7 days; CHILD 7.5mg/kg 3 times a day; ***H.Pylori* gastritis**: 400mg 2 times a day for 14 days in combination with other medicines; *by IV infusion*, ADULT, 500mg 8-hourly, CHILD, 7.5mg/kg 8-hourly

Counseling *take after food; avoid alcohol during the course of treatment*

13.4.2 Antimalarial medicines

(a) Curative treatment

CHLOROQUINE

Tablet, 150mg NRH/RRH/DH/BHU

Therapeutic group antimalarial

Indications treatment of malaria (*Plasmodium vivax*)

Cautions pregnancy (benefit outweighs the risk), renal and hepatic impairment

Interactions see appendix 1

Side effects headache and GI symptoms occur occasionally; visual disturbances; keratopathy and non-reversible retinopathy can occur; skin reactions, hair loss, and discoloration of skin, nails, and mucous membranes

Dose see appendix 2

Counseling take *after food and avoid exposure to direct sunlight*

PRIMAQUINE

Tablet, 7.5mg NRH/RRH/DH/BHU

Therapeutic group antimalarial

Indications adjunct in treatment of *P. falciparum* and *P. vivax* malaria

Cautions G-6-PD deficiency, systemic disease associated with granulocytopenia (e.g. rheumatoid arthritis), pregnancy and breastfeeding

Side effects nausea, vomiting, anorexia and abdominal pain

Dose see appendix 2

Counseling take all the medicine as instructed; use mosquito net to avoid getting bitten by mosquitoes

QUININE

Injection, 300mg/ml (2ml) NRH/RRH/DH
Tablet, 200mg NRH/RRH/DH

Therapeutic group antimalarial

Indications chloroquine-resistant *P. falciparum* malaria

Contraindications myasthenia gravis, haemoglobinuria, optic neuritis

Cautions atrial fibrillation, conduction defects, heart block

Interactions see appendix 1

Side effects serious reactions are rare; signs of mild to moderate cinchonism (tinnitus, headache, blurred vision, hearing change, nausea and diarrhoea) often occur after the third day of treatment, but do not mean the treatment should be stopped; overdose may result in tinnitus, deafness, amblyopia, and cardiovascular symptoms; a single oral dose above 3 grams can cause potentially fatal poisoning; much smaller doses can be lethal in children; emesis, gastric lavage, and activated charcoal should be administered; excessive IV infusion can lead to hypotension, heart block, and ventricular fibrillation and hypoglycaemia

Dose see appendix 2

ARTHEMETHER +LUMEFANTHRINE (Coartem®)

Tablet, (20mg + 120mg) NRH/RRH/DH/BHU

Therapeutic group antimalarial

Indication treatment of acute uncomplicated falciparum malaria

Contraindications history of arrhythmias, of clinically relevant bradycardia, and of congestive heart failure accompanied by reduced left ventricular ejection fraction; family history of sudden death or of congenital QT interval prolongation; breastfeeding

Cautions electrolyte disturbances, concomitant use with other medicines known to cause QT-interval prolongation; hepatic impairment, renal impairment, pregnancy, monitor patients unable to take food (greater risk of recrudescence)

Side effects abdominal pain, anorexia, diarrhoea, vomiting, nausea, palpitations, cough, headache, dizziness, sleep disturbances, asthenia, arthralgia, myalgia, pruritus and rashes

Dose see appendix 2

ARTEMETHER

Injection, 80mg/ml (1ml) NRH/RRH/DH/BHU

Therapeutic group antimalarial

Indications schizonticidal effect on *P. vivax* and *P. falcipurum*

Contraindication hypersensitivity

Cautions pregnancy and lactation

Side effects nausea and vomiting, abdominal pain, reduction in nucleoside and reticulocyte count, bradycardia, 1st degree heart block and transient increase in serum transaminase

Dose**:** see appendix 2

DOXYCYCLINE

Tablet/capsule, 100mg NRH/RRH/DH/BHU

Therapeutic group tetracycline

Indications malaria prophylaxis

For detail refer doxycycline under anti-infective medicines

Dose see appendix 2

Counseling *avoid exposure of skin to direct sunlight or sun lamps*

DAPSONE

Tablet, 50mg NRH/RRH/DH/BHU

Therapeutic group antimalarial

For detail see dapsone under antileprosy medicines

Dose see appendix 2

Counseling *take all this medicine regularly as instructed, as well as the other medicines you have been given*

12.5 Antiviral medicines

12.5.1 Antiherpes

ACYCLOVIR

Tablet, 400mg NRH/RRH/DH

Therapeutic group antiviral

Indications systemic treatment of varicella-zoster (chicken pox-shingles) and systemic and topical treatment of herpes simplex infections of skin and mucous membranes (including initial and recurrent genital herpes)

Contraindications hypersensitivity

Cautions renal impairment, lactation, pregnancy (use only when benefit outweighs risk), neurological abnormalities, severe hypoxia, hydration with high doses of infusion; maintain adequate hydration (especially with infusion or high doses)

Side effects rashes, GI disturbances, rise in bilirubin, liver enzymes, blood urea and creatinine, decrease in haematological indices, headache, tremors, agitation, somnolence, fatigue, psychosis, convulsions and coma

Dose *by oral administration*, **non-genital *Herpes simplex,* initial therapy**: ADULT, 200mg (400 mg in the immunocompromised or if absorption impaired) 5 times daily, usually for 5 days; CHILD under 2 years, half the adult dose; CHILD over 2 years, adult dose; **genital *herpes simplex***, **treatment of first episode***:* 200 mg 5 times daily or 400 mg 3 times daily usually for 5 days (400 mg 5 times daily for 7-10 days in immunocompromised or HIV-positive patients); **treatment of recurrent infection***:* 800 mg 3 times daily for 2 days or 200 mg 5 times daily for 5 days or 400 mg 3 times daily for 3-5 days (400 mg 3 times daily for 5-10 days in immunocompromised or HIV-positive patients); ***herpes simplex*, chronic suppressive therapy**: 200-400mg 2-4 times daily for 12 months; **varicella and herpes zoster**, **treatment**: ADULT, 800 mg 5 times daily for 7 days; CHILD, varicella, 20 mg/kg (up to 800 mg) 4 times daily for 5 days or under

2 years 200 mg 4 times daily, 2–5 years 400 mg 4 times daily, over 6 years 800 mg 4 times daily

12.5.2 Medicines for hepatitis B infection

TENOFOVIR

Tablet, 300mg NRH/RRH

Therapeutic group nucleoside reverse transcriptase inhibitors

Indications HIV infection in combination with other antiretroviral medicines; hepatitis B infection

For details see tenofovir under antiretroviral medicines

Dose *by oral administration,* 300mg once daily

12.5.3. Antiretroviral Medicines

The national HIV Guideline recommends following combination of medicines as the treatment of choice:

1st Line regime: Tenofovir + Lamivudine + Efavirenz

Following alternate first line regime may be considered based on individual patient factors:

- Tenofovir + Lamivudine + Nevirapine
- Zidovudine + Lamivudine + Nevirapine

Currently, fixed dose combinations of Tenofovir, Lamivudine and Efavirenz (3-FDC) and Tenofovir and Lamivudine (2-FDC) are available for use in adults.

2nd Line regime: Tenofovir + Lamivudine+ Lopinavir/ritonavir

Second line regime should be considered only when treatment failure with first line regime is established.

Refer the National Guidelines for Management of HIV/AIDS

13.5.3.1 Nucleoside Reverse Transcriptase Inhibitors (NRTIs)

LAMIVUDINE (3TC)

Tablet, 150mg NRH/RRH

Therapeutic group nucleoside reverse transcriptase inhibitors

Indications HIV infection in combination with at least two other antiretroviral agents

Contraindications breastfeeding

Interactions see appendix 1 under antivirals

Side effects infrequent complications include headache, nausea, diarrhoea, abdominal pain and insomnia, use in pregnancy is extensive and well established, alopecia, class related side effect of lactic acidosis and steatosis are listed but not clear whether it is due to 3TC therapy

Dose *by oral administration,* 150mg 2 times daily

ZIDOVUDINE (AZT)

Tablet, 300mg NRH/RRH

Therapeutic group nucleoside reverse transcriptase inhibitors

Indications HIV infection in combination with at least two other antiretroviral agents

Contraindications abnormally low neutrophil counts or haemoglobin values, raised transaminase levels, breast-feeding, neonates with hyper-bilirubinaemia requiring treatment other than phototherapy

Interaction see appendix 1, under antiviral

Side effects bone marrow suppression within 2-3 months (depends on dose and duration of treatment and stage of disease), finger nail discoloration (2-6 weeks), class related lactic acidosis and hepatic steatosis to a lesser extent than other NRTIs, GI intolerance, altered taste, rare dose related myopathy due to mitochondrial toxicity; advocated for pregnant women beyond first trimester to prevent vertical transmission

Dose *by oral administration,* 300mg 12 hourly (>70kg weight or tolerated) or 200mg 3 times daily

TENOFOVIR (TFV)

Tablet, 300mg NRH/RRH

Therapeutic group nucleoside reverse transcriptase inhibitors

Indications HIV infection in combination with other antiretroviral medicines; medicine of choice in Hepatitis B-HIV coinfection

Contraindications treatment should be stopped if there is a rapid increase in aminotransferase concentrations, progressive hepatomegaly or steatosis, or metabolic or lactic acidosis of unknown aetiology; breastfeeding

Cautions to be used with caution and doses modified, in patients with renal impairment; renal function and serum phosphates should be monitored before treatment is started; every 4 weeks during the first year of therapy, and then every 3 months; in patients with a history of renal impairment or who are particularly at risk, more frequent monitoring may be needed

Interactions use with nephrotoxic medicines or with other medicines eliminated by active tubular secretion is not recommended; if such use is unavoidable, renal function should be monitored weekly; use of lopinavir/ritonavir with tenofovir modestly increases the plasma concentrations of tenofovir

Side effects the most common side effects reported are mild GI effects, particularly diarrhoea, nausea and vomiting, abdominal pain, flatulence, dyspepsia, and anorexia; hypophosphatemia, reduced bone density, renal failure, myopathy and nephrogenic diabetes insipidus may occur; other side effects include peripheral neuropathy, headache, dizziness, insomnia, depression, dyspnoea, asthenia, sweating, and skin rashes

Dose *by oral administration,* 300mg 2 times daily

TENOFOVIR + LAMIVUDINE (2-FDC)

Tablet, (300mg + 300mg) NRH/RRH

Therapeutic group nucleoside reverse transcriptase inhibitors

Indications HIV infection in combination with a NNRTI or PI

Contraindications as under individual medicines

Cautions as under individual medicines

Side effects as for individual medicines

Dose *by oral administration,* ADULT, 1 tablet once daily; CHILD, as per the body weight

12.5.3.2 Non-nucleoside Reverse Transcriptase Inhibitor (NNRTI)

NEVIRAPINE (NVP)

Tablet, 200mg NRH/RRH

Therapeutic group non-nucleoside reverse transcriptase inhibitor

Indications HIV infection in combination with at least two other antiretroviral agents

Contraindications breastfeeding, severe hepatic impairment and post exposure prophylaxis

Interactions see appendix 1, under antiviral

Side effects life threatening cutaneous reactions 3-6% (Stevens-Johnson syndrome), and hepatotoxicity 13% (high CD4), usually during the initial 8 weeks (patient should be warned to report hypersensitivity symptoms: fever, rash 10-16%, arthralgias, or myalgias), maculopapular and erythematous rash

Dose 200mg daily for the first 14 days, then 200mg 2 times daily

Note *if severe rash or rash with constitutional symptoms develop, therapy should be discontinued. If rash develops within the first 14 days of therapy, dose should not be increased to twice daily.*

Therapy should be interrupted in patients who develop moderate to severe liver function test results. Therapy should be reinstated with a 14-day once daily dosing when LFT returns to normal. If LFT recur nevirapine should be discontinued.

EFAVIRENZ (EFV)

Tablet, 600mg NRH/RRH

Therapeutic group non-nucleoside reverse transcriptase inhibitor

Indications HIV infection in combination with at least two other antiretroviral agents

Contraindications pregnancy and breastfeeding

Interactions see appendix 1, under antiviral

Side effects approximately 15-27% develop rash, which is usually morbilliform and does not require discontinuation of the medicine. More severe reactions that require discontinuation are blistering and desquamating rashes (1-2%); CNS (noted in about 52% of patients): dizziness, delusions depression, and bad dreams; false positive urine cannabinoid test, increased aminotransferase levels, contraindicated in pregnancy in the first trimester

Dose 600mg once daily taken in the evening to reduce CNS side effects that is common in the first 2-3 weeks; body weight <40kg: 400mg once daily (empty stomach)

TENOFOVIR + LAMIVUDINE + EFAVIRENZ (3-FDC)

Tablet, (300mg + 300mg + 600mg) NRH/RRH

Indications HIV infection

Contraindications as under individual medicines

Cautions as under individual medicines

Side effects as under individual medicines

Dose *by oral administration:* ADULT, 1 tablet once daily; CHILD, as per the body weight

Counseling *medication compliance is crucial for better treatment outcome; take after meals at regular interval*

12.5.3.3 Protease Inhibitors

LOPINAVIR/ RITONAVIR (LPV/r)

Tablet, (200/50mg) NRH/RRH

Therapeutic group protease inhibitor (PI)

Indications post exposure prophylaxis

Contraindications breastfeeding

Side effects diarrhoea in 15-25%, nausea and abdominal pain; class side effects: insulin resistance, fat accumulation and hyperlipidaemia; elevated transaminase (SGOT and SGTP)

Interactions see appendix 1, under antiviral

Dose *by oral administration,* ADULT 12 hourly

13. Antineoplastic and Immunosuppressive medicines

13.1 Immunosuppressant

CYCLOSPORIN (Neoral®)

Capsule, 25mg, 50mg and 100mg NRH

Therapeutic group immunosuppressant

Indications in organ and tissue transplant, prevention of graft rejection following bone marrow, kidney, liver, pancreas, heart and lung transplantation; for prophylaxis and treatment of graft versus host disease

Contraindications uncontrolled hypertension, severe infections and malignancy; reduce dose by 25-50% if serum creatinine more than 30% above baseline

Cautions monitor kidney function, liver function, and blood pressure; measure serum potassium especially in marked renal dysfunction; measure blood lipids before treatment and thereafter as appropriate; pregnancy and breastfeeding

Interactions see appendix 1

Side effects commonly dose dependent increase in serum creatinine and urea during first few weeks; and less commonly renal structural changes on long-term administration

Dose *by oral administration,* **organ transplants** (when used alone) ADULTs and CHILD over 3 months, 10-15mg/kg followed by 10- 15mg/kg daily for 1-2 weeks post operation; **nephrotic syndrome**, 5mg/kg daily in 2 divided doses; CHILD 5-6mg/kg daily in 2 divided doses

Note *because of differences in bioavailability, care should be taken when switching between different brands of cyclosporin; lower doses are required when used with other immunosuppressants*

TACROLIMUS (Pangraf®)

Capsule, 1mg NRH

Therapeutic group immunosuppressant

Indications primary immunosuppression in liver and kidney allograft recipients and allograft rejection resistant to conventional immunosuppressive regimens; moderate to severe atopic eczema

Cautions see under cyclosporin; also monitor ECG (important: also echocardiography, see note below), visual status, blood glucose, haematological and neurological parameters

Interactions see appendix 1

Contraindications hypersensitivity to macrolides; pregnancy (exclude before starting; if contraception needed non-hormonal methods should be used, appendix 4); breastfeeding (appendix 5); avoid concurrent administration with cyclosporine (care if patient has previously received cyclosporine)

Side effects GI disturbances; hepatic dysfunction, hypertension (less frequently hypotension), tachycardia, angina, arrhythmias, cardiomyopathy (important see note below); dyspnoea, pleural effusion, tremor, headache, insomnia, paraesthesia, confusion, depression, dizziness, anxiety, convulsions, in coordination, encephalopathy, psychosis; visual and hearing abnormalities; haematological effects; altered acid-base balance and glucose metabolism; altered renal function; hypophosphatemia, hypercalcaemia, hyperuricemia; muscle cramps; pruritus, alopecia, rash, sweating, acne, photosensitivity; susceptibility to lymphoma and other malignancies particularly of the skin.

Dose *by oral administration:* **liver transplantation**, starting 6 hours after transplantation, ADULT, 100-200 mcg/kg daily in 2 divided doses; CHILD, 300 mcg/kg in 2 divided doses; **renal transplantation**, starting within 24 hours of transplantation, 150-300 mcg/kg daily in 2 divided doses; CHILD, 300mcg/kg daily in 2 divided doses

Note *cardiomyopathy has been reported in children given tacrolimus after transplantation; patients should be monitored carefully by echocardiography for hypertrophic changes; dose reduction or discontinuation should be considered if these occur*

MYCOPHENOLATE MOFETIL (Cellcept®)

Capsule, 250mg and 500mg NRH

Therapeutic group immunosuppressant

Indications prophylaxis of acute renal, cardiac, or hepatic transplant rejection in combination with cyclosporin and corticosteroids

Contraindications pregnancy (exclude before starting and avoid for 6 weeks after discontinuation); breastfeeding

Cautions complete blood counts every week for 4 weeks then twice a month for 2 months then every month in the first year (neutropenia warrants interruption of treatment); elderly (increased risk of infection, GI haemorrhage and pulmonary oedema); children (higher incidence of side effects may require temporary reduction of dose or interruption); active serious GI disease (risk of haemorrhage, ulceration and perforation); delayed graft function; increased susceptibility to skin cancer (avoid exposure to strong sunlight)

Interactions see appendix 1

Side effects diarrhoea, vomiting, and abdominal pain, GI ulceration and bleeding; abnormal liver function tests, hepatitis, jaundice, pancreatitis; oedema, tachycardia, hypertension, hypotension, vasodilatation; cough, dyspnoea; insomnia, agitation, tremor, dizziness, headache; influenza-like syndrome infections; hyperglycaemia; renal impairment; increased risk of malignancies, particularly of the skin; blood disorders (including leucopoenia, anaemia, thrombocytopenia, pancytopenia), disturbances of electrolytes and blood lipids; arthralgia; alopecia, acne, and rash

Dose *by oral administration,* **renal transplantation**: ADULT, 1g twice daily starting within 72 hours of transplantation; CHILD and ADOLESCENT 2-18years (and body surface over 1.25 m^2) 600 mg/m^2 twice daily (max. 2 g daily); **Cardiac transplantation**:1.5 g twice daily starting within 5 days of transplantation

13.2 Cytotoxic medicines

Staff preparing the cytotoxic medicines should be warned about the tissue irritation and potential eye damage that these medicines can cause, and should be provided with appropriate protective attire. Pregnant staff should not handle cytotoxic medicines.

VINCRISTINE

Injection, 1mg/ml (1ml) NRH

Therapeutic group cytotoxic

Indications chemotherapy of neoplastic disease, alone or in combination with other cytotoxic medicines

Contraindications further treatment is contraindicated if motor weakness develops during treatment; breastfeeding; intrathecal injection should not be given

Cautions like most cytotoxic medicines, vincristine is teratogenic, and may cause life threatening toxicity; breastfeeding should be discontinued

Side effects peripheral and autonomic neuropathy is common, with paraesthesia, loss of ankle jerks, and abdominal bloating; alopecia may occur; nausea and vomiting can usually be controlled with promethazine

Administration the injection is best given through the tubing of a freely running IV infusion of dextrose or sodium chloride; extravasation may cause serious tissue necrosis; dosage will depend on the regimen used, especially in combination chemotherapy, on the stage of the disease, and on the age, weight and size of the patient; up to date specialist literature should be consulted, for specific dosage schedule

Dose *by IV infusion,* ADULT, 10 to 30 mcg/kg of body weight or 0.4mg to 1.4mg per square meter of body surface a week as a single dose; CHILD, 1.5 to 2mg/m^2 a week as a single dose; CHILD > 10kg the initial dose is 50 mcg/kg once a week.

Note *manufacturer's literature should be consulted for specific dosage information*

CYCLOPHOSPHAMIDE

Injection, powder for reconstitution (200mg) NRH
Tablet, 50mg NRH/RRH

Therapeutic group cytotoxic

Indications chemotherapy of neoplastic disease, alone or in combination with other cytotoxic medicines; steroid resistant nephrotic syndrome

Contraindications known hypersensitivity, severe bone marrow depression, and pre-existing haemorrhagic cystitis; pregnancy and breastfeeding

Cautions acute infections should be treated before cyclophosphamide is introduced; like most cytotoxic medicines, cyclophosphamide is teratogenic, and may cause life threatening toxicity; breastfeeding should be discontinued

Side effects leucopoenia may be severe ; alopecia is usually total but reversible; haemorrhagic cystitis occurs in 5-10% of patients, treatment should be withdrawn immediately; vomiting if frequent and on IV treatment,

dexamethasone and/or diazepam may be needed in addition to an antiemetic; a dose of these medicines should be given before treatment starts and 6 hours afterwards

Administration the injection is best given through the tubing of a freely running IV infusion of dextrose or sodium chloride; dosage will depend on the regimen used, especially in combination chemotherapy, on the stage of the disease, and on the age, weight and size of the patient

Dose *by oral administration,* ADULT, 1-5mg/kg/day, to be adjusted on the basis of leucocyte counts; CHILD: **induction**: 2-8mg/kg/daily in divided doses for 6 or more days; **maintenance**: 2-5 mg/ kg twice a week; b*y IV infusion,* ADULT, **induction**: 40-50mg/kg in divided doses over a period of 2-5 days; **maintenance:** 10-15mg/kg every 7 to 10 days, or 3-5 mg/kg two times a week, or 1.5-3mg/kg per day; CHILD, **induction:** 2-8mg/kg daily in divided doses for six or more doses (or total dose for seven doses once a weekly); **maintenance:** 10-15mg/kg every seven to ten days, or 30mg/kg at 3 to 4 week intervals or when bone marrow recovery occurs

Counseling *take the tablets on an empty stomach; drink plenty of water with this medicine*

Note *manufacturer's literature should be consulted for specific dosage information*

DOXORUBICIN

Injection, powder for reconstitution (10mg) NRH

Therapeutic group cytotoxic

Indications chemotherapy of neoplastic disease, alone or in combination with other cytotoxic medicines

Contraindications pregnancy; breastfeeding

Cautions cardiac status and blood counts be monitored regularly like most cytotoxic medicines; doxorubicin is teratogenic, and may cause life threatening toxicity; breastfeeding should be discontinued

Side effects bone marrow suppression is frequently the dose-limiting factor; leucopoenia may improve even if treatment is continued. Cardiomyopathy is serious, but short-term changes in cardiac output at the time of the injection normalise rapidly. Alopecia is to be expected. Vomiting is frequent, and dexamethasone and/or diazepam may be needed in addition to an antiemetic. A dose of these medicines should be given before treatment starts and 6 hours afterwards

Administration the injection is best given through the tubing of a freely running IV infusion of dextrose or sodium chloride; extravasation may cause serious tissue necrosis; dosage will depend on the regimen used, especially in combination chemotherapy, on the stage of the disease, and on the age, weight and size of the patient

Dose *by IV infusion,* ADULT, 60-75mg/m^2, repeated every 21 days, or 25-30mg/ m^2 a day on 2 or 3 successive days, repeated every 3 to 4 weeks, or 20mg/m^2 surface once a week; CHILD, 30mg/ m^2 a day on three successive days every 4 weeks

Note *great care should be taken to prevent exposure of skin to doxorubicin; any doxorubicin solution that comes in contact with the skin or mucosa should be washed off thoroughly with soap and water*

FLUOROURACIL (5-FU)

Injection, 500mg/10ml NRH

Therapeutic group cytotoxic

Indications chemotherapy of neoplastic disease, alone or in combination with other cytotoxic medicines

Contraindications severe bone marrow depression, pregnancy, lactation

Cautions reduce dose in severely debilitated patients, following major surgery, or when hepatic, renal or bone marrow function is impaired; blood counts should be performed daily during initial treatment and weekly thereafter; like most cytotoxic medicines, fluorouracil is teratogenic, and may cause life-threatening toxicity; breastfeeding should be discontinued

Side effects alopecia may be total; dermatitis and mucositis may occur; nausea and vomiting can usually be controlled with an anti-emetic

Dose *by IV infusion* usually given over 4 hours in 500ml dextrose; extravasations may cause serious tissue necrosis; dosage will depend on the regimen used, especially in combination chemotherapy, on the stage of the disease, and on the age, weight and size of the patient

14. Medicines affecting the blood

14.1. Antianaemia medicines

IRON DEXTRAN

Injection, 50mg elemental iron/ml (2ml) NRH/RRH/DH

Therapeutic group antianaemia

Indications to correct as iron deficiency state that does not warrant transfusion, but when oral therapy has been unsuccessful

Contraindications cardiac abnormalities, severe liver disease, acute kidney infections, asthma (IV route)

Cautions a test dose of 1ml should be given by IM route and patient kept under observation for 30 minutes; adrenaline injection should be available in case of anaphylaxis.

Interactions see appendix 1

Side effects staining of the skin in IM injection, arthralgia with acute arthritis and various allergic phenomena following IV infusion

Dose *by deep IM injection*, 1ml following Z technique on the first day, followed by 2ml daily for 10 days; *by deep IM injection*, as a single large dose diluted in 5% dextrose or 0.9% sodium chloride after a 1ml test dose injected over 5 minutes

FERROUS SULPHATE + FOLIC ACID

Syrup, ((30mg+500mcg)/5ml)) (150ml) NRH/RRH/DH/BHU
Tablet, (60mg+0.4mg) NRH/RRH/DH/BHU

Therapeutic group antianaemia

Indications treatment and prevention of iron deficiency states, particularly in pregnancy and lactation, low birth weight infants, menorrhagia, and post-gastrectomy

Contraindications anaemias due to causes other than iron deficiency

Cautions except in the diagnosis mentioned under indications, anaemia should be investigated thoroughly before treatment; alternatively, a clinical trial of 3

weeks ferrous sulphate tablet can be given, and the situation reviewed, if there is no improvement in the haemoglobin concentration; the presence of hookworm in the stool is justification for a course of iron treatment

Interactions see appendix 1

Side effects and Over dosage GI irritation with vomiting and diarrhoea is common; poisoning with iron can easily occur, and as little as 2g may be fatal to an infant; gastric lavage with a bicarbonate solution inactivates the residue; the treatment is otherwise symptomatic

Dose *by oral administration*, *as tablet*, ADULT, **therapeutic:** 1 tablet 2 to 3 times daily; **prophylactic:** 1 tablet daily; CHILD, Low birth-weight newborn babies: ¼ tablet daily; *as syrup*, CHILD, 2mg/kg two to three times daily

Counseling *take this medicine after food and take iron rich diet like green vegetables, liver, beef, beans and peaches*

FOLIC ACID

Tablet, 5mg NRH/RRH/DH/BHU

Therapeutic group antianaemia

Indications treatment and prevention of folate deficiency states; prophylaxis to prevent neural tube effects

Cautions folic acid should not be administered indiscriminately to patients with megaloblastic anaemia unless vitamin B_{12} is given concurrently; haematological response, particularly the reticulocyte count, should be monitored daily until improvement is seen

Side effects and over dosage: although folic acid, like vitamin B_{12}, produces a beneficial haematological response in patients with pernicious anaemia, it may precipitate or exacerbate neurological damage in this condition when used alone

Dose *by oral administration*, ADULT, 5mg daily at first for 4 months followed by 5mg once weekly; CHILD up to 1 year, 500mcg/kg daily; CHILD over 1 year, as adult dose; **neural tube defect prophylaxis (NTD):** 5 mg daily 2-3 months before planning pregnancy and continue up to twelve weeks after conception

VITAMIN B_{12} (hydroxycobalamin)

Injection, 1mg/ml NRH/RRH/DH

Therapeutic group antianaemia

Indications pernicious anaemia; combined degeneration of the spinal cord, other causes of Vitamin B_{12} deficiency, post gastrectomy

Cautions wherever possible, the diagnosis should be firmly established before treatment is started

Dose *by IM injection,* **pernicious anaemia**: initially, 1mg repeated 10 times at intervals of 2-3 days, maintenance dose of 1 mg every month; **prophylaxis (for strict vegetarians and patients with malabsorption)**: 1mg IM every two months; CHILD, same dose as adult

14.2. Medicines affecting coagulation

ENOXAPARIN

Injection, 60mg NRH/RRH

Therapeutic group anticoagulant (low molecular weight heparin)

Indications treatment of deep vein thrombosis and pulmonary embolism; prophylaxis of deep vein thrombosis in both surgical and medical patients at risk of thromboembolic complications; prophylaxis of ischemic complication of unstable angina and ST segment elevation myocardial infarction (STEMI)

Contraindications hypersensitivity; acute bacterial endocarditis, major bleeding disorder, haemorrhagic stroke, drug induced thrombocytopenia

Cautions renal or hepatic impairment; history of GI ulceration, uncontrolled hypertension, spinal or epidural anaesthesia; lactation and pregnancy; elderly

Side effects thrombocytopenia, injection site irritation, pain and ecchymoses, skin necrosis; hypersensitivity, erythema, anemia, hemorrhagic complications; atrial fibrillation, pulmonary edema pneumonia and osteoporosis on prolonged use

Dose *by subcutaneous injection*, **prophylaxis of deep-vein thrombosis in surgical patients**: ADULT, 20-40mg, 2 hours before surgery and then 20-40mg every 24 hours for 7 to 10 days; **prophylaxis for deep vein thrombosis in medical patients**: 40mg (4000 units) every 24 hours for at least 6 days; CHILD<2months: 0.75mg/kg SC every 12 hours; CHILD≥2 months: 0.5mg/kg SC every 12 hours; t**reatment of deep vein thrombosis and pulmonary embolism**: 1.5mg/kg (150 units/kg) every 24 hrs usually for at least 5 days (and until oral anticoagulation established); CHILD<2 months, 1.5mg/kg SC every 12 hours;CHILD ≥2 months, 1mg/kg SC every 12 hours; t**reatment of unstable angina and non ST-segment- elevation myocardial infarction:** 1mg/kg (100units/kg) every 12 hours usually for 2 to 8 days (minimum 2 days)

Note *dosing consideration required in severe renal impairment (CrCl<30ml/min)*

PHYTOMENADIONE (Vit K)

Injection, 10mg/ml (1ml) NRH/RRH/DH/BHU

Therapeutic group anticoagulant antagonists

Indications correction of vitamin K deficiency in neonates and liver disease; reversal of hypoprothrombinaemia due to anticoagulant therapy

Cautions rapid IV injection can lead to fatal collapse; phytomenadione takes 12 hours to reverse acenocoumarol, and the oral anticoagulant effect will be limited for up to 2 weeks

Dose NEONATE, *by IM injection,* 1mg (equivalent to 0.1ml) immediately after delivery; ADULT, *by IM injection,* 10mg or *by slow IV injection,* 0.5-5mg, depending on clinical condition

Note *phytomenadione does not neutralize Heparin; use protamine sulphate instead*

PROTAMINE SULPHATE

Injection, 10mg/ml (5ml) NRH/RRH

Therapeutic group**:** heparin antagonists

Indications to counteract the anticoagulant effect of heparin

Contraindications known hypersensitivity to the medicine or to fish (protamine is purified fish protein)

Cautions if administered in the absence of heparin, protamine itself has an anticoagulant effect by binding with fibrinogen instead; use with caution in men who are infertile or who have had a vasectomy

Side effects nausea, vomiting, lassitude, flushing, dyspnoea, bradycardia, hypotension; hyspersensitivity reactions (including angioedema, anaphylaxis) reported

Dose *by IV injection,* over approx. 10 minutes, 1mg neutralises 80-100 units heparin when given within 15 minutes of heparin; if longer time, less protamine required as heparin rapidly excreted; max. 50 mg; maximum rate of injection: 20mg/minute, i.e. 2ml/minute.

Note *protamine does not neutralize oral anticoagulants*

WARFARIN

Tablet, 1mg, 3mg and 5mg NRH/RRH

Theraeutic group anticoagulants

Indications prophylaxis of embolisation in rheumatic heart disease and atrial fibrillation; prophylaxis after insertion of prosthetic heart valve; prophylaxis and treatment of venous thrombosis and pulmonary embolism; transient ischemic attacks

Contraindications pregnancy, first trimester (use heparin, if essential); situations where prothrombin time cannot be monitored, peptic ulcer, severe hypertension, bacterial endocarditis

Cautions hepatic or renal disease, recent surgery

Interactions see appendix 1

Side effects haemorrhage, rash, alopecia, diarrhoea

Dose *by oral administration*, **induction dose**: 10mg daily for 2 days; subsequent daily maintenance dose is to be determined depending upon the prothrombin time; this is usually 3 to 9mg/day taken at the same time each day

Counseling *do not start or stop any other medicines without checking with the doctor; do regular blood tests*

Note *warfarin usually takes 3-5 days to reach steady state; use heparin during this period; dose adjusted according to International Normalized Ratio (INR)*

TRANEXAMIC ACID

Injection, 50mg/ml (5ml) NRH/RRH
Capsule, 250mg NRH

Therapeutic group antifibrinolytic agent

Indications treatment and prophylaxis of haemorrhage associated with excessive fibrinolysis; to control bleeding during neurosurgical operations

Side effects nausea, vomiting, diarrhea; infrequently hypotension and thrombosis

Cautions dose reduction required in renal impairment; increases risk of thrombotic adverse effects

Contraindications active intravascular clotting

Dose *by oral administration,* 1-1.5g, 2 to 3 times daily; *by IV injection,* 10mg/kg

15. Blood products and plasma substitute

HYDROXYETHYL STARCH

Injection, 3% (500ml) NRH/RRH

Therapeutic group plasma substitutes

Indications hypovolaemia

Cautions cardiac disease; renal impairment

Side effects hypersensitivity

Dose *by IV infusion,* 500-1000ml

16. Cardiovascular medicines

16.1. Antianginal medicines

ISOSORBIDE DINITRATE

Tablet, 5mg (sublingual) and 10mg NRH/RRH/DH

Therapeutic group antianginal (nitrates)

Indications angina; occasionally for resistant congestive heart failure, left ventricular failure

Contraindications known hypersensitivity, marked anaemia, closed angle glaucoma, head trauma, cerebral haemorrhage

Cautions head injury, closed-angle glaucoma; hypotensive conditions; tolerance may develop; sudden withdrawal may precipitate cardiac ischemia

Interactions see appendix 1 under nitrates

Side effects throbbing headache, flushing, postural hypotension, and allergic phenomena

Dose *by sublingual administration,* 5-10mg as required; *by oral administration,* 30-120mg daily in divided doses, up to 240mg per day in heart failure

Counseling *sublingual: place one or two tablets under your tongue and let it dissolve slowly*

Note *regular prophylaxis with oral medication is effective if given regularly at adequate dosage, and is considerably cheaper; for mild or occasional chest pain, immediate sublingual treatment is preferred*

NITROGLYCERINE

Injection, 5mg/ml (5ml) NRH/RRH/DH

Therapeutic group antianginal (nitrates)

Indications prophylaxis and treatment of angina

Contraindications hypersensitivity to nitrates; hypotensive conditions and hypovolaemia; hypertrophic obstructive cardiomyopathy, aortic stenosis, cardiac tamponade, constrictive pericarditis, mitral stenosis, marked anaemia, head trauma, cerebral haemorrhage, closed angle glaucoma

Cautions cerebrovascular disease, COPD, pregnancy, lactation

Interactions see appendix 1 under nitrates

Side effects headache (treat with mild analgesics if unbearable), reddening of skin, allergic contact dermatitis, faintness or light headedness, dizziness, postural hypotension associated with reflex induced tachycardia, nausea and vomiting

Dose *by IV infusion*,10-200 mcg/min

Note *the injection is to be used only after suitable dilution; usual initial dose in angina is 10 mcg/min, increasing gradually*

EPHEDRINE

Injection, 30mg/ml (1ml) NRH/RRH

Therapeutic group antianginal (sympathomimetic)

Indications reversible hypotension from spinal or epidural surgery

Caution hyperthyroidism, diabetes mellitus, ischemic heart disease, hypertension, angle-closure glaucoma, elderly, pregnancy; may cause acute urine retention in prostatic hypertrophy

Contraindications breastfeeding

Side effects nausea, vomiting, anorexia; tachycardia, arrhythmias, angina pain, vasoconstriction with hypertension, vasodilation with hypotension, dizziness and flushing; dyspnoea; headache, anxiety, restlessness, confusion, psychoses, insomnia, tremor; difficulty in micturition, urine retention; sweating, hypersalivation; changes in blood-glucose concentration

Dose *by slow IV injection*, 3-6 mg repeated every 3-4 minutes according to response to max. 30 mg

PHENYLEPHRINE

Injection, 10mg/ml NRH/RRH

Therapeutic group sympathomimetic

Indications mild to moderate hypotension and hypotensive shock

Contraindications hypersensitivity to phenylephrine; severe hypertension; closed angle glaucoma

Caution cerebrovascular insufficiency, hypertension, cardiovascular disorder; prostatic hypertrophy

Side effects hypertension, anxiety, headache, rebound congestion; metabolic acidosis, decreased urine output

Dose **mild to moderate hypertension**: *by IM injection*, initially, 2-5mg, then 1-10mg; **hypotensive shock**: *by IV injection*, in increments of 100-180mcg, then *by IV infusion*, 40-60mcg/min

AMLODIPINE

Tablet, 5mg NRH/RRH/DH

Therapeutic group antihypertensive; antianginal (calcium-channel blocker)

Indications hypertension, prophylaxis of angina

Contraindications cardiogenic shock, unstable angina, significant aortic stenosis; pregnancy; breastfeeding

Cautions hepatic impairment

Interactions appendix 1 (calcium-channel blockers)

Side effects abdominal pain, nausea; palpitations, flushing, oedema; headache, dizziness, sleep disturbances, fatigue; less commonly GI disturbances, dry mouth, taste disturbances, hypotension, syncope, chest pain, dyspnoea, rhinitis, mood changes, tremor, paraesthesia, urinary disturbances, impotence, gynaecomastia, weight changes, myalgia, visual disturbances, tinnitus, pruritus, rashes (including isolated reports of erythema multiforme), alopecia, purpura, and skin discolouration; very rarely gastritis, pancreatitis, hepatitis, jaundice, cholestasis, gingival hyperplasia, myocardial infarction, arrhythmias, vasculitis, coughing, hyperglycaemia, thrombocytopenia, angioedema, and urticaria

Dose *by oral administration*, initially 5mg once daily; max. 10mg once daily

VERAPAMIL

Tablet, 40mg NRH/RRH

Therapeutic group antianginal; antiarrhythmic (calcium channel blockers)

Indications supraventricular arrhythmias; angina, hypertension

Contraindications hypotension, bradycardia, 2nd and 3rd degree heart block and sinoatrial block; cardiogenic shock and uncompensated heart failure; atrial flutter and fibrillation complicating the Wolff-Parkinson white syndrome

Cautions pregnancy, breastfeeding, children, hepatic impairment, patients taking beta-blockers

Interactions see appendix 1 under calcium channel blockers

Side effects constipation; less commonly, nausea, vomiting, flushing, headaches, dizziness, fatigue and ankle oedema

Dose *by oral administration,* **supraventricular arrhythmias:** 40-120 mg 3 times daily; **angina**: 80-120mg 3 times daily

ATENOLOL

Tablet, 50mg NRH/RRH/DH/BHU

Therapeutic group antianginal; antiarrhythmic; antihypertensive (beta-blocker)

Indications hypertension, angina, arrhythmias

Contraindications sinus bradycardia, heart block greater than 2nd degree, untreated cardiac failure, cardiogenic shock, asthma or history of obstructive airway disease

Cautions variant angina, acute MI, bronchospastic diseases, diabetes mellitus, peripheral vascular disorders, hepatic and renal dysfunction, elderly patients; reduce dose in renal impairment; pregnancy (may cause intra-uterine growth restriction, neonatal hypoglycaemia and bradycardia); breastfeeding (small amount in milk); avoid abrupt withdrawal especially in angina

Interactions see appendix 1under beta-blockers

Side effects bradycardia, heart failure, hypotension, conduction disorders, bronchospasm, peripheral vasoconstriction (including exacerbation of intermittent claudication and Raynaud's phenomenon), GI disturbances, fatigue, sleep disturbances

Dose *by oral administration,* 50mg once daily, increased to 100mg once daily; **hypertension**: 50 mg daily (higher doses rarely necessary); **arrhythmias**: 50–100 mg daily; **angina**: 100 mg daily in 1 or 2 doses

PROPRANOLOL

Tablet, 40mg NRH/RRH

Therapeutic group antianginal, antiarrhythmic, antithyroid and antimigraine

Indications treatment of angina, arrhythmias, hyperthyroidism, and prophylaxis of migraine

For details, see under antimigraine medicines

Dose *by oral administration,* **angina**: 40mg 2-3 times daily, increasing to a maximum of 240mg daily; **arrhythmias**: 10-40mg 3-4 times daily; **migraine prophylaxis**: 40mg 2-3 times daily

METOPROLOL SUCCINATE

Tablet, 25mg NRH/RRH

Therapeutic group antianginal; antihypertensive(beta-blockers)

Indications arrhythmias following acute myocardial infarction

For details see under propranolol

Dose *by oral administration,* 50mg 2-3 times daily; up to 300mg daily in divided doses if necessary

16.2. Antiarrhythmic medicines

LIGNOCAINE

Injection, 2% (50ml) (preservative free) NRH/RRH

Therapeutic group antiarrhythmic and general anaesthetic

Indications ventricular arrhythmias, especially after myocardial infarction

Contraindications sino-atrial disorders, all grades of atrioventricular block, severe myocardial depression; porphyria

Cautions lower doses in congestive cardiac failure, in hepatic failure, and following cardiac surgery; elderly

Side effects dizziness, paraesthesia, or drowsiness (particularly if injection too rapid); other CNS effects include confusion, respiratory depression and convulsions; hypotension and bradycardia (may lead to cardiac arrest); hypersensitivity

Dose *by IV administration,* in patients without gross circulatory impairment, 100mg as a bolus over a few minutes (50 mg in lighter patients or those whose circulation is severely impaired), followed immediately by infusion of 4 mg/minute for 30 minutes, 2 mg/minute for 2 hours, then 1 mg/minute. The infusion should be stopped as soon as the patient's cardiac rhythm appears to be stable or at the earliest signs of toxicity. Patients should be changed to oral anti-arrhythmic agents for maintenance therapy; note*: ECG monitoring and specialist advice for infusion*

AMIODARONE

Tablet, 200mg NRH/RRH

Therapeutic group antiarrhythmic

Indications life threatening ventricular arrhythmia, ventricular fibrillation, haemodynamically unstable ventricular tachycardia, sub-ventricular tachycardia, arrhythmias associated with accelerated conduction

Contraindications pregnancy (possible risk of neonatal goitre), breastfeeding (significant amount present in milk), sinus bradycardia, sinoatrial heart block, circulatory collapse, severe arterial hypotension, and congestive heart failure

Cautions heart failure, renal impairment, corneal deposits, elderly; liver, lung & thyroid function tests required in long term therapy; severe bradycardia & conduction disturbances in excessive dosage; porphyria

Interactions see appendix 1

Side effects reversible corneal micro deposits, rarely impaired vision, peripheral neuropathy & myopathy (reversible on withdrawal), bradycardia, phototoxicity, jaundice, hepatitis, cirrhosis, hypothyroidism, hyperthyroidism, pneumonitis

Dose *by oral administration,* **life threatening ventricular arrhythmias, ventricular fibrillation, hemodynamically unstable ventricular tachycardia:**

initially, 600-800mg/day in divided doses for 1 month, maintenance dose: 400mg/day; **sub-ventricular tachycardia, arrhythmia associated with accelerated conduction:** 1st week, 200mg 3 times daily; 2nd week, 200mg 2 times daily; maintenance: 200mg daily

Counseling *avoid exposure of skin to direct sunlight*

Note *amiodarone contains a large amount of organic iodine (75mg iodine in each 200mg tablet) and has a very long half-life (27-107 days)*

ADENOSINE

Injection, 6mg/ml (2ml) NRH/RRH/DH

Therapeutic category antiarrhythmic

Indications rapid reversion to sinus rhythm of paroxysmal supraventricular tachycardias, including those associated with accessory pathways (e.g. Wolff - parkinson-white syndrome)

Contraindications second or third degree AV block and sick sinus syndrome; asthma

Cautions atrial fibrillation or flutter with accessory pathways; heart transplant

Side effects transient facial flush, chest pain, dyspnoea, bronchospasm, choking sensation, nausea, light headedness, and severe bradycardia

Interactions see under appendix 1

Dose *by rapid IV injection,* PSVT, into central or large peripheral vein, ADULT, 3mg over 2 seconds with cardiac monitoring, if necessary followed by 6mg after 1-2 minutes and then by 12mg after a further 1-2 minutes; increments should not be given if high level AV block develops at any particular dose; CHILD<50kg 0.05-0.1mg/kg rapid IV over 1-3 seconds, no more than 0.3mg/kg/dose followed by rapid flush with > 5ml 0.9% sodium chloride

Note*: 3mg dose ineffective in a number of patients, therefore higher initial dose may be necessary but for patients with heart transplant who are very sensitive to effects of adenosine should not receive higher initial dose*

VERAPAMIL

Tablet, 40mg NRH/RRH

Therapeutic group antianginal; antiarrhythmic (calcium channel blockers)

Indications supraventricular arrhythmias; angina, hypertension

For details, see under antiangina medicines

Dose *by oral administration,* **supraventricular arrhythmias**: 40-120mg 3 times daily; **angina**: 80-120mg 3 times daily

DILTAZEM

Injection, 5mg/ml (10ml) NRH

Therapeutic group calcium channel blocker

Indication prophylaxis and treatment of angina; paroxysmal supra ventricular tachaycardia and aterial fibrillation/flutter

Contraindications severe bradycardia, left ventricular failure with pulmonary congestion, second or third-degree AV block (unless pace maker fitted), sick sinus syndrome; pregnancy and breastfeeding

Cautions reduce dose in hepatic and renal failure; heart failure or significantly impaired left ventricular function, bradycardia (avoid if severe), first degree AV block or prolong PR interval

Interactions see appendix 1

Side effects bradycardia, sino aterial block, AV block, palpitation, comma, dizziness, hypotension, malaise, asthenia, headache, hot flushes, GI disturbances, edema (notably of ankles); rarely rashes (including erythema multiform and exfoliative dermatitis), photo sensitivity, hepatitis, gynaecomastia, gum hyperplasia, EPS, and depression

Dose **paroxysmal supraventricular tachycardia and aterial fibrillation**: *by IV injection,* 0.25mg/kg (average adult dose, 20mg) over 2 minutes; after 15 minutes, may repeat bolus by administering 0.35mg/kg actual body weight over 2 minutes (average adult dose, 25mg)

Note *use weight based dosing for lower body weight patients*

DIGOXIN

Injection, 250mcg/ml (2ml) NRH/RRH
Tablet, 250mcg NRH/RRH/DH/BHU

Therapeutic group antiarrhythmic; medicines used in heart failure (cardiac glycosides)

Indications congestive cardiac failure, tachycardia of supraventricular origin

Contraindications AV block, intermittent complete heart block, second degree AV block; supraventricular arrhythmias caused by Wolff-Parkinson-White syndrome; ventricular tachycardia or fibrillation; hypertrophic obstructive cardiomyopathy (unless concomitant atrial fibrillation and heart failure -but with caution)

Cautions myocardial ischemia, hypoxia, hypokalaemia, and IV administration; loading dose can sometimes precipitate toxicity; use with caution in pulse rate below 60 beats/min

Interactions see appendix 1 under cardiac glycosides

Side effects and over dosage dose-dependent effects, occurring in a small proportion of patients, may include nausea and vomiting, induced dysrhythmias and heart block; mild toxicity can be treated by interrupting treatment for 1-2 days; more serious toxicity may demand a slow IV infusion of potassium chloride or IV lignocaine; accidental overdose in children is characterized by vomiting, drowsiness, bradycardia and accentuated sinus arrhythmia; digoxin side effects can be monitored using ECG

Dose ADULT, 0.25mg twice daily for 1-3 weeks then reduce according to response; **loading dose** (seldom required): 0.75-1.5mg stat, followed by 0.25mg 6 hourly until clinical response or toxic effects are seen; CHILD under 10 years require relatively high doses, initially 0.01-0.02mg/Kg by any route, repeated 6 hourly according to response; **maintenance:** 0.01-0.02mg Kg daily or as required

Note *the earliest evidence of Digoxin toxicity is often loss of appetite; it is a good practice always to ask patients if they are taking food as normal*

ISOPRENALINE

Injection, 2mg/ml (1ml) NRH

Therapeutic group antiarrhythmic

Indications cardiogenic and septicaemic shock; heart block and bradycardia

Cautions the risk of inducing serious cardiac dysrhythmia is increased in patients with ischemic heart disease, hypothyroidism or hypoxia

Side effects and over dosage palpitation, tachycardia, headache and flushing; severe dysrhythmias are uncommon at therapeutic dosage, but in over dosage, sudden death may occur due to ventricular fibrillation

Dose *by IV infusion*, 0.5-10mcg/min according to response

ADRENALINE

Injection, 1mg/ml (1ml) (1:1000) NRH/RRH/DH/BHU

Therapeutic group antiallergics (vasoconstrictor sympathomimetic) and medicines used in emergency treatment of acute anaphylaxis; antiarrhythmic

Indications emergency treatment of acute anaphylaxis; angioedema; cardiopulmonary resuscitation

For details see adrenaline under section 3

Dose **cardiac arrest***: by IV injection,* 1mg repeated at 3 minute intervals, if necessary

Note *IV route is for cardiac resuscitation only. Cardiac arrest: 1mg intra-cardiac injection in extremis; then IV as for anaphylaxis (for IV injection, dilute 1:10 in Water for Injections); IV route should be used with extreme care*

PROPRANOLOL

Tablet, 40mg NRH/RRH

Therapeutic group antimigraine; antiarrhythmic; antiangina; antithyroid

Indications prophylaxis of migraine, treatment of angina, arrhythmias, and hyperthyroidism

For details, see under antimigraine medicines

Dose *by oral administration,* **angina**: 40mg 2-3 times, daily, increasing to a maximum of 240mg daily; **arrhythmias**: 10-40mg 3-4 times daily

Counseling *do not stop taking this medicine except on doctor's advice*

16.3. Antihypertensive medicines

HYDROCHLOROTHIAZIDE

Tablet, 25mg NRH/RRH/DH/BHU

Therapeutic group antihypertensive; medicines used in heart failure (thiazide diuretics)

Indications hypertension acute and chronic heart failure, hepatic and renal oedema

Contraindications renal failure advanced hepatic failure, hyponatraemia

Cautions may cause potassium depletion and aggravate renal impairment, especially in the young, the old, and during substantial diuresis; use in pregnancy only if benefit outweighs risk of jaundice and thrombocytopenia in baby; if required during lactation, breastfeeding should be suspended

Interactions see appendix 1 under diuretics

Side effects GI disturbances; water and electrolyte disturbances, aggravation of diabetes, exacerbation of gout, may all be seen

Dose *by oral administration,* **oedema**: 50-75mg daily at first, reducing to 25-50mg daily on alternate days; **hypertension**: initiate with 12.5mg and increasing to 50mg daily if required

Counseling *take this medicine in the morning regularly as instructed*

Note *hydrochlorothiazide is the first-line medicine in all cases of hypertension, except hypertensive crisis. In adequate dose, it will control many cases of hypertension without having to resort to more complex medicines*

FUROSEMIDE

Injection, 10mg/ml (2ml) NRH/RRH/DH
Tablet, 40mg NRH/RRH/DH

Therapeutic group antihypertensive (loop diuretics); acute heart failure medicine

Indications treatment of systemic or pulmonary oedema of cardiac, hepatic or renal origin when either a prompt and vigorous diuresis is required or the response to hydrochlorothiazide has been inadequate

Contraindications hyponatraemia and hypokalaemia; hepatic failure; precomatose states associated with liver cirrhosis; liver failure with anuria

Cautions regular monitoring of fluid and electrolyte balance is essential, especially in the young and the elderly; massive diuresis may result in circulatory collapse; hypokalaemia and metabolic acidosis are common; pregnancy and breastfeeding, hypotension; correct hypovolaemia before using in oliguria; liver failure, prostatic enlargement; porphyria

Interactions see appendix 1under diuretics

Side effects water and electrolyte imbalance; acute urinary retention in patients with prostatic hypertrophy; unmasking of latent diabetes

Dose **oedema associated with heart failure, liver cirrhosis and nephritic syndrome:** *by oral administration,* ADULT, 40-80mg once daily, adjusting within the range 20-100mg daily according to response, in divided doses if necessary; CHILD, 1-3mg/kg daily; *by IM injection,* 0.5-1.5mg/Kg; *By IV or IM injection,* 20-40mg once daily; can be increased by 20mg every 2 hours; **resistant hypertension:** *by oral administration,* 20-80mg 1 to 2 times daily

Counseling *take this medicine regularly in the morning; add KCl syrup on prolonged treatment*

SPIRONOLACTONE

Tablet, 25mg NRH/RRH/DH

Therapeutic group antihypertensive; medicines used in heart failure (potassium sparing diuretics)

Indications**:** oedema and ascites in cirrhosis; malignant ascites; nephrotic syndrome; congestive heart failure; hypertension

Contraindications hyperkalaemia, hyponatraemia, pregnancy and breastfeeding

Cautions elderly patients; hepatic and renal impairment

Interactions see appendix 1 under diuretics

Side effects GI disturbances, gynaecomastia, hyperkalaemia, lethargy, headache, confusion

Dose *by oral administration,* **hypertension**: ADULT, 25-100 mg daily, adjusted according to response; **oedematous conditions:** ADULT, 25-200mg daily increased to 400mg if required; CHILD, 3mg/kg daily in divided doses

METHYLDOPA

Tablet, 250mg NRH/RRH/DH/BHU

Therapeutic group antihypertensive

Indications treatment of hypertension in pregnancy, heart failure and asthma where other medicines are contraindicated

Contraindications history of depression, active liver disease, pheochromocytoma

Cautions positive direct Coombs' test in 20% of patients may affect cross matching, so inform Pathologist of the medication; other laboratory tests may also be affected; reduce dose in renal impairment

Interactions see appendix 1

Side effects GI disturbances, dry mouth, sedation, depression, diarrhoea, fluid retention, ejaculatory failure, and liver damage are all minimized if the total daily dose is below 1 gram; side effects are dose dependent and occurs with higher doses

Dose *by oral administration,* 250mg 2-3 times daily, gradually increased at an interval of 2 or more days if required, maximum daily dose of 3g; ELDERLY, 125mg twice daily gradually increased if required; maximum daily dose of 2g daily

Counseling *may cause drowsiness; if affected, do not drive or operate machinery; do not stop taking this medicine except on doctor's advice*

HYDRALAZINE

Injection, 20mg/1ml NRH/RRH/DH/BHU
Tablet, 25mg NRH/RRH/DH

Therapeutic group antihypertensive

Indications hypertension, when uncontrolled by other medicines; hypertensive crisis including eclampsia, heart failure (with long acting nitrates)

Contraindications severe tachycardia, high-output heart failure, myocardial Insufficiency due to mechanical obstruction, cor pulmonale, dissecting aortic aneurysm

Cautions reduce initial dose in renal impairment, coronary artery disease and recent myocardial infarction; parenteral therapy sometimes results in sudden fall of blood pressure

Interactions see appendix 1

Side effects tachycardia, palpitations, flushing, hypotension, fluid retention, GI disturbances; headache, dizziness; systemic lupus erythematosus-like syndrome after long-term therapy with over 100 mg daily

Dose *by oral administration,* 25mg twice daily, increasing to a maximum of 50mg twice daily if required; **heart failure** (initiated in hospital): 25 mg 3-4 times daily, increased every 2 days if necessary, usual maintenance dose 50-75 mg 4 times daily; *by slow IV injection,* 5-10mg diluted with 10ml sodium chloride 0.9% over 20 minutes; repeat after 30 minutes if required; *by IV infusion:* 0.2-0.3mg/minute at first, then 0.05-0.15m/ minute

NIFEDIPINE

Tablet (Sustained Release), 20mg NRH/RRH/DH

Therapeutic group antihypertensive (calcium channel blockers)

Indications hypertension

Contraindications cardiogenic shock

Cautions pregnancy-labour may be inhibited; withdraw, if ischemic pain occurs or worsens soon after treatment starts; reduce dose in hepatic impairment

Interactions see appendix 1 under calcium channel blockers

Side effects headache, flushing, dizziness, lethargy; occasional gravitational oedema, rash, nausea, eye pain and frequency of micturition

Dose**:** **hypertension**: *by oral administration,* 20mg twice daily, increased up to max of 40 mg twice daily

Counseling**:** SR tablets should not be broken; swallow whole

AMLODIPINE

Tablet, 5mg NRH/RRH/DH

Therapeutic group antihypertensive; antiangina medicines (calcium channel blocker)

Indications hypertension, prophylaxis of angina

For details, see under antiangina medicines

ATENOLOL

Tablet, 50mg NRH/RRH/DH

Therapeutic group**:** antianginal; antiarrhythmic; antihypertensive (beta-blockers)

For details refer atenolol under antianginal medicines

Dose *by oral administration,* **hypertension**: 25-50mg daily (higher doses not considered necessary); **arrhythmias**: 50-100mg daily; **angina**: 100mg daily in 1 or 2 divided doses

ENALAPRIL

Tablet, 5mg NRH/RRH/DH

Therapeutic group antihypertensive; medicines used in heart failure (ACE inhibitors)

Indications hypertension; symptomatic heart failure; prevention of symptomatic heart failure in patients with left ventricular dysfunction

Contraindications hypersensitivity to ACE inhibitors (including angioedema) and in known or suspected renal artery stenosis; pregnancy

Cautions ACE inhibitors need to be initiated with care in patients receiving diuretics; first doses may cause hypotension especially in patients taking high doses of diuretics, on a low-sodium diet, on dialysis, dehydrated or with heart failure. They should also be used with caution in peripheral vascular disease or generalised atherosclerosis owing to risk of clinically silent renovascular disease. Renal function should be monitored before and during treatment, and the dose reduced in renal impairment.

Interactions see appendix 1 under ACE inhibitors

Side effects see cautions above; also dry cough, palpitations, arrhythmias, angina, chest pain, Raynaud's syndrome, syncope, cerebrovascular accident, myocardial infarction; anorexia, ileus, stomatitis, hepatic failure; dermatological

side effects including erythema multiforme, Stevens-Johnson syndrome, toxic epidermal necrolysis, exfoliative dermatitis and pemphigus; confusion, depression, nervousness, asthenia, drowsiness, insomnia, dream abnormalities, blurred vision, tinnitus, sweating, flushing, impotence, alopecia, dyspnoea, asthma, pulmonary infiltrates and muscle cramps

Dose *by oral administration,* **hypertension**: used alone, initially 5 mg once daily; if used in addition to diuretic, or in renal impairment, initially 2.5 mg daily; usual maintenance dose 20 mg once daily; max. 40 mg once daily

Counseling *profound first dose hypotension may occur when ACE inhibitors are introduced in patients with severe heart failure or those receiving high doses of diuretics, high dose vasodialatory therapy, hypovolemic, impaired renal, aged 70 years or more. Therefore, ACE inhibitors should be initiated under specialist supervision and with clinical monitoring in the above mentioned patients.*

LOSARTAN

Tablet, 25mg NRH/RRH/DH

Therapeutic group antihypertensive (angiotensin II antagonists)

Indications hypertension; diabetic nephropathy in type 2 diabetes mellitus and in patients where enalapril is not tolerated due to cough

Contraindications hypersensitivity; pregnancy and lactation

Cautions absolute contraindication in renal artery stenosis; monitoring of plasma potassium is advised in elderly & in patients with renal impairment

Interactions see appendix 1 under angiotensin II antagonists

Side effects diarrhoea, dizziness, taste disturbance; usually mild, symptomatic hypotension may occur, particularly in patients with intravascular volume depletion

Dose *by oral administration,* 50mg once daily, increased to 100mg daily in 2 divided doses; ELDERLY and over 75 years with mild to moderate severe renal impairment, 25mg once daily

Counseling *do not stop taking this medicine except on your doctor's advice; dizziness or light-headedness may occur after the first dose of this medicine; do not drive or operate machinery*

CLONIDINE

Injection, 150µg/ml NRH/RRH

Therapeutic group alpha 2-agonist (centrally acting)

Indications hypertension, migraine, menopausal flushing

Cautions must be withdrawn gradually to avoid hypertensive crises; Raynaud's syndrome or other peripheral vascular disease

Interactions see appendix 1

Side effects dry mouth, sedation, depression, fluid retention, bradycardia, headache, dizziness, euphoria, nocturnal unrest, rash, nausea, constipation

Dose *by IV infusion,* 150-300mcg; max. 750mcg in 24 hours

16.4 Medicines used in heart failure

ENALAPRIL

Tablet, 5mg NRH/RRH/DH

Therapeutic group medicines used in heart failure; antihypertensive (ACE inhibitors)

For details refer enalapril under antihypertensives

Dose **congestive heart failure, asymptomatic left ventricular dysfunction**: *by oral administration,* initially, 2.5 mg daily under close medical supervisio; usual maintenance dose 20mg daily in 1-2 divided doses; max. 40mg daily

DIGOXIN

Injection, 250mcg/ml (2ml) NRH/RRH
Tablet, 250mcg NRH/RRH/DH/BHU

Therapeutic group antiarrhythmic; medicines used in heart failure (cardiac glycosides)

Indications congestive cardiac failure, tachycardia of supraventricular origin

For details, refer digoxin under antihypertensives

Dose *by oral administration,* ADULT, 0.25mg twice daily for 1-3 weeks then reduced according to response; loading dose (seldom required): 0.75- 1.5mg stat, followed by 0.25mg 6-hourly until clinical response or toxic effects are seen; CHILD under 10 requires relatively high doses, initially, 0.01-0.02mg/Kg by any route, repeated 6 hourly according to response; maintenance: 0.01-0.02mg/kg daily or as required

SPIRONOLACTONE

Tablet, 25mg NRH/RRH/DH

Therapeutic group antihypertensive; medicines used in heart failure (potassium sparing diuretics)

For details, refer spironolactone under antihypertensive

Dose *by oral administration,* ADULT, 100-200mg daily; CHILD, 3mg/kg daily in divided doses

HYDROCHLOROTHIAZIDE

Tablet, 25mg NRH/RRH/DH/BHU

Therapeutic group antihypertensive; medicines used in heart failure (thiazide diuretics)

Indications acute and chronic heart failure, hepatic and renal oedema, hypertension
For details, refer hydrochlorothiazide under antihypertensive

Dose *by oral administration,* **oedema**: 50-75mg daily at first, reducing to 25-50mg daily on alternate days

DOPAMINE

Injection, 200mg/5ml NRH/RRH/DH

Therapeutic group medicines used in heart failure (sympathomimetic)

Indications cardiogenic shock in infarction or cardiac surgery

For details, refer dopamine under sympathomimetic

Dose dilute 4 ampoules (800mg) with 500ml dextrose or saline solution (not bicarbonate); solution now contains 1.6mg/ml, or 1600 micrograms/ml; b*y IV infusion* into a large vein, 2-5 mcg/min may be successful, but may cause renal vasoconstriction, so urine output must be checked frequently

CARVEDILOL

Tablet, 3.125mg NRH/RRH

Therapeutic group medicines used in heart failure (beta-blockers)

Indications adjunct to diuretics, digoxin, or ACE inhibitors in symptomatic chronic heart failure

Cautions see under propranolol; before increasing dose ensure renal function and heart failure not deteriorating; severe heart failure, avoid in acute or decompensated heart failure requiring IV inotropes

Contraindications see under propranolol; severe chronic heart failure; hepatic impairment

Side effects postural hypotension, dizziness, headache, fatigue, GI disturbances, bradycardia; occasionally diminished peripheral circulation, peripheral oedema and painful extremities, dry mouth, dry eyes, eye irritation or disturbed vision, impotence, disturbances of micturition, influenza like symptoms; allergic skin reactions, nasal stuffiness, wheezing, depressed mood, sleep disturbances, heart failure, changes in liver enzymes, thrombocytopenia, leucopoenia

Dose *by oral administration,* initially 3.125 mg twice daily, dose increased at intervals 2 weeks, up to highest dose tolerated, max 25mg twice daily in patients with severe heart failure or body weight less than 85 kg and 50mg twice daily in patients over 85kg

Note *beta-blocker therapy in patients with heart failure can be extremely difficult to manage; the initiation and up-titration should be undertaken in consultation with a specialist*

16.5 Antiplatelet agents

ASPIRIN

Tablet (Enteric coated), 75mg NRH/RRH/DH/BHU

Therapeutic group antiplatelet medicines

Indications prophylaxis of cerebrovascular disease or myocardial infarction; It is also given following coronary bypass surgery

For details, see aspirin under analgesics

Dose *by oral administration,* as single dose of 150-300mg as soon as possible after an ischemic event, followed by maintenance treatment with 75-150mg daily

CLOPIDOGREL

Tablet, 75mg NRH/RRH

Therapeutic group antiplatelet agent

Indications prevention of atherosclerotic events in peripheral arterial disease; myocardial infarction and ischemic stroke

Contraindications active bleeding, breastfeeding

Cautions patients at risk of increased bleeding from trauma, surgery or other pathological conditions; concomitant use of medicines that increase risk of bleeding; discontinue 7 days before elective surgery if platelet effect not desirable; hepatic and renal impairment; pregnancy

Interactions see appendix 1 under antiplatelets

Side effects dyspepsia, abdominal pain, diarrhoea; bleeding disorders (including GI and intracranial); less commonly nausea, vomiting, gastritis, flatulence,

constipation, gastric and duodenal ulcers; headache, dizziness, paraesthesia, leucopoenia, decreased platelets, eosinophilia, rash, and pruritus; rarely vertigo; and very rarely hypersensitivity like reactions

Dose *by oral administration,* **prevention of atherosclerotic events in peripheral arterial disease or after myocardial infarction or ischemic stroke**: 75mg once daily; **acute coronary syndrome**: initially, 300mg then 75mg daily; **management of acute coronary syndromes, including unstable angina and non-Q wave myocardial infarction**: initially, 300mg single dose, then 75 mg once daily

16.6. Lipid regulating medicines

ATORVASTATIN

Tablet, 10mg NRH/RRH/DH

Therapeutic group lipid regulating agent (statins)

Indications adjunct to diet in the treatment of mixed hyperlipidaemia

Contraindications active liver disease; pregnancy (adequate contraception required during treatment and for 1 month afterwards; breastfeeding

Cautions history of liver disease, high alcohol intake use should be avoided in active liver disease); LFT to be carried out before and within 1-3 months of starting treatment and thereafter at intervals of 6 months for 1 year

Side effects headache, altered LFT, myalgia, myositis and myopathy have been reported with the statins; if myopathy is suspected and serum creatinine kinase is markedly elevated (more than 5 times upper limit) treatment should be discontinued

Dose *by oral administration*, **primary hypercholesterolemia and mixed hyperlipidaemia**: usually 10mg daily, up to a max of 80mg daily

Counseling *advise patient to report promptly unexplained muscle pain, tenderness, and weakness*

FENOFIBRATE

Tablet, 200mg NRH/RRH

Therapeutic group lipid regulating agent

Indications hyperlipidaemias of types IIa, IIb, III, IV, and V; in patients who have not responded adequately to diet modifications and other appropriate measures

Contraindications gall bladder disease; severe hepatic impairment; pregnancy and breastfeeding

Cautions hepatic impairment (liver function tests recommended every 3 months for first year and discontinue treatment if significantly raised) and renal impairment (avoid if creatinine clearance is <10ml/minute)

Interaction see appendix 1

Side effects GI disturbances, anorexia; less commonly cholestasis, weight gain, dizziness, headache, fatigue, drowsiness, renal impairment, raised serum creatinine (unrelated to renal impairment), erectile dysfunction, urticaria, pruritus, photosensitivity reactions

Dose *by oral administration,* ADULT, 200 mg daily with food initially; doses may be adjusted according to response to between 200 and 400 mg daily in divided doses; CHILD, 5 mg/kg daily.

Note *fibrates are a first line therapy only in those whose serum triglyceride concentration is >180mg/dl or in those who cannot tolerate statins*

16.7. Peripheral vasodilator

PENTOXIFYLLINE

Tablet, 400mg NRH

Therapeutic group peripheral vasodilator

Indications peripheral vascular disease, tropic leg ulcers, cerebrovascular disease, retinal vascular disorders, diabetic vascular disorders, ischemic heart disease

Contraindications cerebral haemorrhage, extensive retinal haemorrhage, acute myocardial infarction, lactation, porphyria

Interactions see appendix 1

Side effects GI disturbances, dizziness, headache; rarely flushing, tachycardia; hypersensitivity including rash, pruritus and bronchospasm

Dose 400mg 2-3 times daily with meals, minimum 8 weeks for optimum effects

Counseling *take this medicine with meals so that it will not upset your stomach*

17. Medicines acting on the respiratory tract

17.1 Bronchodilators and inhaled corticosteroids

THEOPHYLLINE+ETOPHYLLINE

Injection, (25.3mg + 84.7mg)/ml (2ml) NRH/RRH/DH
Tablet, (69mg+231mg) (retard) NRH/RRH/DH

Therapeutic group antiasthmatic (methylxanthine)

Indications prophylaxis and relief of reversible bronchospasm associated with asthma (acute & chronic), bronchitis including chronic bronchitis, emphysema, other obstructive airway diseases where there is a reversible airway narrowing

Contraindications hypersensitivity; neonates and lactation

Cautions in patients with severe cardiac disease, hypertension, hyperthyroidism, acute myocardial injury, CCF, history of peptic ulcer, children, pulmonary oedema, hepatic dysfunction, pregnancy and smokers

Interactions see appendix 1 under theophylline

Side effects cardiac arrhythmias in pre-existing cardiac disease, tachycardia anorexia, nausea, tremors, CNS excitation, hyperglycaemia

Dose *by oral administration,* 1 tablet 1 to 2 times daily; b*y IM or IV injection,* ADULT, 2-4ml up to 2 or 3 times daily; also as a combined injection with dextrose; CHILD, 5mg/kg/dose slow IV, with close monitoring

CAFFIENE CITRATE

Injection, 20mg/ml (1ml) NRH/RRH

Therapeutic group respiratory stimulant

Indications neonatal apnea

Contraindications hypersensitivity

Cautions anxiety, agitation, tremor; seizure disorder; hepatic and renal impairment

Interactions see appendix 1

Side effects tachycardia, palpitations, insomnia, irritability, nervousness, restlessness, tremor, tinnitus, nausea, vomiting, diarrhoea, diuresis

Dose *by IV administration*, loading dose, 10-20mg/kg; maintenance dose, 5 to 10mg/kg/day

SALBUTAMOL

Inhalation, 100mcg/MDI (200MDIs)	NRH/RRH/DH
Respiratory solution, 5mg/ml (15ml)	NRH/RRH/DH/BHU
Tablet, 4mg	NRH/RRH/DH/BHU

Therapeutic group bronchodilator

Indications asthma; bronchospasm in patients with reversible obstructive airway

Contraindications hypersensitivity and thyrotoxicosis

Cautions hyperthyroidism, myocardial insufficiency, arrhythmias, hypertension, elderly patients, diabetics

Side effects fine tremor, nervous tension, headache, peripheral vasodilatation, tachycardia, sleep and behavioural disturbance in children

Dose *by oral administration,* ADULT, 2-4mg 3-4 times daily; CHILD 2-5 years, 1-2mg 3-4 times daily; CHILD 6-12years, 2mg 3-4 times daily; b*y nebulisation (respiratory solution);* **for intermittent administration**: ADULT, 0.5-1ml of respiratory solution diluted to a final volume of 2-4 ml with 0.9% sodium chloride is inhaled from a suitably driven nebuliser until aerosol generation ceases; CHILD under 12 years, 0.03ml/kg of solution diluted to 2-4 ml with 0.9% sodium chloride and inhaled from a nebulizer; **for continuous administration**: 1-2ml of the respiratory solution is diluted to 100ml with 0.9% sodium chloride to contain 50-100mcg salbutamol per ml. The diluted solution is administered as on aerosol by a suitably driven nebuliser. The usual rate of administration is 1-2mg per hour; *by inhalation,* **management of chronic asthma**: 2 MDIs (puff) up to 4 times daily; CHILD, 1 MDI, increased 2 MDIs if necessary, up to 4 times daily; **prophylaxis of allergen or exercise induced bronchospasm**: 2 MDIs as and when required

ADRENALINE

Injection, 1mg/ml (1ml)	NRH/RRH/DH/BHU

Therapeutic group medicines used in allergy and anaphylaxis; antiasthmatic

Indications anaphylactic shock, asthma and cardiac arrest, severe angioedema; bronchiolitis in nebuliser (paediatric)

For details, see adrenaline under section 3

Dose 0.1-0.5mg, *by IM injection* at 15-20 minute intervals as required; CHILD, 0.01mg/Kg, *by SC injection,* repeated after 4 hours if required

BECLOMETHASONE DIPROPIONATE

Inhalation (aerosol), 50mcg/MDI (200MDIs)	NRH/RRH

Therapeutic group antiasthmatic (steroid)

Indications chronic asthma not controlled by short acting β_2 agonists

Cautions systemic therapy may be required during periods of stress or when either airway obstruction or mucus prevents medicine access to smaller airways

Interactions its hypoglycaemic action may be potentiated by alcohol, fluconazole, beta-blockers, and possibly ACE inhibitors

Side effects inhaled corticosteroids have considerably fewer systemic effects than oral corticosteroids; high doses of inhaled corticosteroids used for prolonged periods have been associated with oropharyngeal candidiasis cough and lower respiratory tract infection including pneumonia; adrenal suppression, growth retardation in children and adolescents, impaired bone metabolism, glaucoma and cataract

Dose *by inhalation,* ADULT, 2 MDIs 2-3 times daily and in severe cases up to 4 times; CHILD, 1 MDI 2-3 times daily
Counseling *rinse the mouth with water after inhalation to reduce the risk of oral candidiasis or use a spacer device if available*

FLUTICASONE + SALMETEROL

Inhalation, (250µg + 50µg) (200 actuations) NRH/RRH

Therapeutic group antiasthmatic

Indications pophylaxis of asthma and management of chronic obstructive pulmonary disease

Contraindications hypersensitivity to fluticasone, salmeterol or any ingredients in the formulation

Cautions arrhythmia, susceptibility to QT prolongation and diabetes; excessive dose of inhaled corticosteroids should be avoided in children

Side effects fine tremor, headache, muscle cramp, palpitation, tachycardia, arrhythmia, myocardial ischemia and disturbances of sleep behavior; inhaled corticosteroids used in high doses and for prolonged period of time can cause adrenal suppression and reduction in bone mineral density; in older patients with COPD, higher doses of inhaled corticosteroid are associated with increased risk of lower respiratory tract infection including pneumonia; oral candidiasis

Dose *by inhalation,* ADULT and CHILD over 5 years, initially 1 MDI twice daily, increased up to 2 to 3 MDIs twice daily in severe cases

Counseling *do not to use the preparation for relief of acute attack; rinse the mouth with water after inhalation to reduce the risk of oral candidiasis or use a spacer device if available*

IPRATROPIUM

Respiratory solution, 0.25mg/ml NRH/RRH/DH

Therapeutic group antiasthmatic

Indications chronic asthma, chronic obstructive pulmonary disease

Contraindications hypersensitivity to ipratropium or any ingredients in the formulation

Cautions prostatic hypertrophy; pregnancy; glaucoma (in case of nebulized medicine in association with salbutamol); risk of paradoxical bronchospasm

Side effects occasionally dry mouth; rarely urinary retention and constipation; tachycardia and atrial fibrillation

Dose *by inhalation of nebulized solution,* **chronic obstructive pulmonary disease**: ADULT, 250-500 mcg 3-4 times daily; **adjunct in acute bronchospasm**: ADULT, 500 mcg repeated as required; CHILD up to 6 years: 125-250 mcg, maximum 1mg daily; CHILD 6-12 years, 250 mcg, maximum 1mg daily

Counseling *advise patient to avoid spraying in or around eyes; advise patient that medicine may cause dizziness and to use caution while driving or performing other tasks requiring mental alertness*

17.2 Antitussives and decongestants

17.2.1 Antitussives

CODEINE PHOSPHATE

Tablet, 15mg NRH/RRH/DH

Therapeutic group opioid analgesic; antitussive

For details, see codeine phosphate under section 3

Dose *by oral administration,* ADULT, 15-30mg 2 times; CHILD 2-5 years, 3mg two to three times daily; CHILD 6-12 years, 7.5-30mg 2 to 3 times daily

17.2.2 Decongestants

COMPOUND BENZOIN

Tincture for inhalation (450ml) NRH/RRH/DH/BHU

Therapeutic group antitussive and decongestants

Indications nasal obstruction; viral respiratory conditions; adjunct in bacterial respiratory conditions

Cautions the inhalation should not be made with boiling water, to avoid the risk of scalding; children and elderly should be supervised

Dose 5ml in 500ml hot water for inhalation

Counseling *this inhalation will help clear your breathing; in children, care must be taken to prevent burning*

18. Gastrointestinal Medicines

18.1 Medicines for dyspepsia and ulcer

18.1.1 Antacids

ANTACID (Aluminum& Magnesium salts)

Syrup (extemporaneous preparation) NRH/RRH/DH
Tablet, 650mg (flavored) NRH/RRH/DH/BHU

Therapeutic group antacids

Indications peptic ulcer syndrome, dyspepsia, reflux oesophagitis

Contraindications hypophosphatemia

Cautions renal impairment

Interactions see appendix 1

Side effects aluminium salts tend to be constipating while magnesium ones tend to be laxative; these may counterbalance, or either effect may be seen

Dose *by oral administration,* **as tablet:** 1-2 tablets chewed 3 times daily and at bedtime; **as syrup**: 10ml 3-4 times daily and at bed time; more frequent doses may be required in acute pain

Counseling *antacids should preferably not be taken at the same time as other medicines since they may impair absorption*

SODIUM CITRATE

Powder for oral solution, 0.3 Molar NRH/RRH/DH

Therapeutic group antacids, antiulcer medicines and acid aspiration prophylaxis

Indications to be given prior to caesarean-section and to prevent acid aspiration syndrome

Cautions elderly and debilitated, and also in patients with respiratory and metabolic alkalosis, hypocalcaemia and hypochlorhydria; renal impairment, heart failure, hypertension and eclampsia

Contraindications acute gastrointestinal conditions

Dose *by oral administration,* 15ml stat before the procedure

18.1.2. H_2 receptor antagonists

RANITIDINE

Injection, 25mg/ml (2ml) NRH/RRH/DH
Tablet, 150mg NRH/RRH/DH/BHU

Therapeutic group antiulcer (H_2 receptor antagonists)

Indications peptic ulcer unresponsive to antacids; reflux oesophagitis; prophylaxis of acid aspiration in surgical procedures

Contraindications hypersensitivity and children below 2 years

Cautions renal and hepatic impairment (reduce dose); in older patients where gastric carcinoma may be the underlying cause of peptic pain, this diagnosis must be excluded by radiography or endoscopy before ranitidine is used, or it may delay the diagnosis

Side effects altered bowel habits, rash, tiredness; reversible confusion states, reversible liver damage, headache

Dose **reflux oesophagitis**: *by oral administration*, ADULT, 150mg twice daily or 300mg at night for up to 8 weeks or if necessary 12 weeks; **benign gastric & duodenal ulceration**: *by oral administration*, ADULT, 150mg twice daily or 300mg at night for 4-8 weeks, then 150mg at night as required; *By IM injection*, ADULT, 50mg 6-8 every hour; *by slow IV injection*, ADULT, 50mg given over 2 minutes repeated every 6-8 hours; s**urgical procedures**: *by oral administration,* ADULT, 150mg 2 hours before induction of anaesthesia; *by IM or slow IV injection*, ADULT, 1 hour before induction of anaesthesia

Counseling *smoking and drinking alcohol should be reduced or stopped, as they can both cause the ulcer to get worse*

18.1.3 Proton Pump Inhibitors

OMEPRAZOLE

Capsule, 20mg NRH/RRH/DH

Therapeutic group antacids and other antiulcer (proton pump inhibitors)

Indication peptic ulcer disease; combined with antibacterial for *H. pylori induced* gastritis; gastric oesophageal reflux disease; prevention and treatment of NSAIMs-associated ulcer

Contraindications children, neonate

Cautions liver disease; pregnancy; breastfeeding

Side effects GI disturbance (diarrhoea, nausea, vomiting); headache; hypersensitivity

Interactions see appendix 1 under proton pump inhibitors

Dose *by oral administration*, **peptic ulcer**: 20mg daily; **GORD**: 20mg daily; **NSAIMs associated ulcer**: 20mg daily for 4 weeks; ***H. pylori* induced gastritis**: 20mg 2 times in combination with antibacterials

Counseling *it should be taken before food*

18.1.4. Antiemetic

METOCLOPRAMIDE

Injection, 10mg/ml (2ml) NRH/RRH/DH/BHU
Tablet, 10mg NRH/RRH/DH/BHU

Therapeutic group antiemetics

Indications nausea and vomiting; adjunct treatment of reflux esophagitis; adjunct treatment of migraine and acid aspiration prophylaxis

Contraindications within 3-4 days of GI surgery, GI obstruction, perforation or haemorrhage

Cautions hepatic and renal impairment; the elderly, young adults and children

Interactions see appendix 1

Side effects extrapyramidal effects, especially in young adults and children; cardiac conduction abnormalities after IV administration

Dose *by oral administration* or *by IM* or *slow IV injection* (over at least 3 minutes), ADULT over 18 years, body weight over 60 kg, 10mg up to 3 times daily; body weight under 60 kg, max. daily dose 500 mcg/kg in 3 divided doses; CHILD 1-18 years, 100-150 mcg/kg up to 3 times daily

Counseling *take before food*

ONDANSETRON

Injection, 2mg/ml (4ml) NRH/RRH
Tablet, 4mg NRH/RRH

Therapeutic group antiemetics

Indications moderately emetogenic chemotherapy or radiotherapy; severely emetogenic chemotherapy; prevention of postoperative nausea and vomiting; treatment of postoperative nausea and vomiting

Cautions pregnancy and breastfeeding; moderate or severe hepatic impairment (max. 8 mg daily)

Side effects constipation; headache, sensation of warmth or flushing, hiccups; occasional alterations in liver enzymes; hypersensitivity reactions reported; occasional transient visual disturbances and dizziness following IV administration; involuntary movements, seizures, chest pain, arrhythmias, hypotension and bradycardia also reported; suppositories may cause rectal irritation

Dose **moderately emetogenic chemotherapy or radiotherapy**: *by oral administration, 8mg 1-2 hours before treatment; by IM injection or slow IV injection,* 8mg immediately before treatment; then *by oral administration*, 8mg every 12 hours for upto 5 days; CHILD, *by slow IV injection or IV infusion* over 15 minutes, 5mg/m^2 immediately before treatment then, *by oral administration* 4mg every 12 hours for upto 5 days; **severely emetogenic chemotherapy**: by *IM injection or slow IV injection,* 8mg immediately before treatment, where

necessary followed by 8 mg at intervals of 2-4 hours for 2 further doses (or followed by 1 mg/hour by continuous IV infusion for up to 24 hours); CHILD, *by slow IV injection or by IV infusion* over 15 minutes, 5 mg/m^2 immediately before chemotherapy then, 4 mg by mouth every 12 hours for up to 5 days; **prevention of postoperative nausea and vomiting**: *by oral administration,* 16mg 1 hour before anaestheisa or 8mg 1 hour before anaesthesia followed by 8mg at intervals of 8 hours for 2 further doses; *by IM or slow IV injection*, 4mg at induction of anaesthesia; CHILD over 2 years, by slow IV injection, 100mcg/kg (max. 4mg) before, during, or after induction of anaesthesia; **treatment of postoperative nausea and vomiting,** *by IM or slow IV injection*, 4mg; CHILD over 2 years, *by slow IV injection,* 100mcg/kg (max. 4 mg)

PROMETHAZINE HCl

Injection, 25mg/ml (2ml) NRH/RRH/DH/BHU
Tablet, 10mg NRH/RRH/DH/BHU

Therapeutic group antiallergies; antiemetics

For details, see promethazine under antiallergies section 5

Dose *by oral administration,* ADULT, 10mg 2-3 times daily up to 20mg 3 times daily; 25mg at night may be preferable in seasonal rhinitis; CHILD, 1mg/kg per day, in divided doses; by *IM injection,* ADULT, 25-50mg; CHILD, 0.5mg/kg/day in divided doses

Counseling *do not drive, may cause drowsiness*

Note *for IV injection, dilute 1:10 in water for injections*

18.2. Antihaemorrhoidal medicines

ANTIHAEMORRHOIDAL

Ointment (20g) NRH/RRH/DH/BHU

Therapeutic group antihaemorrhoid

Indications symptomatic relief of first degree haemorrhoids and pruritus ani

Cautions for short term use only

Dose apply at night and morning, and after bowel movements, externally to the anus or rectally, using the nozzle provided

Counseling *apply the ointment as instructed, but also take note of advice about diet and hygiene, which may make the medicine unnecessary in future*

18.3. Antispasmodic medicines

DICYCLOMINE (dicycloverine)

Injection, 10mg/ml (2ml) NRH/RRH/DH/BHU
Tablet, 10mg NRH/RRH/DH/BHU

Therapeutic group antispasmodic medicines (antimuscarinic)

Indications adjunct in GI disorders characterized by smooth muscle spasm

Contraindications intestinal obstruction, urinary retention, intestinal atony, myasthenia gravis, unstable CVS, reflux oesophagitis; children below 6 months of age

Cautions hepatic or renal disease, autonomic neuropathy, infants, elderly, pregnancy

Interactions see appendix 1 under antimuscarinics

Side effects dry mouth with difficulty in swallowing and thirst, dilation of pupils with loss of accommodation and sensitivity to light, increased intraocular pressure, flushing, dry skin, bradycardia, urinary retention, confusion, excitement, hallucination and delirium

Dose *by oral administration,* ADULT, 10-20mg 3-4 times daily; CHILD, 6-24 months, 5-10mg 3-4 times daily, 15 minutes before feeds; CHILD 2-12 years, 10mg 3 times daily; *by IM injection,* 20mg repeated 4-6 hourly as required, max 80mg daily; CHILD over 2 years, 10mg every 6 hours, Max 40mg daily.

Counseling *take 30 minutes before meal; take plenty of fluids while taking this medicine*

ATROPINE SULPHATE

Injection,1mg/ml (1ml) NRH/RRH/DH/BHU

Therapeutic group antispasmodic; antidote (antimuscarinics)

For details, refer atropine under antidotes

Dose **spasmolytic**: *by IM injection,* 1mg with appropriate analgesia

18.4. Laxatives

GLYCERINE

Suppositories (4g) NRH/RRH/DH

Therapeutic group laxatives

Indications constipation

Contraindications intestinal obstruction

Dose 1 suppository moistened with water before insertion

MAGNESIUM SULPHATE

Powder (400g) NRH/RRH/DH/BHU

Therapeutic group laxatives

Indications rapid bowel evacuation prior to bowel surgery, and as an adjunct to niclosamide treatment for tapeworm infestation

Contraindications acute GI conditions and obstruction

Cautions renal impairment, elderly or debilitated patients

Interactions see appendix 1

Side effects colic is common

Dose *by oral administration,* 5-10g in 150ml of water; before surgery, this dose may be repeated at 2 hour intervals

SENNA

Tablet, 7.5mg NRH/RRH/DH/BHU

Therapeutic group laxatives

Indications constipation; evacuation before radiology or surgery

Contraindications intestinal obstruction

Cautions avoid prolonged use; avoid in children

Side effects abdominal cramps

Dose *by oral administration,* ADULT, 2-4 tablets at night, initial dose should be low then gradually increased; CHILD 2-4 years ½-2 tablets once daily; CHILD 4-6 years ½-4 tablets once daily; CHILD 6-18 years 1-4 tablets once daily

LACTULOSE

Solution, 10mg/15ml (100ml) NRH/RRH/DH

Therapeutic group laxatives

Indications constipation; hepatic encephalopathy

Contraindications galactosaemia; intestinal obstruction

Side effects flatulence, cramps and abdominal discomfort.

Dose *by oral administration,* **constipation**: ADULT, 15ml twice daily, then gradually reduced; CHILD 6-12 years, 10ml twice daily, then gradually reduced; 1-5 years, 5ml twice daily, then gradually reduced; under 1 year, 2.5ml twice daily, then gradually reduced; **hepatic encephalopathy**: ADULT, 30-50ml 3 times daily, then adjusted to produce 2-3 soft stools daily

18.5. Medicines used in diarrhoea

18.5.1. Oral Rehydration

ORAL REHYDRATION SALT (ORS)

Powder for reconstitution (1g) NRH/RRH/DH/BHU

Therapeutic group medicines used in diarrhoea

Indications prevention and treatment of dehydration

Cautions renal impairment; always assess dehydration; ask about blood in the stool; check for pyrexia and severe malnutrition

Dose according to fluid loss, usually 200-400ml solution after every loose motion; **moderate dehydration**: *by oral administration,* INFANT up to 4 months, 200 to 400ml; 4 months up to 12 months, 400 to 700 ml; CHILD 12 months up to 2 years, 700 to 900 ml;2 years up to 5 years 900 to 1400 ml; **severe dehydration**, start IV immediately; if the child can drink, give ORS by mouth while the drip is set up; Give 100ml/kg Ringer's lactate solution (or, if not available, 0.9% sodium chloride), divided as follows: INFANT under 12 months, give 30ml/kg in the 1st hour and 70ml/kg from the 5th hour; CHILD 12 months up to 5 years, give 30ml/kg in the first ½ hour and 70ml/kg from 2 ½ hours; repeat once if radial pulse is still very weak or not detectable; reassess the child every 1-2 hours; if hydration status is not improving, give the IV drip more rapidly; also give ORS (about 5ml/kg/hour) as soon as the child can drink; usually after 3-4 hours (infants) and 1-2 hours (children); reassess an infant after 6 hours and a child after 3 hours

Counseling *dissolve 1 packet in a litre of boiled and cooled water and take small sips throughout the day; if you cannot finish the solution in 24 hrs, throw it away and prepare fresh one*

18.5.2 Antimotility

CODEINE PHOSPHATE

Tablet, 15mg NRH/RRH/DH

Therapeutic group opioid analgesic, antidiarrhoeal

For details, refer codeine phosphate under section 3

Dose *by oral administration,* ADULT, 15-30 mg two to three times daily; *not recommended for diarrhoea in children*

19. Diuretics

19.1 Osmotic diuretic

MANNITOL

Injection, 20% (350ml) NRH/RRH/DH

Therapeutic group osmotic diuretics

Indications forced diuresis in impending renal failure, and in excretion of poisons; emergency reduction of intracranial pressure, cerebral oedema, and intraocular pressure

Contraindications established anuria from severe renal disease, congestive cardiac failure, severe dehydration, active intracranial bleeding

Cautions fluid and electrolyte balance and urinary flow must be monitored; do not mix with whole blood infusion; only use in pregnancy if benefit to mother clearly outweighs risk to foetus

Side effects fluid and electrolyte imbalance associated with fluid retention or fluid depletion; occasional idiosyncratic reactions

Dose *by IV infusion,* **renal failure**: 1ml/kg infused over 5 minutes and repeated after 2-3 hours; if no response, reassess the patient; if urine flow does increase, 250-500ml over 5 minutes; **poisoning**: up to 1 litre per 24 hours may be infused, as long as urine output remains high; **emergency pressure reduction**: 7.5ml/kg given over 30 minutes; CHILD: 5ml/kg stat, then 2ml/kg 3-4 times a day

Note *if crystals are found in the bottle, warm gently to dissolve before use*

19.2 Thiazide Diuretic

HYDROCHLOROTHIAZIDE

Tablet, 25mg NRH/RRH/DH/BHU

Therapeutic group: antihypertensive; diuretics; medicines used in heart failure

For details, refer section 12.3 and 12.4

19.3 Loop Diuretic

FUROSEMIDE

Injection, 10mg/ml (2ml) NRH/RRH/DH
Tablet 40mg NRH/RRH/DH

Therapeutic group loop Diuretics; antihypertensive

For details, refer see section 12.3

19.4 Potassium sparing diuretic

SPIRONOLACTONE

Tablet, 25mg NRH/RRH/DH

Therapeutic group potassium sparing diuretics; antihypertensive; medicines used in heart failure

For details, refer section 12.3 and 12.4

20. Genitourinary medicines

20.1 Medicines for urinary incontinence

OXYBUTYNIN

Tablet, 2.5mg NRH

Therapeutic group antimuscarinic

Indications urinary frequency, urgency and incontinence; neurogenic bladder disorders instability, and as an adjunct to non-pharmacological therapy for nocturnal enuresis

Contraindications myasthenia gravis, bladder outflow obstruction or urinary retention, severe ulcerative colitis, toxic mega colon, and in gastro-intestinal obstruction or intestinal atony; breast feeding; allergy to oxybutynin

Cautions minimal doses should be considered to start with, in elderly and children; should be used with caution in open angle glaucoma, hepatic and renal impairment; pregnancy

Interactions the effects of atropine and other antimuscarinics may be enhanced by the concomitant use of other medicines with antimuscarinic properties, such as sedating antihistamines, phenothiazines and tricyclic antidepressants; antimuscarinics may also antagonise the GI effects of domperidone and metoclopramide

Side effects typical anticholinergic side effects such as dryness of mouth, constipation, flatulence and taste disturbances, dryness of eyes, blurred vision, dizziness, headache, fatigue, palpitation, difficulty in micturition, heat intolerance and dryness of skin

Dose *by oral administration,* ADULT, 5 mg 2 times increased to 3 times if required; ELDERLY, 2.5mg 2 times initially, increased to 5 mg 2 times if necessary

Counseling *do not stop taking this medicine except on your doctor's advice; do not drive or operate machinery*

20.2 Medicines for Benign Prostatic Hypertrophy

TAMSULOSIN

Tablet, 0.4mg NRH/RRH

Therapeutic group medicines used in benign prostatic hypertrophy (selective α_1 blocker)

Indications symptomatic relief in benign prostatic hypertrophy

Side effects headache, rhinitis, dizziness, back pain

Contraindications allergy to tamsulosin

Dose *by oral administration,* ADULT, 0.4mg once daily

Counseling *dizziness on standing may occur especially when starting treatment or dose is increased; stop the treatment if there is no benefit after 4-6 weeks of maximal treatment*

FINASTERIDE

Tablet, 5mg NRH/RRH

Therapeutic group 5α reductase inhibitor

Indications benign prostatic hyperplasia

Side effects libido, erectile dysfunction, ejaculation disorders, and reduced volume of ejaculate; rarely gynaecomastia

Cautions hepatic impairment; obstructive uropathy

Interactions antacids containing aluminium and magnesium salts may reduce absorption from gastrointestinal tract

Dose *by oral administration,* 5mg daily

Counseling *take in the morning after breakfast*

21. Hormones, other endocrine medicines and contraceptives

21.1 Adrenal hormones & synthetic substitutes

HYDROCORTISONE SODIUM SUCCINATE

Injection, 100mg/ml NRH/RRH/DH

Therapeutic group antiallergies; adrenal hormones and synthetic substitutes (corticosteroids)

Indications adjunct in the emergency treatment of anaphylaxis; inflammatory skin conditions; inflammatory bowel disease; adrenocortical insufficiency

Contraindications known hypersensitivity to hydrocortisone, or any other corticosteroid; systemic fungal infections unless needed to control medicine reactions due to amphotericin B; concurrent administration of live virus vaccines in patients receiving immunosuppressive doses of corticosteroids; IM administration for conditions prone to bleeding (e.g., idiopathic thrombocytopenic purpura)

Dose *by IM or slow IV or infusion,* 100-500 mg, 3-4 times in 24 hours or as required; CHILD, *by slow IV injection* up to1 year 25 mg, 1-5 years 50 mg, 6-12 years 100 mg

PREDNISOLONE

Tablet 5mg and 20mg NRH/RRH/DH

Therapeutic group**:** antiallergies; adrenal hormones and synthetic substitutes (corticosteroids)

For details, refer prednisolone under section 3

Dose**:** *by oral administration,* initially, 10-30mg (occasionally 60mg) daily; maintenance: 2.5-15mg daily; CHILD, 0.5mg/kg

TRIAMCINOLONE ACETONIDE

Injection, 40mg/ml (1ml) NRH

Therapeutic group adrenal hormones and synthetic substitutes (corticosteroids)

Indications severe inflammatory skin disorders such as eczema unresponsive to less potent corticosteroids; psoriasis, local inflammation of joints (especially in RA), and soft tissues

Contraindications local/systemic fungal infections, septic arthritis, herpes simplex, hypersensitivity, lactation, peptic ulcer, osteoporosis (long term use), history of glucocorticoid induced myopathy

Cautions repeated infections may lead to Cushingoid's syndrome, or to local necrosis and muscle wasting; full aseptic precautions must be taken; in tendonitis, the injection should be into the synovial sheath, not into the tendon itself; n*ot recommended for children below 6 years*

Interactions see appendix 1 under corticosteroids

Side effects Cushing's syndrome, growth retardation in children, osteoporosis, vertebral compression, glaucoma, hyperglycaemia, nocturia, obesity, facial rounding, increased fragility of skin and behavioural changes

Dose *by deep IM* injection, ADULT, 2.5-60mg/day; CHILD (6-12 years), 40mg; *By intra-articular injection*, 2.5-40mg according to joint size, to a maximum of 80mg in multiple injections; *by intralesional injection,* 2-3mg; maximum 30mg in multiple injections; doses are repeated every 1-2 weeks according to response

DEXAMETHASONE

Injection, 4mg/ml (2ml) NRH/RHR/DH/BHU
Tablet 4mg NRH/RRH

Therapeutic group corticosteroids

Indications suppression of inflammatory and allergic disorders; congenital adrenal hyperplasia, cerebral oedema associated with malignancy, as an adjunct therapy in chemotherapy induced nausea and vomiting

Contraindications hypersensitivity to corticosteroids or any ingredient in the formulation

Cautions hypertension; hypothyroidism; congestive heart failure or recent myocardial infarction; liver failure; renal insufficiency; diabetes mellitus or in those with a family history of diabetes; osteoporosis; glaucoma; patients with a history of severe affective disorders particularly of steroid induced psychoses; epilepsy and/or seizure disorder; peptic ulceration; previous steroid myopathy; tuberculosis; patients with myasthenia gravis receiving anticholinesterase therapy

Interactions aminoglutethimide; amphotericin B injection and potassium depleting agents; macrolides; anticholinesterases; warfarin; antidiabetics; isoniazid; cholestyramine; mifepristone; cyclosporine; digitalis glycosides; ephedrine; oestrogens, including oral contraceptives; hepatic enzyme inducers, inhibitors and substrates (e.g. barbiturates, phenytoin, carbamazepine, rifampin); ketoconazole; NSAIMs; diuretics; sympathomimetic (salbutamol, salmeterol); vaccines; antacids

Side effects adrenal suppression, swelling, rapid weight gain, GI perforation, mood changes, acne, dry skin, bruising or discoloration, glucose intolerance, slow wound healing, muscle weakness, changes in the shape or location of body fat, osteoporosis

Dose *by oral administration, ADULT, 0.5-10mg daily;* CHILD, 10-100mcgs/kg daily; *by IM injection or slow IV injection or IV infusion,* 0.5-24mg; CHILD, 200-400mcg/kg daily

Counseling *to be taken with or after meals; do not stop the medicine unless advised by the physician*

21.2. Ovulation inducers

CLOMIPHENE

Tablet, 50mg NRH/RRH

Therapeutic group ovulation inducers

Indications anovulatory infertility

Contraindications hepatic disease, ovarian cysts, endometrial carcinoma, pregnancy, undiagnosed or abnormal vaginal bleeding

Cautions polycystic ovary syndrome: risk of over-stimulation and multiple pregnancies; breast-feeding

Side effects visual disturbance - withdraw treatment; hot flushes, abdominal discomfort; occasionally nausea, vomiting depression, insomnia, breast tenderness, weight gain, rashes, dizziness and hair loss, headache, intermenstrual spotting, menorrhagia, endometriosis, convulsions

Dose *by oral administration,* 50 mg daily for 5 days, starting within about 5 days of onset of menstruation (preferably on 2nd day) or at any time (normally preceded by a progestogen-induced withdrawal bleed) if cycles have ceased;

second course of 100mg daily for 5 days may be given in absence of ovulation; most patients who are going to respond will do so to first course; 3 courses should constitute adequate therapeutic trial; long term cyclical therapy not recommended; **male infertility**: 25mg/day for 3 months

21.3 Contraceptives

21.3.1 Hormonal contraceptives

LEVONORGESTREL + ETHINYLOESTRADIOL

Tablet, (0.3mg + 0.03mg) NRH/RRH/DH/BHU

Therapeutic group hormonal contraceptives

Indications contraception, primary amenorrhoea, dysfunctional uterine bleeding, endometriosis, menorrhagia and chronic pelvic pain

Contraindications pregnancy, breastfeeding (until weaning or for first 6 months post-partum), history of thromboembolism, active liver disease, undiagnosed vaginal bleeding, breast, and uterine or other hormone-dependent cancers

Cautions diabetes, hypertension, cardiac or renal disease, migraine, epilepsy may all be made worse; varicose veins, inflammatory bowel disease including Crohn's disease, cigarette smoking, obesity, and age over 35 years may all predispose to thromboembolic disease

Interactions see appendix 1 under oral contraceptives

Side effects nausea and vomiting are common in the first few weeks; thromboembolism is more common than in the normal population in patient over 35 years old and smokers

Dose *by oral administration,* 1 pill daily

Counseling *tablets should be taken daily, at the same time of each day; if you miss more than 2 tablets, avoid sex for at least for 7 days, or use a condom or emergency contraceptive pills, and continue taking the tablets regularly so that you are protected after that*

Note *except after delivery, contraceptive pills should be started within 5 days of the start of menstruation; they should not be started less than 4 weeks after delivery, once breastfeeding is fully established; oral contraceptives should be discontinued one month before elective surgery*

LEVONORGESTREL

Tablet, 750mcg NRH/RRH/DH

Therapeutic group hormonal contraceptives

Indications emergency hormonal contraception

Contraindications severe liver disease, porphyria

Cautions avoid repeated use

Side effects nausea, vomiting, headache, dizziness, breast discomfort, depression, skin disorders, disturbances of appetite, irregular menstrual period

Interactions see appendix 1 under oral contraceptives and progestogens

Dose *by oral administration,* 1.5 mg (two tabs) as a single dose as soon as possible after unprotected sex (preferably within 12 hours but no later than after 72 hours) or a tablet each 12 hours apart

MEDROXYPROGESTERONE ACETATE DEPOT (DMPA)

Injection, 150mg/1ml NRH/RRH/DH/BHU

Therapeutic group hormonal contraceptives

Indications contraception

Contraindications pregnancy, undiagnosed vaginal bleeding, history or family history of arterial disease; liver adenoma; after hydatidiform mole (until HCG normal); breast and other hormone-dependent cancers

Cautions diabetes, hypertension, heart disease, ovarian cysts, malabsorption syndromes, migraine, active liver disease, recent cholestatic jaundice or history of jaundice in pregnancy

Interactions see appendix 1 under progestogens

Side effects irregular menstruation or amenorrhoea (50%) are normal, and may extend beyond the treatment period; nausea and vomiting, headache, breast tenderness, depression, skin disorders and weight changes may sometimes occur: delayed return of fertility (max 24 months)

Dose *by deep IM injection,* (gluteal muscle in average and thin patients and deltoid muscle in obese patients) 150 mg within first 5 days of cycle or within first 5 days after delivery (delay until 6 weeks after delivery if breastfeeding); **for long-term contraception**, repeated every 12 weeks (if interval greater than 12 weeks and 5 days, exclude pregnancy before next injection and advise patient to use additional contraceptive measures (e.g. barrier) for 14 days after the injection

Counseling *your menstrual cycle will be irregular, or may even stop; but as long as you come regularly for injections, there is no risk of you becoming pregnant*

NORETHISTERONE

Injection, 200mg/ml NRH/RRH/DH/BHU

Therapeutic group hormonal contraceptives

Indications contraception (short term)

Contraindications see under medroxyprogesterone acetate

Cautions see under medroxyprogesterone acetate

Side effects bloating, breast discomfort, headache, dizziness, depression, nausea, menstrual irregularities, delayed return to fertility; rarely weight gain; injection site reactions

Dose *by IM injection,* 200mg within the first 7 days of menstrual cycle or immediately after parturition; repeated after 2 months

Counseling *it is recommended that before treatment, women receive full counselling about the likelihood of menstrual irregularities and the potential of delay in the return to full fertility*

21.4 Oestrogens

ETHINYLOESTRADIOL

Tablet, 50mcg NRH/RRH/DH/BHU

Therapeutic group oestrogens

Indications post DMPA bleeding

Contraindications pregnancy, oestrogen-dependent cancer, history of thromboembolism, hepatic impairment, endometriosis and undiagnosed vaginal bleeding

Cautions oestrogen predisposes to thromboembolism and, in prolonged courses, to endometrial cancer; care is needed in diabetes, epilepsy, migraine, cardiac or renal disease

Interactions see appendix 1 under oestrogens

Side effects nausea, vomiting, headache, breast tenderness and weight gain may occur; changes in libido, depression, and amenorrhoea occur occasionally; thromboembolism is more common than in the normal population

Dose *by oral administration,* 10-20mcg daily for 20 days for DMPA bleeding; if given as hormone replacement therapies, add medroxyprogesterone

Note *for primary amenorrhoea, the combined oral contraceptive may be more convenient in establishing cyclical bleeding*

CONJUGATED OESTROGEN

Tablet, 0.625mg NRH/RRH

Therapeutic group conjugated oestrogens

Indications menopause, osteoporosis, prostatic carcinoma, atrophic vaginitis/ urethritis

Contraindications breast carcinoma, hepatic impairment, thromboembolic disorders, vaginal bleeding of unknown cause, suspected oestrogen dependent neoplasia

Cautions migraine, epilepsy, asthma, renal and cardiac disease, recurrent and chronic mastitis, may cause retention of salt and water, abnormal mammograms; to discontinue if cancer progression or hypercalcaemia occurs, uterine fibromyomata.

Interactions see appendix 1 under oestrogens

Side effects nausea, vomiting, breakthrough bleeding, breast tenderness, breast enlargement

Dose *by oral administration,* **moderate to severe vasomotor symptoms associated with climacteric:** 0.625-1.25mg daily; **atrophic vaginitis/urethritis**: 0.3mg-1.25mg daily depending on response; **osteoporosis**: 0.625mg daily; **female hypogonadism**: 2.5mg-7.5mg daily in divided doses for 20 days, then no tablet for 10 days, if no bleeding, repeat same; **primary ovarian failure**: 1.25mg daily, adjust upward or downward as per response; **oestrogen replenishment**: 0.625mg daily; n*ot recommended for children*

21.5 Progestogens

MEDROXYPROGESTERONE ACETATE

Tablet, 10mg NRH/RRH

Therapeutic group progestogens

Indications dysfunctional uterine bleeding, secondary amenorrhoea, mild to moderate endometriosis and postmenopausal syndrome

Contraindications pregnancy, undiagnosed vaginal bleeding, hepatic impairment or active liver disease, breast or genital tract carcinoma; porphyria

Cautions diabetes, hypertension, cardiac and renal failure

Interactions see appendix 1 under progestogens

Side effects acne, urticaria, fluid retention, weight changes, GI disturbances, changes in libido, breast discomfort, premenstrual symptoms, irregular menstrual cycles; also depression, insomnia, somnolence, alopecia, hirsutism, anaphylactoid-like reaction and rarely jaundice

Dose *by oral administration,* 2.5-10mg daily for 5-10 days beginning 16th-21st day of cycle, repeated for 2 cycles in dysfunctional uterine bleeding (DUB); **secondary amenorrhoea**: 3 cycles; **mild to moderate endometriosis**: 10mg 3 times daily for 90 consecutive days, beginning on the 1st day of cycle

21.6 Insulin & other antidiabetic agents

HUMAN INSULIN

Isophane, 40 units/ml (10ml) NRH/RRH/DH
Mixtard, (neutral + isophane) 30:70 (10ml) NRH/RRH/DH
Soluble, 40 units/ml inj, (10ml) NRH/RRH/DH

Therapeutic group antidiabetic agents

Indications diabetes mellitus

Cautions renal impairment; changes in life style/meal timing, trauma, infections and pregnancy can all affect dose requirement

Side effect hypoglycaemia; minor allergic reactions at injection sites during the first weeks of treatment are common; fat hypertrophy or atrophy may occur, but are limited by rotating injection sites used; transient oedema, this may be reduced by rotating injection sites; overdose causes hypoglycaemia

Dose *by subcutaneous injections* (and soluble only: *IM, IV or infusion*): adjusted according to patient's requirements.

Note ***short acting Insulin****: when injected subcutaneously has a rapid onset of action (30 to 60 minutes), a peak action between 2 to 4 hours, and duration of action up to 8 hours;* ***intermediate Insulin and long acting****: when given by subcutaneous injection, intermediate and long acting Insulin have an onset of action of approximately 1-2 hours, a maximal effect at 4-12 hours, and duration of action 16-35 hours*

GLIPIZIDE

Tablet, 5mg NRH/RRH/DH

Therapeutic group oral antidiabetic agent (sulfonylureas)

Indications diabetes mellitus type II; preferred in elderly patients

Contraindications should be avoided in sevre hepatic and renal impairment and in porphyria; should not be used while breastfeeding and insulin therapy should be substituted during pregnancy; ketoacidosis

Cautions increased risk of severe hypoglycaemia in elderly, debilitated patients and in patients with hepatic or renal impairment; risk of hypoglycaemia when caloric intake is deficient or after strenuous exercise

Interactions its hypoglycaemic action may be potentiated by alcohol, fluconazole, β-blockers, and possibly ACE inhibitors

Side effects GI side effects such as nausea, vomiting, diarrhoea and constipation; dizziness and drowsiness may also occur

Dose *by oral administration,* initially 2.5-5mg daily adjusted according to response; maximum 40mg in divided doses

Counseling *preferably taken shortly before breakfast or lunch*

METFORMIN

Tablet, 500mg NRH/RRH/DH/BHU

Therapeutic group oral antidiabetic agents (biguanides)

Indications type II diabetes and in overweight patients

Contraindications hepatic or renal impairment (withdraw if renal impairment suspected); predisposition to lactic acidosis, heart failure, severe infection or trauma, dehydration, alcohol dependence; in pregnancy and breastfeeding, it is normally substituted with insulin

Cautions serious infections, trauma, surgery, avoid alcohol

Interactions see appendix 1 under antidiabetics

Side effects lactic acidosis seen in presence of renal failure and alcoholism; minor transient anorexia, nausea, vomiting, diarrhoea, occasionally metallic taste, urticaria, malabsorption of vitamin B_{12}

Dose *by oral administration,* initially 500 mg with breakfast for at least 1 week, then 500 mg with breakfast and evening meal for at least 1 week, and then 500 mg with breakfast, lunch and evening meal; max. 3 g daily in divided doses though it is preferable to limit this to 2 g daily

PIOGLITAZONE

Tablet,15mg NRH/RRH/DH

Therapeutic group oral antidiabetic agents

Indications type II diabetes mellitus (alone or combined with metformin or a sulphonylurea)

Contraindications hepatic impairment, history of heart failure, combination with insulin (risk of heart failure), pregnancy (insulin is normally substituted in all diabetics), breastfeeding

Cautions monitor liver function (see below); cardiovascular disease (risk of heart failure)

Note ***liver toxicity****: rare reports of liver dysfunction; monitor liver function before treatment, then every 2 months for 12 months and periodically thereafter; advise patients to seek immediate medical attention if symptoms such as nausea, vomiting, abdominal pain, fatigue and dark urine develop; discontinue if jaundice occurs*

Side effects GI disturbances, weight gain, oedema, anaemia, headache, visual disturbances, dizziness, arthralgia, hypoaesthesia, haematuria, impotence; less commonly hypoglycaemia, fatigue, insomnia, vertigo, sweating, altered blood lipids, proteinuria

Dose**:** *by oral administration,* initially 15-30 mg once daily, increased to 45 mg once daily according to response

21.7 Thyroid hormones and antithyroid medicines

21.7.1 Thyroid hormones

THYROXINE

Tablet, 100mcg NRH/RRH/DH

Therapeutic group thyroid hormones

Indications hypothyroidism (myxoedema); diffuse non-toxic goitre; Hashimoto's thyroiditis; thyroid carcinoma

Contraindications thyrotoxicosis

Cautions neonatal hypothyroidism needs early recognition and prompt treatment if normal development is to be achieved; care in cardiovascular disorder, after prolonged myxoedema, and in adrenal insufficiency

Interactions see appendix 1 under thyroid hormones

Side effects arrhythmia, angina, tachycardia, skeletal muscle cramps, headache, restlessness, excitability, flushing, sweating, diarrhoea and excessive weight loss

Dose *by oral administration,* ADULT, 50mcg daily before breakfast; ELDERLY half or quarter dose of adult, increasing very gradually; maintenance dose of 0.2mg daily may be needed; CHILD, 10 mcg/kg up to a maximum of 50mcg should be given; subsequent therapy should reach 100 mcg by 5 years, and may reach the upper adult dose by 12 years, guided by clinical response, growth assessment and laboratory results

Counseling *take this medicine regularly; do not stop taking it without medical advice*

21.7.2 Antithyroid medicines

CARBIMAZOLE

Tablet, 5mg NRH/RRH/DH

Therapeutic group antithyroid medicines

Indications hyperthyroidism

Cautions liver disorders, pregnancy, breastfeeding

Side effects nausea, mild GI disturbances, headache, rashes and pruritis, arthralgia; rarely myopathy, alopecia, bone marrow suppression, jaundice

Dose *by oral administration,* ADULT, 30-60mg daily in divided doses until the patient is euthyroid, usually 4-8 weeks; maintenance dose of 5-15mg daily; CHILD, 15mg daily in divided doses adjusted as required

Counseling *warn patient to report immediately if sore throat, mouth ulcers, bruising, fever, malaise, or non-specific illness develops; blood test should be advised at regular intervals*

PROPRANOLOL

Tablet, 40mg NRH/RRH/DH

Therapeutic group antimigraine; antiarrhythmic; antiangina; antithyroid medicines

Indications prophylaxis of migraine, treatment of angina, arrhythmias, and hyperthyroidism

For details, refer propranolol under antimigraine medicines

Dose *by oral administration,* **hyperthyroidism**: 10-40mg 3-4 times daily

Counseling *do not stop taking this medicine except on physician's advice*

WEAK IODINE SOLUTION

Lugol's iodine (extemporaneous preparation) NRH/RRH/DH

Therapeutic group antithyroid medicines

Indications suppression of thyroid toxicity prior to thyroidectomy and thyroid storm

Contraindications hypersensitivity, especially on the skin; avoid oral use while breastfeeding

Cautions not for long term use

Side effects and over dosage oral hypersensitivity reactions include irritation of conjunctiva and respiratory mucous membranes, headaches and salivary gland pain; **overdose:** depression, insomnia, impotence and myxoedema may occur

Dose *by oral administration,* 0.1- 0.3ml 3 times daily diluted in a cup of milk or water

21.8 Medicines used in calcium metabolism

IBANDRONATE

Tablet, 150mg NRH/RRH

Therapeutic group calcium metabolism modifier (bisphosphonate)

Indications treatment and prevention of osteoporosis in post menopausal women; reduction of bone damage in bone metastases in breast cancer

Contraindications hypersensitivity; pregnancy

Cautions renal impairment (monitor renal function and serum calcium, phosphate and magnesium), cardiac disease and breastfeeding

Interactions see appendix 1

Side effects hypocalcaemia, hypophosphataemia, influenza like symptoms, bone pain; diarrhoea, nausea, vomiting, abdominal pain, dyspepsia, pharyngitis, oesophageal reactions; headache, hypersensitivity reactions, angioedema and bronchospasm

Dose *by oral administration*, **post-menopausal osteoporosis**: 150mg once a month; **reduction of bone damage in bone metastases in breast cancer**: 50mg daily

Counseling *tablet should be swallowed whole with plenty of water in upright position; to be taken on empty stomach at least 1 hour before breakfast (or any other oral medicines); patient should be in upright position for at least 1 hour after taking tablet*

22. Medicines used in obstetrics

MAGNESIUM SULPHATE

Injection, 50% (2ml) NRH/RRH/DH

Therapeutic group anticonvulsant

Indications prevention of recurrent seizures in eclampsia; prevention of seizures in pre-eclamsia

Cautions hepatic impairment; renal impairment monitor blood pressure for signs of over dosage weakness, nausea, sensation of warmth, flushing, drowsiness, double vision, and slurred speech, pregnancy

Interactions see appendix 1

Side effects respiratory depression, oliguria, neuro muscular depression and muscle weakness

Dose **prevention of recurrent seizures in eclampsia**: *by IV injection*, initially 4g over 5-15 minutes followed either *by IV infusion,* 1g/hour for atleast 24 hours after the last seizure or delivery (whichever occurs later) *or by deep IM injection,* 5g into each buttock, then 5g every 4 hours into alternate buttocks for at least 24 hours after the last seizure or delivery*;* recurrence of seizures may require an additional *IV injection* of 2g (4g, if body weight over 70kg); **prevention of seizures in pre-eclampsia:** *by IV injection*, initially 4g over 5-15 minutes followed either *by IV infusion,* 1g/hour for 24 hours or *by deep IM injection,* 5g into each buttock, then 5g every 4 hours into alternate buttocks for at least 24 hours*;* if seizure occurs, give an additional dose *by IV injection* of 2g

Note *for IV injection, 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 injections); for IM injection, mix magnesium sulphate injection, 50%, with 1ml of lignocaine injection 2%*

22.1 Oxytocic

METHYLERGOMETRINE

Injection, 200mcg/ml (1ml) NRH/RRH/DH/BHU
Tablet, 0.125mg NRH/RRH/DH/BHU

Therapeutic group oxytocic

Indications third stage of labour; post-partum haemorrhage; sub-involution of the uterus; incomplete abortion

Contraindications antepartum haemorrhage; first and second stage of labour; impaired pulmonary, hepatic or renal function, severe hypertension, sepsis

Cautions pre-eclampsia and eclampsia; cardiac disease; sepsis; also exclude multiple pregnancy

Interactions see appendix 1 under ergotamine and ergometrine.

Side effects nausea, vomiting, transient hypertension, vasoconstriction

Dose *by oral administration,* 1-2 tablets 3 times daily, maximum 3 days; *by IM injection,* **labour:** 0.2mg when anterior shoulder is delivered or immedicately after birth; **PPH**: *by IV injection,* 0.25-0.5mg when anterior shoulder is delivered or immedicately after birth

Note *to control bleeding in incomplete abortion, oxytocin should be used as well; the uterus in early pregnancy responds better to the combination than to either medicine alone*

OXYTOCIN

Injection, 5 units/1ml NRH/RRH/DH/BHU

Therapeutic group oxytocic

Indications induction and augmentation of labour; and management of third stage labour in referral hospitals/with gynecologist; active management of third stage labour in district hospital and BHU

Contraindications hypertonia of uterus; mechanical obstruction to delivery; failed trial of labour; severe pre-eclampsia; foetal distress; placenta praevia

Cautions hypertension; high parity, previous caesarean section, multiple pregnancies

Interactions see appendix 1 under oxytocin

Side effects high doses cause violent uterine contractions leading to uterine rupture and/or foetal asphyxiation; arrhythmias, maternal hypertension and sub-arachnoid haemorrhage may also occur

Dose *by IV infusion,* infuse 10 units in 500ml IV fluids at 60 drops per minute; maintenance dose: infuse 10 units in 500ml IV fluids per minute; maximum dose, not more than 6 pints of IV fluids containing oxytocin

Note *do not use as IV bolus; to control bleeding in incomplete abortion, methylergometrine should be used; the uterus in early pregnancy responds better to methylergometrine*

MISOPROSTOL

Tablet, 100mcg NRH/RRH

Therapeutic group prostaglandin analogues

Indications induction of labour (dead and live foetus)

Contraindications pregnancy, breastfeeding

Cautions conditions where hypotension might precipitate severe complications (e.g. cerebrovascular disease or cardiovascular disease)

Side effects nausea, vomiting, diarrhoea, abdominal cramps, flatulence

Dose *by vaginal administration,* **induction of labour**: initially 25mcg, repeated after 6 hours if necessary; if still no response, increase to 50mcg every 6 hours for up to 4 doses

Note*should it be necessary to continue induction of labour with oxytocin, administration of oxytocin should be avoided within 8 hours of using misoprostol*

22.2 Antioxytocic

RITODRINE

Injection, 10mg/ml (5ml) NRH
Tablet, 10mg NRH

Therapeutic group tocolytic agent

Indications uncomplicated premature labour between 24-33 weeks of gestation

Contraindications cardiac disease, eclampsia and severe pre-eclampsia, intra-uterine foetal death, antepartum haemorrhage, placenta praevia, cord compression; not for use in first or second trimester

Cautions suspected cardiac disease, hypertension, hyperthyroidism, hypokalaemia, diabetes mellitus, mild to moderate pre-eclampsia; avoid over hydration; concomitant beta-blocker treatment

Side effects nausea, vomiting, flushing, sweating, tachycardia, palpitations, hypotension, uterine bledding, pulmonary oedema, chest pain or tightness

Dose *by IV infusion,* initially 50mcg/minute, increased gradually according to response by 50mcg/minuteevery 10 minutes until contraction stops or maternal heart rate reaches 140 beats/minute; continue for 12-48 hours after contraction cease (usual rate 150-350mcg/minute); max. rate 350mcg/minute or *by IM injection,* 10mg every 3-8 hours continued for 12-48 hours after contraction have ceased; then *by oral administration*, 10mg 30 minutes before termination of *IV infusion*, repeated every 2 hours for 24 hours, followed by 10-20mg every 4-6 hours, max. oral dose 120mg daily

23. Ophthalmological Preparations

23.1 Anti-infective agents

Chloramphenicol

Eye applicap, 1% (250mg) NRH/RRH/DH/BHU
Eye/Ear drop, 0.4% (5ml) NRH/RRH/DH/BHU

Therapeutic group antibacterial

Indications bacterial infection

Side effects transient burning pain in the eye may be felt; rare reports of aplastic anaemia, due to systemic absorption

Dose b*y ocular instillation*, drops: 1-2 drops 2 hourly; reduced once infection is controlled, continue for 48 hours after the eye is white; applicap: apply 3-4 times daily

Counseling ***applicaps:*** *use a clean blade to cut off the tip of the capsule, and squeeze the ointment into your eye;* ***drops:*** *once the course of treatment is finished, throw away the bottle; it is dangerous to use it again later, or to give it to anyone else*

Note *for serious infections, instill drops more frequently; applicap is more convenient, and cheaper for most other infections*

CIPROFLOXACIN

Eye/Ear drop, 0.3 %(5ml) NRH/RRH/DH/BHU

Therapeutic group antibacterial

Indications superficial bacterial infections; corneal ulcers, chronic otitis media in patients with perforation of the tympanic membrane; pseudomonal infection of the otitis externa

Contraindications hypersensitivity

Cautions not recommended for children under 1 year; pregnancy (appendix 7); breast feeding (appendix 8)

Side effects local sensitivity, taste disturbances, nausea and visual disturbances

Dose *by ocular/aural instillation,* **superficial bacterial infection**: apply 1-2 drops (ear: 3-5 drops) 2 hourly; reduce once infection is controlled; continue for 48 hours after the eye is white; **corneal ulcer**: day 1 apply every 15 minutes for 6 hours, then 30 minutes, day 3 apply every hour, days 3-14 apply every 4 hours (max, duration of treatment 21 days)

Counseling *once the course of treatment is finished, throw away the bottle; it is dangerous to use it again later, or to give it to anyone else*

MOXIFLOXACIN

Eye drop, 0.5% NRH/RRH

Therapeutic group antibacterial (fluoroquinolone)

Indications bacterial conjunctivitis and corneal ulcers not responding to ciprofloxacin

Contraindications hypersensitivity to quinolones

Side effects eye discomfort and pain; pharyngitis and rhinitis

Dose *by ocular instillation*, 1 to 2 drops every 8 hours into affected eye(s), for 1 week

TOBRAMYCIN

Eye drop, 0.3% (5ml) NRH/RRH

Therapeutic group antibacterial (aminoglycoside)

Indications external infections of the eye and its adnexa caused by susceptible bacteria

Contraindications hypersensitivity

Cautions hypersensitivity; pregnancy; breastfeeding; if tobramycin is administrated topically in conjunction with systemic aminoglycoside therapy, serum aminoglycoside concentration should be monitored

Side effects localized ocular toxicity and hypersensitivity including increased lacrimation, itching and oedema of the eyelid and conjunctival erythema

Dose *by ocular instillation,* ADULT and CHILD over 1 year, 1 drop twice daily for 1 week; in severe infection, 1 drop four times daily on the first day, then twice daily for 5 to 7 days

Counseling *once the course of treatment is finished, throw away the bottle; it is dangerous to use it again later, or to give it to anyone else; use the solution within one month after opening the container*

NEOSPORIN(neomycin+polymixin+bacitracin)

Eye ointment, 5g NRH/RRH

Therapeutic group antibacterial

Indications bacterial infection

Contraindications known sensitivity to any of the components

Dose apply 3-4 times daily

Counseling *once the course of treatment is finished, throw away the tube; it is dangerous to use it again later, or to give it to anyone else*

ACYCLOVIR

Eye ointment, 3% (5g) NRH/RRH

Therapeutic groupantiviral

Indications local treatment of herpes simplex infections

Contraindications known hypersensitivity

Side effects transient burning pain in the eye may be felt.

Dose apply 5 times daily and continue for at least 3 days after complete healing

Counseling *once the course of treatment is finished, throw away the remaining ointment; do not use it after 4 weeks of opening; do not share the ointment with another patient*

FLUCONAZOLE

Eye drop, 0.3 % (5ml) NRH/RRH

Therapeutic group antifungal

Indications fungal blepharitis, fungal conjunctivitis and fungal keratitis

Contraindications known hypersensitivity

Side effects local sensitivity and irritation

Dose *by ocular instillation,* **fungal blepharitis or conjunctivitis**: 1 drop every 4-6 hours; **fungal Keratitis**: 1 drop every 1-2 hours initially, reduced to 1 drop every 3-4 hours after the first 3 or 4 days

23.2 Anti-inflammatory Agents

PREDNISOLONE ACETATE

Eye/Ear drop, 0.1% (5ml) NRH/RRH

Therapeutic group anti-inflammatory agents (corticosteroids)

Indications local treatment of inflammation (short term)

Cautions should be used under expert supervision

Side effects three main dangers associated with their use: "*red eye*" where the diagnosis is unconfirmed, maybe due to herpes simplex virus, and a steroid may aggravate the condition, leading to corneal ulceration, with possible damage to vision and even loss of the eye; bacterial, fungal and amoebic infections pose a similar hazard; "*steroid glaucoma*" may follow the use of corticosteroid eye preparations in susceptible individuals; "*steroid cataract*" may follow prolonged use; other side effects include thinning of the cornea and the sclera

Dose *by ocular instillation,* 1-2 drops 4-6 times daily; severe conditions every 30-60 minutes until control of symptoms is achieved, then reduce the frequency; by *aural administration,* 2-3 drops 3-4 times daily

23.3 Antiglaucoma medicines

23.3.1 Miotic

BRIMONIDINE

Eye drop, 0.2 % (5ml) NRH

Therapeutic group antiglaucoma medicines (sympathomimetic)

Indications raised intra-ocular pressure in open-angle glaucoma or ocular hypertension in patients whom beta-blockers are inappropriate; adjunctive therapy when intra-ocular pressure is being inadequately controlled by other antiglaucoma therapy

Cautions severe cardiovascular disease; cerebral coronary insufficiency, Raynaud's syndrome, postural hypotension, depression, hepatic or renal impairment; pregnancy, breastfeeding;

Interactions see appendix 1 (alpha adrenoceptor stimulants)

Side effects ocular reactions include hyperaemia, burning, stinging, burning, blurring, pruritis, allergy, and conjunctival follicles; occasionally corneal erosion and staining, photophobia, eyelid inflammation, conjunctivitis; headache, dry mouth, taste alteration, fatigue, dizziness, drowsiness

Dose *by ocular instillation,*1 drop 2 times daily

Counseling *drowsiness may affect performance of skilled tasks (e.g. driving)*

23.3.2 Beta-blockers

TIMOLOL MALEATE

Eye drop 0.5 %(5ml) NRH/RRH/DH

Therapeutic group antiglaucoma medicines (miotics)

Indications raised intra-ocular pressure in primary open-angle glaucoma

Contraindications systemic absorption may follow topical application therefore eye drops containing a beta-blocker are contra-indicated in patients with bradycardia, heart block, or uncontrolled heart failure; asthma

Side effects ocular stinging, burning, pain, itching, erythema, dry eyes and allergic reactions including anaphylaxis and blepharoconjunctivitis; occasionally corneal disorders

Dose *by ocular instillation,*1 drop 2 times daily

23.3.3 Carbonic anhydrase inhibitors

ACETAZOLAMIDE

Tablet, 250mg NRH/RRH

Therapeutic group antiglaucoma medicines; diuretics

Indications open angle glaucoma, secondary glaucoma, hydrocephalus

Contraindications severe renal and hepatic impairment, hypokalaemia, hyponatraemia

Cautions pregnancy, may cause neonatal thrombocytopenia; diabetes, breastfeeding; not for prolonged use

Interactions see appendix 1 under diuretics

Side effects diuresis: parasthesia, hypokalaemia, loss of appetite, drowsiness and depression may occur, especially in the elderly; nausea, vomiting, diarrhoea, taste disturbance

Dose *by oral administration,* ADULT, 250–750 mg/day in divided doses; CHILD, 8-30mg/kg daily, max of 750 mg; **mountain sickness**: *prophylactic*: 125 to 250mg twice daily starting 1 or 2 days before and continuing for 3 days once the highest altitude is reached; *treatment:* 250 mg twice a day for about 3 days

Counseling *may cause drowsiness; if affected do not drive or operate machinery*

DORZOLAMIDE

Eye drop, 2% (5ml) NRH/RRH

Therapeutic group antiglaucoma (carbonic anhydrase inhibitor)

Indications glaucoma

Contraindications severe renal impairment (CrCl<30mL/min)

Side effects burning and stinging sensation, bitter taste, visual disturbances

Dose *by ocular instillation*, 1 drop to the affected eye 3-4 times a day

23.3.4 Cholinergics

PILOCARPINE

Eye drop, 2% (5ml) NRH/RRH

Therapeutic group antiglaucoma medicines

Indications glaucoma

Contraindications hypersensitivity to pilocarpine or any other components in the formulation; acute inflammatory disease of the anterior segment of the eye

Cautions treatment should be stopped, if symptoms of systemic toxicity develop, and before surgery on the eye as there is an increased risk of hyphemia

Side effects ciliary spasm, ocular pain and irritation, blurred vision, lachrymation, myopia, and browache; conjunctival vascular congestion, superficial keratitis, vitreous haemorrhage, and lens opacities may occur after prolonged use

Dose *by ocular instillation,* 1-2 drops up to 4 times daily, adjusted according to response

Counseling *pupillary constriction leads blurred vision and difficulty with dark adaptation and caution is necessary with night driving or when hazardous tasks are undertaken in poor illumination; miotics should not be used by patients wearing soft contact lenses*

23.4 Mydriatic and cyclopegics

ATROPINE

Eye ointment, 1% (5g) NRH/RRH/DH

Therapeutic group mydriatics and cycloplegic

Indications refraction procedures in young children; anterior uveitis

Contraindications glaucoma

Cautions dilatation of the pupil may precipitate acute glaucoma, especially in the elderly; the action of the medicine may persist for up to 7 days after stopping treatment

Side effects contact dermatitis; systemic toxicity (dry mouth, bradycardia) may occur in the very young and the very old

Dose *apply ointment* 3 times daily at first in the affected eye; CHILD, *apply ointment* daily for 1 week before refraction

Note *paralysis of accommodation accompanies cycloplegia*

HOMATROPINE

Eye drop, 2% (5ml) NRH/RRH

Therapeutic group mydriatics

Indications anterior segment inflammation; refraction procedures in young children

Contraindications glaucoma

Cautions dilatation of the pupil may precipitate acute glaucoma, especially in the elderly

Side effects contact dermatitis

Dose *by ocular instillation,* 1-2 drops every 10 minutes, repeated 4-5 times

Counseling *do not drive or operate machinery for 1-2 hours after instilling in the eye*

Note *paralysis of accommodation will continue for up to 12 hours*

TROPICAMIDE

Eye drops, 1% (5ml) NRH/RRH

Therapeutic group mydriatics and cycloplegics (antimuscarinics)

Indications examination of fundus of the eye

Contraindications angle-closure glaucoma

Caution children and elderly (avoid 10% strength); cardiovascular disease (avoid or use 2.5% strength only); tachycardia; hyperthyroidism; diabetes

Side effects transient stinging; raised intra-ocular pressure

Counseling *patients should be warned not to drive for 1-2 hrs after mydriasis*

CYCLOPENTOLATE

Eye drop, 0.5% (5ml) NRH/RRH

Therapeutic group mydriatic and cycloplegic (antimuscarinic)

Indications refraction procedures in young children; uveitis

Contraindications see under atropine

Cautions see under atropine

Side effects see under atropine

Dose *by ocular instillation,* **diagnostic procedures**: 1-2 drops repeated after every 5 to 15 minutes; **treatment of uveitis**: 1-2 drops up to four times daily

TROPICAMIDE + PHENYLEPHRINE

Eye drop, (0.8% + 5%) (5ml) NRH/RRH

Indications dilatation of the pupil to examine the fundus

Contraindications as under individual components

Cautions as under individual components

Side effects as under individual components

Dose *by ocular instillation,* 1 to 2 drops, 15-20 minutes before examination, to be repeated every 30 minutes, as required

23.5 Miscellaneous

METHYLCELLULOSE

Eye drops, 0.3% (5ml) NRH/RRH

Therapeutic group ocular lubricant

Indications dry, irritated eye

Side effects temporary blurred vision, minor burning/stinging/ irritation

Dose *by ocular instillation,* 1-2 drops 3-4 hourly as required

HYALURONIDASE

Injection, 1500 iu/ml (1ml) inj NRH/RRH

Therapeutic group dispersion agent

Indications to enhance permeation of subcutaneous or IM injections, local anaesthetics and subcutaneous infusions; to promote resorption of excess fluids and blood

Cautions infants or elderly (control speed and total volume and avoid over hydration especially in renal impairment)

Contraindications do not apply direct to cornea; avoid infection or malignancy sites; not for anaesthesia in unexplained premature labour; not to be used to reduce swelling of bites or stings; not for IV administration

Side effects occasional severe allergy

Dose *by subcutaneous or IM injection*: 1500 units dissolved directly in solution to be injected (ensure compatibility); *by local anaesthetics*: 1500 units mixed with local anaesthetic solution (ophthalmology, 15 units/ml); **hypodermoclysis**: 1500 units dissolved in 1 ml water for injections or 0.9% sodium chloride

injection, administered before start of 500-1000 ml infusion fluid; **extravasation or haematoma**: 1500 units dissolved in 1 ml water for injections or 0.9% sodium chloride injection, infiltrated into affected area (as soon as possible after extravasation)

SODIUM CROMOGLYCATE

Eye drop, 4% (20mL) NRH/RRH

Therapeutic group mast cell stabilizers

Indications allergic conjunctivitis

Contraindications patients with known hypersensitivity to any of the ingredients in the formulation

Side effects transient burning and stinging

Dose *by ocular instillation,* 1 to 2 drops 4-6 times daily

KETOROLAC

Eye drop, 0.4% (5ml) NRH/RRH

Therapeutic group anti-inflammatory Agents

Indications prophylaxis and reduction of inflammation and associated symptoms following ocular surgery and to relieve ocular itching associated with allergic conjunctivitis

Contraindications known hypersensitivity to any of the ingredients in the formulation; pregnancy (third trimester)

Dose *by ocular instillation*, 1 drop to the affected eye three to four times daily

24. Dermatological Medicines

24.1. Antifungal medicines (topical)

CLOTRIMAZOLE

Cream, 1% (15g) NRH/RRH/DH/BHU

Therapeutic group antifungal medicines (topical)

Indications susceptible fungal infections of skin and vagina

Cautions contact with eyes and mucous membranes should be avoided

Side effects occasionally, local irritation or mild inflammation

Dose *by topical application,* applications 2-3 times daily

Counseling ***skin****: apply the ointment thinly as instructed; you should continue for 14 days after the skin has healed to be sure the infection does not come back*

Note *tinea of nails and scalp usually needs systemic treatment*

WHITFIELD'S OINTMENT

Ointment (extemp preparation) NRH/RRH/DH/BHU

Therapeutic group antifungal preparation (topical)

Indications mild superficial fungal infections particularly tinea pedis, tines corporis and, occasionally tinea capitis

Side effects localized mild inflammation

Dose**:***by topical application,* apply thin layer of ointment over infected areas twice daily for at least 4 weeks

24.2 Antibacterial medicines (topical)

NITROFURAZONE

Cream, 0.2% (500g) NRH/RRH/DH/BHU

Therapeutic group antibacterial (topical)

Indications superficial skin infections; superficial burns

Contraindications known hypersensitivity

Cautions sensitization may occur if treatment exceeds 5 days

Dose *by topical application,* 3-4 times daily after cleaning the affected area

Note *regular soap and water washing, followed by exposure or dry dressing, will usually be adequate treatment for superficial infections*

SILVER SULPHADIAZINE

Cream, 1% (25g) NRH/RRH/DH/BHU

Therapeutic group antibacterial (topical)

Indication skin infection, particularly gram-negative infection such as pseudomonal infection; in second and third degree burns; infected leg ulcers; pressure sores

Contraindications sensitivity to sulphonamides, pregnancy and breastfeeding

Cautions hepatic and renal impairment G-6-PD deficiency; pregnancy and breastfeeding (avoid in late pregnancy and in neonates)

Side effects rarely allergic reactions including rashes, burning sensation, argyria reported following prolonged use

Counseling *in burns, apply with sterile applicator; in leg ulcers apply at least 3 times a week*

24.3 Antiviral Medicines

ACYCLOVIR

Tablet, 400mg NRH/RRH/DH

Therapeutic group antiviral medicines (dermatological)

For details, refer antiviral, under section 6.5

24.4 AntiInflammatory and antipruritic medicines

CALAMINE

Ointment and lotion (extemp. preparation) NRH/RRH/DH/BHU

Therapeutic group antipruritic medicine

Indications soothing and protecting the skin following minor skin irritations

Cautions avoid getting this medication in the eyes, mouth, nose, and genital/anal areas; if you do get the medication in those areas, flush with plenty of water

Dose *by topical application,* apply thinly 1-2 times daily

Counselling *apply the medication with a cotton pad, and allow the medication to dry on the skin*

ZINC OXIDE

Ointment 15% (extemp. preparation) NRH/RRH/DH/BHU

Theraoeutic group protectant

Indications minor skin irritations; diaper rash

Cautions do not use on deep or puncture wounds, cuts, or infections

Dose *by topical application,* apply thinly 1-2 times daily

HYDROCORTISONE

Cream, 1% (15g) NRH/RRH/DH

Therapeutic group anti-inflammatory and antipruritic medicines (mild corticosteroid)

Indications mild inflammatory skin disorders

Contraindications bacterial, fungal and viral skin infections

Cautions avoid large amounts or prolonged usage during pregnancy; particular care needs to be taken if used for napkin rash in infants

Side effects local: exacerbation of untreated infection, atrophy of skin structure, acne and papular dermatitis

Dose *by topical application,* apply thily for 2-3 times daily, reducing the frequency as the condition improves

Counseling *only use this cream according to the physician's instructions; do not use it on any other person, or on a skin problem that has not been checked by a physician*

Note *hydrocortisone has the few side effects of all topical steroid preparations; only if the lesion is unresponsive patients should be advised to use a stronger preparation*

TRIAMCINOLONE ACETONIDE

Cream, 0.1%, (15g) NRH/RRH/DH

Therapeutic group anti-inflammatory and antipruritic medicines (potent corticosteroid)

Indications inflammatory skin conditions unresponsive to hydrocortisone, especially lichen planus and discoid lupus erythematosus; psoriasis unresponsive to keratolytic agents

Contraindications known hypersensitivity; tuberculosis, fungal and viral skin lesions

Cautions avoid large amounts or prolonged usage during pregnancy; occlusive dressings increase the risk of systemic absorption; children and infants

Side effects local exacerbation of untreated infection, atrophy of skin structure, acne and papular dermatitis

Dose *by topical application,* apply thinly over the affected area 2-3 times daily, reducing the frequency as the condition improves.

Counseling *only use this cream according to the physician's instructions; do not use it on any other person, or on a skin problem without a physician's order*

CLOBETASOL PROPIONATE

Cream, 0.05% w/w (15g) NRH

Therapeutic group anti-inflammatory and antipruritic medicines (very potent corticosteroid)

Indications short term treatment only of severe resistant inflammatory skin disorders such as recalcitrant eczemas unresponsive to less potent corticosteroids; psoriasis

Contraindications not recommended for children under 12 years; rosacea, acne vulgaris, perioral dermatitis, primary cutaneous viral infections, lesions infected with bacteria or fungi; hypersensitivity

Cautions not more than 50g of preparation should be applied per week; discontinue use if irritation occurs; pregnancy and lactation; avoid contact with eyes

Side effects use of large amounts of clobetasol propionate over prolonged periods can lead to systemic levels to produce adrenal suppression, Cushing's syndrome, diabetes and hypertension

Dose *by topical application,* apply thinly over affected areas 1-2 times daily for up to 4 weeks

Counseling *use this cream according to physician's instructions; do not use it on any other person, or on a skin problem without a physician's order*

BETAMETHASONE VALERATE

Cream, 0.1% (15g) NRH

Therapeutic group anti-inflammatory and antipruritic medicines (potent corticosteroid)

Indications severe inflammatory skin disorders such as eczema unresponsive to less potent steroids; psoriasis

Contraindications untreated bacteria, fungi or viral skin infections, rosacea, acne vulgaris; infants under 1 year, and in general they should be avoided in children or if necessary use with great care and for short periods

Cautions avoid prolonged use in infants and children and on the face; do not use this medication near the eyes if you have glaucoma

Side effects may cause burning, stinging, itching or redness when first applied to the skin; exacerbation of untreated infection, thinning of skin, contact dermatitis

Dose *by topical application,* apply thinly iiver affected areas 1-2 times daily for 1-2 weeks only

Counseling *clean and dry the affected area before applying the medication; to apply, gently massage a small amount of the medication into the affected area and surrounding skin; do not bandage, wrap or cover the area treated unless you are instructed to do so by your doctor*

24.5 Keratoplastic and keratolytic agents

SALICYLIC ACID

Ointment, 40% (extemp. preparation) NRH/RRH/DH/BHU

Indications hyperkeratotic skin disorders; acne; warts and calluses; scalp conditions; fungal nail infections

Cautions significant peripheral neuropathy, patients with diabetes at risk of neuropathic ulcers; protect surrounding skin and avoid broken skin; not suitable for application to face, anogenital region, or large areas

Side effects sensitivity, excessive drying, irritation, systemic effects after widespread use

Dose advise patient to apply carefully to wart and to protect surrounding skin with soft paraffin; rub wart surface gently with file or pumice stone once weekly; treatment may need to be continued for up to 3 months

COMPOUND PODOPHYLLINE

Paint, 15% (extemp. preparation) NRH/RRH/DH

Dose **external genital warts:** apply weekly in genitourinary clinic

Note *should be allowed to stay on the treated area for not longer than 6 hours and then washed off; care should be taken to avoid splashing the surrounding skin during application (which must be covered with soft paraffin as a protection); where there are a large number of warts only a few should be treated at any one time as severe toxicity can be caused by absorption*

COAL TAR AND SALICYLIC ACID

Ointment, 9% (extemp preparation) NRH/RRH/DH

Indications psoriasis and occasionally chronic atopic eczema

Dose *by topical application,* 1-2 times daily

24.6. Scabicides and pediculosides

GAMMA BENZENE HEXACHLORIDE

Lotion, 1% (100ml) NRH/RRH/DH/BHU

Therapeutic group scabicides and pediculocides

Indications scabies and pediculosis (crab-lice)

Contraindications premature neonates, history of seizures, breast feeding and pregnancy

Cautions avoid contact with eyes and mucous membranes; do not use more than twice for one course of treatment

Interactions oils enhance absorption and therefore simultaneous application of creams, ointments and oils should be avoided

Side effects eczematous eruptions, CNS toxicity, dizziness, convulsions, aplastic anaemia on prolonged use

Administration **scabies:** apply thinly over whole body, omitting head and neck, wash off using cool water after 24 hours; repeat if necessary after 7 days; CHILD, leave for only 12 hours; **lice**: apply to dry hair, leave for 4 minutes, rinse, towel dry and comb

24.7 Local anaesthetics (topical)

LIGNOCAINE

Gel, 2% (30g) NRH/RRH/DH

Therapeutic group local anaesthetic

Indications surface anaesthesia of mucosa: pharynx, larynx, trachea and urethra

Contraindications known or suspected hypersensitivity

Cautions absorption from inflamed or highly vascular surfaces may cause systemic effects

Dose **respiratory tract**: 1-5ml; **rrethral catheterisation**: into urethra at least 5 minutes before catheter insertion; MEN 10ml followed by further 3-5 ml; WOMEN 3-5ml; CHILD 1-5ml

24.8 Rubefacients

METHYLSALICYLATE

Ointment (extemp. preparation) NRH/RRH/DH/BHU

Therapeutic group rubefacients

Indications counter-irritation for minor musculoskeletal injury

Contraindications broken or inflamed skin, hypersensitivity

Cautions careful exclusion of treatable underlying injury is important before this application is prescribed

Side effects skin irritation may occur

Aministration rub in a little ointment and message the painful muscles 3 times daily; report to hospital again if there is no improvement after 1 week

24.9 Medicines for vitiligo

METHOXSALEN

Cream/Ointment, 1% w/v (25ml) NRH

Therapeutic group medicines for vitiligo

Indications vitiligo, psoriasis

Contraindications known tendency to photosensitivity; lupus erythematosus; liver disease

Cautions**:** topical application can cause photosensitivity and other effects, and may predispose to malignancy

Side effects contact dermatitis may occur

Dose a 10-fold or 100-fold dilution should be considered at first; apply to the skin at the rate of 8-32 mcg/m^2; expose to sunlight very briefly after 2 hours and gradually increase duration of exposure

Note *guttate and plaque-like psoriasis is more responsive than the exfoliative type of psoriasis*

24.10 Miscellaneous

WATER BASED GEL

Water miscible lubricant jelly, (82g) NRH/RRH/DH/BHU

Indications lubrication for digital or instrumental examination

Contraindications hypersensitivity

Cautions an antiseptic lubricant like dichloroxzylenol obstetric cream is to be preferred in labour; for male catheterisation, lignocaine gel should be used

GLYCERINE

Solution, 450ml NRH/RRH/DH

Dose mouthwash as 10% solution, or diluted further in water

25. Immunological and vaccines

25.1 Sera and immunoglobulin

TETANUS IMMUNOGLOBULIN

Injection, 1500IU NRH/RRH/DH

Therapeutic group sera and immunoglobulin

Indications passive immunization against tetanus in high-risk cases

Contraindications known hypersensitivity to horse serum

Cautions anaphylaxis or lesser evidence of sensitivity may occur; adrenaline should always be available, possibly in association with corticosteroids and antihistamines

Side effects serum sickness, with fever, vomiting, diarrhoea, bronchospasm and urticaria may often occur 7-10 days after the injection

Dose **prophylaxis**: *by IM injection*, 1500 units; **established tetanus**: *By IM* or *IV injection,* at least 10,000 units in association with sedative and other medicines

HUMAN RABIES IMMUNOGLOBULIN (RIG)

Injection, 500IU NRH/RRH/DH

Therapeutic group sera and immunoglobulin

Indications passive immunization against rabies

Contraindications hypersensitivity to the serum of the animal from which the anti-toxin is prepared (see label)

Cautions anaphylaxis or lesser evidence of sensitivity may occur

Side effects serum sickness, with fever, vomiting, diarrhoea, bronchospasm urticaria may often occur 7-10 days after the injection

Dose 20IU/kg body weight (max 1500IU); HRIG should be infiltrated as much as possible in and around all wounds; after infiltration on the wounds if there are any remaining HRIG, it should be administered *by IM injection* on the anterolateral region or deltoid region (away from the site of vaccine administration). Anti-rabies vaccine should be administered preferably on the same day after the HRIG but at different sites

Note *realistic risk assessment is important, as the antiserum carries its own risks; unpunctured (i.e. bruised only) skin does not constitute a risk of rabies; a dog behaving normally (including one that bites when provoked or when guarding its territory) is unlikely to be rabid; any dog alive 10 days after the bite is also not rabid; wash wound with soap and water followed by generous application of spirit despite the pain will itself greatly reduces the risk of rabies*

ANTI-SNAKE VENOM SERUM

Injection, powder for reconstitution 10g NRH/RRH/DH/BHU

Therapeutic group sera and immunoglobulin

Indications treatment of bite from viper, cobra and krait

Contraindications known hypersensitivity to antiserum, unless the danger to life outweighs the risk; bite by non-poisonous snake, or when puncture marks are not seen

Cautions history of previous serum injections (including antitetanus, antidiphtheria); history of allergy, asthma or eczema. Test dose of 0.1ml serum in 0.9ml normal saline to be injected SC and patient observed for 30 minutes

Side effects local flare or general anaphylactic reaction may be seen after the test dose or during the full dose; pallor, sweating, nausea, vomiting, urticaria and hypotension are the features of anaphylaxis.

Dose *by IV injection,* 10ml immediately; a further 10-20ml may be given after 2 hours or less, then repeated 6-hourly as required

Note *all injections should be given very slowly, never more than 1ml per minute, and preferably diluted in 100ml 9% sodium chloride and given as a slow IV infusion*

25.2 Vaccines

25.2.1 For universal immunization

BCG

Injection, (20 doses) NRH/RRH/DH/BHU

Therapeutic group vaccines (universal)

Indications routine prevention of tuberculosis and leprosy

Contraindications known HIV infection

Cautions correct intradermal technique is needed to reduce the risk of ulceration or abscess formation; use a fresh needle and syringe for every child, and discard the vial at the end of the session

Side effects a papule or small ulcer appears within 6 weeks, and normally heals within 6 weeks

Dose see appendix 3 under immunization schedule

TETANUS DIPTHERIA (TD)

Injection, 0.5ml NRH/RRH/DH/BHU

Therapeutic group vaccines (universal)

Indication**:** prevention of tetanus and diphtheria

Cautions acute febrile illness, but mild illness is not a reason for delaying vaccination

Side effects redness or swelling where the shot was given; mild fever; headache

Dose see appendix 3 under immunization schedule

MUMPS MEASLES RUBELLA VACCINE

Injection, powder for reconstitution, NRH/RRH/DH/BHU

Therapeutic group vaccines (universal)

Indications routine prevention of measles, mumps and rubella

Contraindications allergy to eggs; immune deficiency disorders

Cautions acute febrile illness; mild febrile illness, malnutrition and diarrhoea are no reason for delaying vaccination; use a fresh needle and syringe for every child, and discard the vial at the end of the session

Side effects a mild measles like rash and fever may occur about 1 week after the injection; convulsions and encephalitis are rare complications

Dose see appendix 3 under immunization schedule

POLIOMYELITIS

Oral drops, (10 doses) NRH/RRH/DH/BHU

Therapeutic group vaccines (universal)

Indications routine prevention of polio types 1, 2 and 3

Contraindications vomiting, serious diarrhoea, immunodeficiency disorders

Cautions live vaccine excreted in stool, protect immuno-compromised or non-immunized household contacts; in mild diarrhoea, consider extending course to 4 doses; discard the opened container at the end of the session

Dose**:** see appendix 3 under immunization schedule

DTP- Hep B- Hib (Pentavalent)

Injection (0.5ml) NRH/RRH/DH/BHU

Therapeutic group vaccine (universal)

Indications active immunization against diphtheria, tetanus, pertussis, hepatitis B and haemophilus influenza B

Contraindications known hypersensitivity to any component of the vaccine, or a severe reaction to a previous dose of the combination vaccine or any of its constituents is an absolute contraindication to subsequent doses of the combination vaccine or the specific vaccine known to have provoked an adverse reaction

Caution careful injection technique will reduce the risk of thigh abscess; use a fresh needle and syringe for every child, and discard the vial at the end of the session

Side effects mild local or systemic reactions are common, temporary swelling, tenderness and redness at the site of injection; fever, vomiting, diarrhoea

Dose see appendix 3 under immunization schedule

25.2.2 For specific group of individuals

PURIFIED VERO-CELL RABIES VACCINE (PVRV)

Injection (0.5 ml) NRH/RRH/DH/BHU

Therapeutic group vaccines (specific)

Indications pre and post-exposure active immunization against rabies

Contraindications known hypersensitivity to the components of the vaccine

Side effects local and systemic symptoms are less frequent; neurological complications do not seem to occur

Dose *by intradermal injection,* one dose each (0.1 ml) at two sites on both arms (over deltoid) on D0, D3, D7, and D28

Counseling *patients must be advised not to rub the site of injection after administration of vaccine*

Note *realistic risk assessment is importan; un-punctured (i.e. bruised only) skin does not constitute a risk of rabies; a dog behaving normally (including one that bites when provoked or when guarding its territory) is unlikely to be rabid; any dog alive 10 days after the bite is also not rabid; locally wash the wound thorough with soap and water followed by generous application of spirit despite the pain, will itself greatly reduce the risk of rabies*

HEPATITIS B VACCINE (rDNA)

Injection (10ml) NRH/RRH/DH

Therapeutic group vaccine (specific)

Indications active immunization against hepatitis B virus infection

Contraindications known hypersensitivity to the components of the vaccine; severe febrile infections

Caution should not be administered in the gluteal region or intradermally

Side effects mild local or systemic reactions are common, temporary swelling, tenderness and redness at the site of injection; fever, vomiting, diarrhoea

Dose *by IM injection* in to deltoid muscle, ADULT, 3 doses of 1ml (20mcg) at an interval of 0,1,6; CHILD, 3 doses of 0.5ml (20mcg) at an interval of 0, 1, 6; **chronic hemodialysis patients**: 4 doses of 2ml (40mcg), at an interval of 0, 1, 2, 6

Note *the vaccine is used in individuals at high risk of contracting hepatitis B. High-risk groups include:*

- *parenteral medicine misusers, their sexual partners, and household contacts; other medicine misusers who are likely to 'progress' to injecting;*
- *individuals who change sexual partners frequently;*
- *close family contacts of a case or individual with chronic hepatitis B infection;*
- *babies whose mothers have had acute hepatitis B during pregnancy or are positive for hepatitis B surface antigen (regardless of e-antigen markers);*
- *babies whose mothers are positive for hepatitis B surface antigen and for e-antigen antibody*
- *individuals with haemophilia, those receiving regular blood transfusions or blood products, and carers responsible for the administration of such products;*
- *patients with chronic renal failure including those on hemodialysis and home carers of dialysis patients;*
- *individuals with chronic liver disease;*
- *healthcare personnel (including trainees) who have direct contact with blood or blood-stained body fluids or with patients' tissues;*
- *laboratory staff who handle material that may contain the virus;*
- *other occupational risk groups such as morticians and embalmers;*
- *staff and patients of day-care or residential accommodation for those with severe learning difficulties;*
- *staff and inmates of custodial institutions;*
- *those travelling to areas of high or intermediate prevalence who are at increased risk or who plan to remain there for lengthy periods;*
- *families adopting children from countries with a high or intermediate prevalence of hepatitis B;*
- *foster carers and their families.*

Immunization takes up to 6 months to confer adequate protection; the duration of immunity is not known precisely, but a single booster 5 years after the primary course may be sufficient to maintain immunity for those who continue to be at risk

26. Vitamins & Minerals

26.1 Vitamins

VITAMIN B COMPLEX

Injection, 250mg/ml (10ml) NRH/RRH/DH
Tablet, 32.5mg NRH/RRH/DH/BHU

Therapeutic group vitamins and minerals

Indications prophylaxis of vitamin B deficiency viz beri-beri, riboflavine deficiency, pellagra and other vitamin B deficiency states; alcoholic vitamin deficiency states

Contraindications **injection**: known hypersensitivity to parenteral thiamine, vitamin B complex or multivitamin injection

Cautions injection may occasionally cause anaphylaxis; thiamine deficiency should be treated with thiamine; vitamin B complex does not include pyridoxine, which should be prescribed specifically if indicated

Side effects occasional rashes and allergic reactions

Dose *by oral administration,* ADULT, 1 tablet every 12 hours; CHILD 5-14 years, adult dose; CHILD 2-4 years, 1 tablet daily; *By IM injection,* ADULT: 2ml daily

VITAMIN C

Tablet, 250mg NRH/RRH/DH/BHU

Therapeutic group vitamins and minerals

Indications scurvy; prevention of vitamin C deficiency, especially in the elderly

Dose *by oral administration,* **prophylactic**: 25-75mg daily; **therapeutic**: at least 250mg daily in divided doses

RETINOL (Vitamin A)

Capsule, 200,000 units NRH/RRH/DH/BHU

Therapeutic group vitamins and minerals

Indications prophylaxis and treatment of vitamin A deficiency

Contraindications repeated treatment; pregnancy - high doses may lead to birth defects

Cautions toxicity with repeated doses

Side effects rough skin, dry hair, enlarged liver and raised ESR may occur with over dosage

Dose *by oral administration,* **prophylaxis**: CHILD over 1 year, and ADULT, 1 capsule every 6 months; CHILD under 1 year, 3 drops every 6 months; **night blindness**, established vitamin A deficiency, **malnutrition grade II and III**: CHILD over 1 year, and ADULT, 1 capsule on day 1, 2 and 14; CHILD under 1 year, 3 drops day 1,2 and 14; all ages: repeat only after 6 months; **breastfeeding**: 1 capsule only at delivery or during early lactation

Note *this treatment should always be recorded in the growth chart and MCH card so that extra doses are not given*

PYRIDOXINE (Vitamin B_6)

Tablet, 25mg NRH/RRH/DH

Therapeutic group vitamins and minerals

Indications prophylaxis and treatment of pyridoxine deficiency, including isoniazid neuropathy

Side effects none at normal doses; toxicity in excessive dosage is said to occur

Dose *by oral administration,* **Isoniazid induced neuropathy (prophylaxis)**: 10mg daily; (**treatment**): 50mg 3 times daily

THIAMINE (Vitamin B1)

Injection, 100mg/ml (1ml) NRH/RRH/DH

Tablet, 75mg NRH/RRH/DH/BHU

Therapeutic group vitamins and minerals

Indications treatment and prevention of thiamine deficiency, beri-beri (wet or dry), Wernicke's encephalopathy

Contraindications known hypersensitivity to parenteral thiamine, vitamin B Complex, or multivitamin injection

Cautions anaphylactic shock may occasionally follow

Dose **severe deficiency**: *by IM injection,* 200-300mg daily; **mild chronic deficiency**: *by oral administration,* 10-25mg daily; **prophylactic in alcoholic patient**: *by oral administration,* \10-25 mg daily

MULTIVITAMIN

Injection, (10ml) NRH/RRH

Therapeutic group vitamin and minerals

Indications treatment of Wernicke's encephalopathy and Korsakoffs psychosis in alcoholic and malnourished patients

Contraindications known hypersensitivity to parenteral thiamine, vitamin B complex, or multivitamin injection

Cautions anaphylaxis may occur; facilities for treatment must be available during and shortly after administration.

Dose *by slow IV injection or by IV infusion* 10ml every 4-8 hours for up to 2 days

26.2 Minerals

CALCIUM LACTATE

Injection 10% (10ml) NRH/RRH/DH
Tablet ,300mg NRH/RRH/DH/BHU

Therapeutic group vitamins and minerals

Indications calcium deficiency, especially in childhood, pregnancy and lactation, osteoporosis and tetany

Contraindications conditions associated with hypercalcaemia and hypercalciuria

Interactions see appendix 1 under calcium salts

Side effects (after IV injection): bradycardia, arrhythmia and local irritation

Dose **prophylaxis**: *by oral administration,* 1-2 tablets 3 times daily; **osteoporosis**: *by oral administration,* 5 tablets 4 times daily; **hypocalcaemic tetany**: *by slow IV injection,* 10ml followed by 40ml daily as an IV infusion

Note *alkalotic tetany due to hyperventilation can be reversed by a stat dose of 10ml IV; however, rebreathing from a paper bag is usually safe and effective*

ZINC SULPHATE

Tablet, 20mg (elemental zinc) NRH/RRH/DH/BHU

Therapeutic group vitamins and minerals

Indications zinc deficiency or supplementation in zinc losing conditions; diarrhoea

Contraindications hypersensitivity

Interactions see appendix 1 under zinc

Side effects abdominal pain, dyspepsia, nausea, vomiting, diarrhoea, gastric irritation, gastritis; irritability, headache, lethargy

Dose *by oral administration,* ADULT and CHILD over 30Kg, 1 tablet in water 1-3 times daily after food; CHILD less than 10Kg, ½ tablet daily; CHILD 10-30 Kg, ½ tablet 1-3 times; **diarrhoea** CHILD less than 6 months, 10mg/day; CHILD 6 months-5 years, 20mg/day

CALCIUM CARBONATE + VITAMIN D_3

Tablet, (500mg + 250IU) NRH/RRH

Therapeutic group vitamins and minerals

Indications management of combined calcium and vitamin D deficiency including chronic kidney disease and hyperparathyroidism

Side effects constipation, flatulence, nausea, abdominal pain and diarrhoea

Dose *by oral administration,* 1 tablet twice or thrice daily

Counseling *take the medicine after meals*

27. Solution for water, electrolytes & acid-base disturbances

27.1. Oral

POTASSIUM CHLORIDE

Injection, 15% (10ml) NRH/RRH/DH
Oral Solution 10% (extemp. preparartion) NRH/RRH/DH/BHU

Therapeutic group solutions for water, electrolyte and acid-base disturbances

Indications potassium depletion; potassium solution given to correct hypokalaemia caused by diuretics

Contraindications severe renal impairment, raised plasma potassium levels, untreated Addison's disease

Cautions **oral** potential scarring/stricture of GI tract; **IV**: mix solution thoroughly after adding to infusion bottle to avoid "layering"

Interactions see appendix 1 under potassium salts

Side effects **oral**: nausea and vomiting; occasional small bowel ulceration; **IV**: rapid infusion may cause cardiac asystole

Dose *by oral administration,* 30ml daily; *by IV infusion,* 1 ampoule in 500ml dextrose or 0.9% sodium chloride infusion, given over 3-4 hours

CALCIUM POLYSTYRENE SULFONATE

Oral powder, 15g NRH/RRH

Therapeutic group potassium binder (ion exchange resin)

Indication hyperkalaemia

Contraindications obstructive bowel disease; hypokalaemia

Cautions children (impaction of resin with excessive dosage or inadequate dilution); pregnancy and breast feeding

Interactions see appendix 1

Side effects GI disturbance, constipation; hypokalemia, hypocalcaemia, hypomagnesemia; nausea, vomiting; GI tract ulceration or necrosis which could lead to perforation

Dose *by oral administration*, ADULT, 4 times daily in water (not in fruit squash which has high potassium content); CHILD, 0.5g to 1g/kg daily in 3-4 divided dose

Counseling *reconstitute powered resin as suspension in water or syrup; for each 1g of powered resin add 3-4 ml of water or syrup; do not refrigerate*

27.2 Parenteral

COMPOUND SOLUTION OF SODIUM LACTATE

Injection (500ml) NRH/RRH/DH/BHU

Therapeutic group solutions correcting water, electrolyte and acid-base disturbances

Indications pre-and perioperative fluid and electrolyte replacement; hypovolaemic shock

Contraindications metabolic or respiratory alkalosis; hypocalcaemia or hypochlorhydria

Cautions restrict intake in impaired renal function, cardiac failure, hypertension, peripheral and pulmonary oedema, and toxaemia during pregnancy

Side effects excessive administration may cause metabolic alkalosis; administration of large doses may give rise to oedema

Dose *by IV infusion,* CHILD under 1 year, 30ml/kg in one hour, repeated once if pulse still very weak or undetectable, then 70ml/kg in 5 hours; CHILD over 1 year, 30ml/Kg in 30 minutes, repeated once if pulse still very weak or undetectable, then 70ml/kg in 2½ hours; re-assess the patient after completion of IV regime; any child able to drink should have ORS 5ml/Kg/hour as well during the infusion

DEXTROSE

Injection, 5% (500ml) NRH/NRH/DH/BHU
Injection, 10% (500ml) NRH/NRH/DH/BHU
Injection, 25% (100ml) NRH/NRH/DH/BHU

Therapeutic group solutions for water, electrolyte and acid-base disturbances

Indications **5% inj**: rehydration in diarrhoea, trauma and post-operatively; **10% inj**: post-operative rehydration when additional energy is required; **25%**: correction of hypoglycaemia

Cautions **5% and 10% inj**: monitor for signs of vascular overload; unduly rapid replacement may lead to pulmonary oedema; sodium depletion may occur due to dilution; **10% inj**: thrombophlebitis may occur at the infusion site

Dose *by IV infusion,* ADULT, 2-3 litres per day or as required

DEXTROSE + SODIUM CHLORIDE

Injection, (5%+0.9%) NRH/RRH/DH
Injection, (5%+0.45%) NRH/RRH

Therapeutic group solutions for water, electrolyte and acid-base disturbances

Indications pre-operative and post-operative fluid replacement

Cautions monitor for signs of vascular overload; unduly rapid replacement may lead to pulmonary oedema; restrict intake in impaired renal function, cardiac failure, hypertension, peripheral and pulmonary oedema

Side effects administration of large doses may give rise to sodium accumulation and oedema

Dose *by IV infusion,* typical rate during surgery, 5ml/kg/hour

SODIUM BICARBONATE

Injection, 7.5% (25ml) NRH/RRH/DH
Tablet, 500mg NRH/RRH

Therapeutic group solutions for water, electrolyte and acid-base disturbances

Indications metabolic acidosis

Cautions monitoring of plasma pH is advised

Dose *by oral administration,* 1 to 2 tablets 2-3 times daily; *by slow IV injection*, 10ml

Note *metabolic acidosis due to early renal failure or diabetic ketoacidosis is usually accompanied by hyponatremia; it is best to correct this by infusion of sodium chloride 0.9% injection, which may restore the kidney's own ability to generate bicarbonate*

SODIUM CHLORIDE

Injection, 0.9% (500ml) NRH/RRH/DH/BHU
Injection, 0.9% (100ml) NRH/RH

Therapeutic group solution for water, electrolyte and acid-base disturbances

Indications preoperative correction of fluid and sodium depletion; replacement of extracellular fluid during surgery; initial restoration of circulatory volume in hypovolaemic shock

Cautions monitor for signs of vascular overload; unduly rapid replacement may lead to pulmonary oedema

Side effects excessive infusion may result in sodium retention; symptoms of hypernatraemia include restlessness, flushing of the skin, pyrexia and tachycardia

Dose **preoperative**: ADULT, 50ml/minute; CHILD, 5ml/minute; **shock:** rapid infusion until systolic BP reaches 100mm Hg

MULTI-ELECTROLYTE (N5-PD-Lyte)

Injection (500ml) NRH/RRH/DH/BHU

Therapeutic group solutions for water, electrolyte and acid-base disturbances

Indications fluid replacement therapy in diarrhoea, burns, trauma; metabolic and diabetic ketoacidosis; hyponatremia; post-operative

Dose *by IV infusion,* 1-2 litres/day

28. Parenteral nutrition

AMINO ACID SOLUTION

Injection (250ml) NRH/RRH

Therapeutic group solutions for water, electrolyte and acid-base disturbances

Indications parenteral feeding

Contraindications severe hepatic impairment

Cautions fluid overload may occur, especially when given simultaneously with another infusion; scrupulous care in sterilizing equipment and establishing the

venous line should be taken, as bacterial overgrowth may readily occur in amino acid solutions; adequate simultaneous dextrose infusion must be given to allow maximal utilization of amino acids by the body

Dose *by IV infusion,* ADULT, 200-800ml per day at 40-50 drops/minute; CHILD, 20-40ml/Kg per day

29. Diagnostic agents

29.1 Ophthalmic medicines

FLUORESCIN

Strips, 4% (100strips/pkt) NRH/RRH/DH

Therapeutic group diagnostic agents (ophthalmic)

Indications examination of the cornea for lesions of foreign bodies

Cautions maintain sterility of tip when opening and using this agent; avoid touching the cornea with the tip of the strip

Use moisten the strip in sterile water or in tear fluid, and gently wipe it on the inner aspect of the lower lid; gross lesions will show up with white light, but blue light evokes fluorescence and a better view

29.2 Radio-contrast Media

IOHEXOL

Injection, 300mg (50ml) NRH
Injection, 300mg (10ml) NRH/RRH
Injection, 350mg (100ml) NRH

Therapeutic group radio-contrast media

Indications myelography, urography, arthrography and for visualization of GI tract and body cavities

Contraindications hypersensitivity to iodine containing compounds

Cautions pregnancy and lactation; history of allergy, severe hepatic and renal impairment, dehydration (correct fluid and electrolyte balance before administration)

Side effects nausea, vomiting, metallic taste, flushing, sensation of heat, weakness, headache, coughing, rhinitis etc

Dose route and dose depends on the procedure; administered only by radiologist

BARIUM SULPHATE

Oral suspension, 95% w/v NRH/RRH/DH

Therapeutic group radio-contrast media

Indications radiography of GI tract

Contraindications intestinal obstruction, intestinal perforation or conditions with risk of perforation

Cautions pre-existing heart disease; ulcerative colitis; adequate hydration must be ensured after the procedure to prevent severe constipation

Side effects constipation or diarrhoea, abdominal cramps; ECG changes and occasional dysrhythmias

Dose as a suspension or paste by mouth or by enema

SODIUM AMADOTRIAZOATE + MEGLUMIN AMODOTRIAZOATE

Solutions, 10:60 (150ml) NRH

Therapeutic group radio-contrast media

Indications urography, venography, operative cholangiography, splenoportography, arthrography, discography; computer assisted axial tomography

Contraindications hypersensitivity to iodine-containing compounds

Cautions history of allergy, atopy or asthma; severe hepatic impairment; renal impairment; dehydration (correct fluid and electrolyte balance before administration); multiple myeloma (risk if dehydrated, may precipitate fatal renal failure); cardiac disease, hypertension, phaeochromocytoma, sickle cell disease, hyperthyroidism, elderly, debilitated or children (increased risk of adverse effects); pregnancy; breastfeeding; may interfere with thyroid function tests; biguanides (withdraw 48 hours before administration; restart when renal function stabilized)

Side effects nausea, vomiting, diarrhoea, metallic taste, flushing, sensations of heat, weakness, dizziness, headache, coughing, rhinitis, sweating, sneezing, lacrimation, visual disturbances, pruritus, salivary gland enlargement, pallor, cardiac disorders, hemodynamic disturbances and hypotension; disseminated intravascular coagulation; fibrinolysis and depression of blood coagulation factors

Dose diagnostic radiography, ADULT and CHILD, route and dosage depend on procedure and preparation used (consult manufacturer's literature)

Note *administration, only by radiologists, according to manufacturer's literature*

Appendix 1: Interactions

Pharmacodynamic interactions: These are interactions between medicines, which have similar or antagonistic (opposite) pharmacological effects or side effects. This may be due to competition at the receptor sites, or occur at between medicines acting on the same physiological system.

Pharmacokinetic interactions: These occur when one medicine alters the absorption, distribution, metabolism or excretion of another, thus increasing or reducing the amount of medicine available to produce its pharmacological effect.

List of medicine interactions

ACE inhibitors and angiotensin II antagonists

- Includes enalapril and losartan
- Anesthetics: enhanced hypotensive effect
- Analgesics: antagonism of hypotensive effect & increased risk of renal impairment with NSAIMs
- Cyclosporin: increased risk of hyperkalemia
- Diuretics: enhanced hypotensive effect; risk of severe hyperkalemia with potassium sparing diuretics
- Potassium salts: increased risk of hyperkalemia

Acyclovir

- Risk of renal impairment increased by other nephrotoxic medicines

Adenosine

- Local anesthetics: increase myocardial depression when antiarrhythmic given with bupivacaine
- Antiarrhythmic: increase myocardial depression when anti arrhythmic given with another anti arrhythmic
- Antipsychotics: increase risk of ventricular arrhythmias when anti arrhythmic that prolong QT interval given with antipsychotic that prolong QT interval
- Beta blockers: increase myocardial depression when anti arrhythmic given with beta-blockers
- Theophylline: antiarrhythmic effect of adenosine antagonist by theophylline

Albendazole

- Serum level is increased with dexamethasone

Allopurinol

- Antibacterial: increased risk of rash with concomitant ampicillin and amoxycillin
- Anticoagulants: effects of warfarin and acenocoumarol possibly enhanced
- Cyclosporin: plasma concentration of cyclosporin increased (risk of nephrotoxicity)
- Theophylline: plasma-theophylline concentration possibly increased

Alpha-blockers

- Includes tamsulosin
- Anesthetics: enhanced hypotensive effect
- Analgesics: NSAIMs antagonize hypotensive effect
- Beta-blockers: enhanced hypotensive effect

- Calcium channel blockers: enhanced hypotensive effect
- Diuretics: enhanced hypotensive effect
- Dopaminergics: levodopa enhances hypotensive effect

Aminoglycosides

- Cyclosporin: increased risk of nephrotoxicity
- Cytotoxics: increased risk of nephrotoxicity and possibly of ototoxicity with cisplatin
- Diuretics: increased risk of ototoxicity with loop diuretics

Amiodarone

Note: *amiodarone has a long half-life; there is potential for medicine interactions to occur for several weeks after treatment has been stopped*

- Antibacterials: increased risk of ventricular arrhythmias with erythromycin (parenteral) and cotrimoxazole
- Anticoagulants: metabolism of warfarin inhibited (enhanced effect)
- Antidepressants: increased risk of ventricular arrythmias with tricyclic antidepressants
- Antiepileptics: metabolism of phenytoin inhibited
- Antimalarials: increased risk of ventricular arrhythmias with chloroquine and quinine; avoid concomitant use with coartem ®
- Antipsychotics: increased risk of ventricular arrhythmias with phenonthiazines (e.g. chlorpromazine) and haloperidol
- Beta-blockers: increased risk of bradycardia, AV block and myocardial depression
- Calcium channel blockers: increased risk of bradycardia, AV block and myocardial depression with verapamil
- Cardiac glycosides: increased plasma concentration of digoxin (half digoxin maintenance dose)
- Diuretics: cardiac toxicity increased if hypokalaemia occurs with acetazolamide, loop diuretics and thiazides

Anaesthetics (general)

- ACE inhibitors and angiotensin II antagonists: enhanced hypotensive effect
- Antihypertensive: enhanced hypotensive effect
- Antipsychotics: enhanced hypotensive effect
- Beta-blockers: enhanced hypotensive effect
- Calcium channel blockers: enhanced hypotensive effect and AV delay with verapamil
- Cytotoxic: antifolate effect of methotrexate increased by N20
- Dopaminergics: risk of arrhythmias if a volatile liquid anaesthetic such as halothane is given with levodopa
- Sympathomimetics: risk of arrythmias if adrenaline given with volatile liquid anaesthetics such as halothane

Antacids

Note: *antacids should preferably not be taken at the same time as other medicines since they may impair absorption*

- Antibacterials: reduced absorption of ciprofloxacin, isoniazid, norfloxacin, ofloxacin, rifampicin and most tetracyclines
- Iron: magnesium trisilicate reduces absorption of iron

Anticholinesterase

- Includes neostigmine
- Antibacterials: aminoglycosides antagonize the effect of neostigmine

Antidepressants-SSRIs

- Includes fluoxetine
- Analgesics: risk of CNS toxicity increased with tramadol; increased risk of bleeding with aspirin and NSAIMs
- Anticoagulants: effect of warfarin enhanced
- Antiepileptics: plasma concentration of carbamazepine and phenytoin increased by fluoxetine
- Antimalarials: avoid concomitant use with coartem ®
- Antipsychotics: plasma concentration of risperidone and haloperidol increased by fluoxetine
- Dopaminergics: hypertension and CNS excitation with fluoxetine

Antidepressants-tricyclic

- Includes amitriptyline
- Alcohol: enhanced sedative effect
- Analgesics: risk of CNS toxicity with tramadol; possibly increased sedation with opioid analgesics
- Antiarrhythmics: increased risk of ventricular arrhythmias with medicines which prolong QT interval including amiodarone
- Antiepileptics: antagonism (convulsive threshold reduced)
- Antihypertensive: enhanced hypotensive effect
- Antimalarials: avoid concomitant use withncoartem ®
- Sympathomimetics: hypertension and arrhythmias with adrenaline

Antidiabetics

- Includes insulin, metformin, pioglitazone
- Antidiabetic action of sulfonylureas is enhanced by phenylbutazone, sulfonamides, chloramphenicol, warfarin, lithium and theophylline
- Antidiabetic action of sulfonylurea is decreased by phenobarbitone, phenytoin, rifampicin, oral contraceptives and corticosteroids
- ACE inhibitors: action of metformin is enhanced
- Alcohol: Lactic acidosis may occur when metformin is taken with alcohol
- Glycemic control of metformin may be affected by phenothiazines, diuretics and corticosteroids

Antifungals

- Antibacterials: rifampicin accelerates metabolism of ketoconazole
- Anticoagulants: effect of warfarin enhanced
- Antiepileptics: plasma concentration of ketoconazole reduced by phenytoin
- Antimalarials: avoid concomitant use with coartem®

- Cyclosporin: metabolism inhibited by ketoconazole
- Theophylline: plasma concentration increased by ketoconazole

Antihistamines (H1 antagonists)

- Includes chlorpheniramine, ceterizine
- Anticholinergics: potentiates properties such as dryness of mouth with anticholinergic medicines such as dicyclomine
- Potentiates CNS depression with alcohol, benzodiazepines, antidepressants and opioid analgesics

Antimuscarinics

- Includes atropine, and dicyclomine
- Many medicines have antimuscarinics side effects like dry mouth, urine retention and constipation
- Antidepressants: increased antimuscarinic side effects
- Antihistamines: increased antimuscarinic side effects
- Nitrates: reduced effect of sublingual nitrates (failure to dissolve under tongue due to dry mouth)

Antipsychotics

- Includes haloperidol, chlorpromazine, fluphenazine, risperidone, olanzapine
- Analgesics: enhanced sedative and hypotensive effect if given with opioid analgesics; severe drowsiness possible if indomethacin given with haloperidol
- Antidepressants: fluoxetine increases the plasma concentration of risperidone and haloperidol
- Antiepileptics: carbamazepine accelerates metabolism of haloperidol, olanzapine and risperidone; phenobarbital accelerates the metabolism of haloperidol; increased risk of neutropoenia if olanzapine given with valproate
- Beta-blockers: concomitant administration of propranolol and chlorpromazine may increase plasma concentration of both medicines

Antiretrovirals

- Includes lamivudine, stavudine, nevirapine, efavirenz, zidovudine, and lopinavir
- Avoid concomitant use of zidovudine with stavudine
- Efavirenz and Nevirapine possibly reduce plasma concentration of lopinavir
- Plasma concentration of efavirenz and lopinavir reduced by nevirapine
- Antibacterials: plasma concentration of nevirapine and lopinavir reduced by rifampicin
- Anticoagulants: nevirapine may enhance or reduce anti-coagulant effect of warfarin
- Antiepileptics: plasma concentration reduced by carbamazepine and phenytoin
- Antifungals: nevirapine reduces plasma concentration of ketoconazole
- Barbiturates: plasma concentration of lopinavir reduced by barbiturates
- Estrogens: nevrirapine accelerates metabolism of estrogens
- Progestogens: nevirapine accelerates metabolism of progestrogens

Anxiolytics and Hypnotics

- Includes diazepam, lorazepam, midazolam
- Antibacterials: isoniazid inhibits metabolism of diazepam; rifampicin increases metabolism of diazepam and possibly other benzodiazepines

Artemether + Lumefanthrine (Coartem®)

- Antiarrhythmics: avoid concomitant administration with amiodarone
- Antibacterials: avoid concomitant use with quinolones and macrolides
- Antidepressants: avoid concomitant use
- Antifungals: avoid concomitant use with imidazoles
- Antipsychotics: avoid concomitant use

Aspirin

- Other analgesics: avoid concomitant use with other NSAIMs (increased side effects); cardio protective effect of aspirin possibly reduced by ibuprofen
- Anticoagulants: increased risk of bleeding due to anti-platelet effect of aspirin
- Cytotoxics: reduced excretion of methotrexate (increased toxicity)

Barbiturates

- Antibacterials: metabolism of chloramphenicol, metronidazole and doxycycline increased
- Anticoagulants: metabolism of warfarin accelerated
- Antidepressants: antagonism of anticonvulsant effect
- Antifungals: reduces absorption of griseofulvin
- Antipsychotics: antagonism of anticonvulsant effect; phenobarbitone accelerates metabolism of haloperidol
- Calcium channel blockers: effect of nifedipine and verapamil reduced
- Cyclosporin: metabolism of cyclosporin accelerated
- Corticosteroids: metabolism of corticosteroids accelerated
- Estrogens: metabolism of oral contraceptives accelerated

Betablockers

- Includes atenolol, propranolol, carvedilol, metoprolol, timolol
- Note: *since systemic absorption may follow after topical application to eye, the possibility of interaction especially with verapamil should be borne in mind*
- Anaesthetics: enhanced hypotensive effect; increased risk of bupivacaine toxicity with propranolol
- Analgesics: NSAIMs antagonize hypotensive effect
- Antiarrhythmics: increased risk of myocardial depression and bradycardia; increased risk of myocardial depression and AV block with amiodarone; increased risk of lignocaine toxicity with propranolol
- Antibacterials: rifampicin accelerates metabolism of propranolol
- Antihypertensive: increased hypotensive effect; increased risk of first dose hypotensive effect with post-synaptic alpha-blockers such as prazosin
- Antipsychotics: concomitant administration of propranolol and chlorpromazine may increase concentration of both medicines

- Calcium channel blockers: severe hypotension and heart failure occasionally with nifedipine
- Sympathomimetics: severe hypertension with Adrenalineand possibly with dobutamine

Betahistine

- Antihistamines: effect theoretically antagonized by anti-histamines

Bupivacaine

- Antiarrhythmics: increased myocardial depression
- Betablockers: increased risk of bupivacaine toxicity with propranolol

Calcium polystyrene sulfonate

- Thyroid hormones: calcium polysttyrene sulfonate reduces absorption of levo thyroxin

Cefixime

- Anticoagulants: cephalosporins possibly enhance anticoagulant effects of coumarins
- Oestrogen: antibacterial that do not induce liver enzymes reduce contraceptives of oestrogen
- Probenecid: excretion of cephalosporin reduced by probenecid

Calcium salts

- Reduced absorption of ciprofloxacin and tetracyclines

Calcium channel blockers

- Includes verapamil, amlodipine and nifedipine
- Anaesthetics: verapamil increases hypotensive effect of GA and risk of AV delay
- Antiarrhythmics: amiodarone induced risk of bradycardia, AV block and myocardial depression
- Antibacterials: rifampicin increases metabolism of nifedipine and verapamil
- Antiepileptics: effect of carbamazepine enhanced by verapamil; effect of nifedipine reduced by carbamazepine, phenobarbitone and phenytoin
- Antifungals: possibly increased ionotropic effect with ketoconazole
- Antihypertensive: enhanced hypotensive effect
- Beta-blockers: occasionally severe hypertension and heart failure with nifedipine
- Cardiac glycosides: plasma concentration of digoxin increased by verapamil and possibly nifedipine; increased AV block and bradycardia with verapamil
- Cyclosporin: plasma concentration increased by verapamil
- Magnesium salts: profound hypotension reported with nifedipine and IV MgSO4 in pre-eclampsia
- Theophylline: plasma concentration increased by verapamil

Carbamazepine

- Analgesics: effect of tramadol decreased by carbamazepine
- Antibacterials: metabolism of doxycycline increased; plasma concentration of carbamazepine increased by erythromycin and isoniazid

- Anticoagulants: metabolism of acenocoumarol and warfarin increased
- Antidepressants: antagonism of anti-convulsant effect; plasma concentration of carbamazepine increased by fluoxetine

Other antiepileptics

- concomitant administration of two or more antiepileptics may enhance toxicity without a corresponding increase in antiepileptic effect
- Antimalarials: chlororquine antagonize anticonvulsant effect
- Antipsychotics: antagonism of anticovulsant effect
- Calcium channel blockers: verapamil increases the effect of carbamazepine
- Cyclosporin: metabolism of cyclosporin accelerated
- Corticosteroids: metabolism of corticosteroids accelerated
- Diuretics: increased risk of hyponatraemia
- Estrogens and progestogens: metabolism of OCP accelerated

Cardiac glycosides

- Include digoxin
- Antiarrythmics: plasma concentration of digoxin increased by amiodarone
- Antibacterials: erythromycin enhance the effect of digoxin
- Calcium channel blockers: plasma concentration of digoxin increased by verapamil
- Diuretics: increased toxicity if hyponatraemia occurs with acetazolamide, loop and thiazide diuretics; effect of digoxin increased by spironolactone

Cephalosporins

- Includes cephalexin, cephazolin, ceftriaxone, cefotaxime
- Diuretics: loop diuretics may increase nephrotoxicity with cephalosporin

Chloramphenicol

- Anticoagulants: effect of acenocoumarol and warfarin enhanced
- Antidiabetics: effect of sulphonylureas increased
- Antiepileptics: metabolism of chloramphenicol accelerated by phenobarbitone

Chloroquine

- Antiarrythmics: chloroquine increases the risk of ventricular arrhythmias with amiodarone
- Antiepileptics: antagonism of anticonvulsant effect
- Cardiac glycosides: chloroquine increases the concentration of digoxin
- Cyclosporin: chloroquine increase concentration of cyclosporine

Ciprofloxacin

- Antacids: reduced absorption of ciprofloxacin
- Artemether+Lumefantrine: manufacturer of artemether with lumefanthrine advises avoid concomitant use
- Cyclosporin: increased risk of nephrotoxicity
- Ferrous salts: absorption of ciprofloxacin reduced by oral ferrous salts
- Ibuprofen: possibly increased risk of convulsions

- Morphine: manufacturer of ciprofloxacin advises avoid premedication with morphine (reduced plasma-ciprofloxacin concentration).
- Phenytoin: plasma-phenytoin concentration possibly altered by ciprofloxacin
- Theophylline: increased plasma theophylline concentration; possible increased risk of convulsions
- Warfarin: enhanced anti-coagulant effect

Cyclosporin

- ACE inhibitors and angiotensin II antagonists: increased risk of hyperkalaemia
- Analgesics: increased risk of nephrotoxicity with NSAIMs
- Antibacterials: aminoglycosides, cotrimoxazole and quinolones increase risk of nephrotoxicity
- Antiepileptics: carbamazepine, phenytoin & phenobarbitone increase metabolism of cyclosporin
- Antifungals: grisoefulvin possibly decreases plasma cyclosporin concentration
- Calcium channel blockers: verapamil increases plasma cyclosporin concentration
- Corticosteroids: cyclosporin increases concentration of prednisolone
- Cytotoxics: increased toxicity with methotrexate
- Diuretics: potassium sparing diuretics increase the risk of hyperkalaemia
- Lipid regulating medicines: increased risk of myopathy with statins
- Estrogens & progestogens: progestogens inhibit metabolism
- Potassium salts: increased risk of hyperkalaemia.

Contraceptives, oral

- Includes OCP, levonorgestrel, medroxyprogesterone acetate
- Antibacterials: rifampicin accelerates metabolism of OCP
- Anticoagulants: antagonism of anti-coagulant effect with warfarin
- Antiepileptics: carbamazepine, phenobarbitone and phenytoin accelerate metabolism
- Antifungals: griseofulvin accelerates metabolism
- Cyclosporin: increased plasma-concentration of cyclosporine

Corticosteroids

- Includes dexamethasone, hydrocortisone and prednisolone
- Antibacterials: rifampicin accelerates metabolism
- Anticoagulants: anticoagulant effect of acenocoumarol and warfarin altered
- Antiepileptics: carbamazepine, phenytoin and phenobarbitone accelerates metabolism
- Cyclosporin: cyclosporin increases plasma concentration of prednisolone

Cotrimoxazole

- Antiarrhythmics: cotrimoxazole increases risk of ventricular arrhythmias with amiodarone
- Other Antibacterial: increased risk of crystaluria with sulphonamides

- Anticoagulants: effect of warfarin enhanced
- Antiepileptics: antifolate effect and plasma concentration of phenytoin increased by cotrimoxazole
- Cyclosporin: increased risk of nephrotoxicity
- Cytotoxics: antifolate effect of methotrexate increased by cotrimoxazole

Cyclophosphamide

- Other cytotoxics: increased toxicity with high dose cyclophosphamide

Cycloserine

- Alcohol: increased risk of seizures

Dapsone

- Antibacterials: plasma concentration reduced by rifampicin

Diltazem

See under calcium channel blocker

Diuretics

- Includes hydrochlorothiazide, furosemide, mannitol and acetazolamide
- ACE inhibitors and angiotensin II antagonists: enhanced hypotensive effect
- Analgesics: diuretics increase risk of nephrotoxicity of NSAIDs. Indomethacin antagonizes diuretic effect; diuretic effect of spironolactone antagonized by aspirin; aspirin reduces excretion of acetazolamide. Indomethacin increases risk of hyperkalaemia with potassium sparing diuretics
- Antiarrhythmics: cardiac toxicity of amiodarone increased if hypokalaemia occurs
- Antibacterials: loop diuretics increase ototoxicity of aminoglycosides; loop diuretics may increase nephrotoxicity of cephalosporins
- Antiepileptics: increased risk of hyponatraemia with carbamazepine; acetazolamide increases concentration of carbamazepine
- Antihypertensive: enhanced hypotensive effect
- Cardiac glycosides: increased toxicity if hypokalaemia occurs with acetazolamide, loop and thiazide diuretics
- Cyclosporin: increased risk of hyperkalaemia with potassium sparing diuretics
- Potassium salts: hyperkalaemia with potassium sparing diuretics

Doxorubicin

- Cyclosporin: increased risk of neurotoxicity

Ergot alkaloids

- Includes ergotamine, methylergometrine
- Antibacterials: increased risk of ergotism with erythromycin and tetracyclines
- Erythromycin
- Antiarrhythmics: parenteral erythromycin increases risk of ventricular arrhythmias with amiodarone
- Anticoagulants: effect of acenocoumarol and warfarin enhanced
- Antiepileptics: erythromycin inhibit metabolism of carbamazepine
- Antimalarials: avoid concomitant use with coartem®

- Cyclosporin: erythromycin inhibit metabolism
- Ergometrine and ergotamine: increased risk of ergotism - avoid concomitant use
- Lipid regulating medicines: erythromycin increases risk of myopathy with atorvastatin
- Theophylline: increased plasma concentration of theophylline

Fluconazole

- Amphotericin B: possible antagonism of effect of amphotericin B
- Coartem®: avoid concomitant use with fluconazole
- Ciclosporin: metabolism of ciclosporin inhibited (increased plasma concentration)
- Contraceptives, oral: anecdotal reports of failure of estrogen containing contraceptives.
- Glibenclamide: plasma concentration of glibenclamide increased
- Hydrochlorothiazide: plasma concentration of fluconazole increased
- Nevirapine: increased concentration of nevirapine
- Phenytoin: plasma concentration of phenytoin increased
- Rifampicin: accelerated metabolism of fluconazole there by reducing plasma concentration
- Ritonavir: plasma concentration of fluconazole increased by ritonavir
- Saquinavir: plasma concentration of saquinavir possibly increased
- Warfarin: enhanced anticoagulant effects
- Zidovudine: increased plasma concentration of zidovudine (increased risk of toxicity)

Fluorouracil (5-FU)

- Anticoagulants: possibly enhances effect of warfarin and other coumarins

Fenofibrate

- Anticoagulants: enhanced effect of oral Anticoagulants including warfarin; dose of Anticoagulants may need to be reduced
- Antidiabetics: enhanced effect of sulphonylureas and insulin
- Ciclosporin: increased risk of renal impairment
- Statins: increased risk of myopathy; avoid concomitant use

Grisoefulvin

- Anticoagulants: reduced effect of warfarin and acenocoumarol
- Estrogens and progestogens: reduced contraceptive effect

Hydralazine

- Anaesthetics: enhanced hypotensive effect

Ibandronate

- Antacids: absorptions of bisphosphonates reduced by antacids
- Antibacterials: increased risk of hypocalceamia when bisphosphonates given with aminoglycosides
- Calcium salts: absorption of bisphosphonates reduced by calcium salts

- Iron: absorption of bisphosphonates reduced by oral iron

Iron (ferrous sulphate)

- Antibacterials: tetracyclines reduce absorption of oral iron (and vice versa)

Isoniazid

- Antiepileptics: metabolism of carbamazepine and phenytoin inhibited; with carbamazepine, isoniazid hepatotoxicity increase

Lamotrigine

- Antibacterials: plasma concentration of lamotrigine reduced by rifampicin
- Antidepressants: anticonvulsant effect of anti-epileptics possibly antagonized by MAOIs and TCAs (convulsive threshold lowered); anticonvulsant effect of antiepileptics antagonized by SSRIs and tricyclics (convulsive threshold lowered)
- Antiepileptics: plasma concentration of lamotrigine often reduced by carbamezapine and oxycarbamezapine, phenytoin; plasma concentration of lamotrigine increased by valproate
- Chloroquine: possible increased risk of convulsions
- Phenobarbital: plasma concentration of lamotrigine reduced
- Estrogens: plasma concentration of Lamotrigine reduced
- Progestogens: plasma concentration of lamaotrigine reduced by progestogens

Levetiracetam

- Antidepressants: anticonvulsant effect possibly antagonized by SSRIs and TCAs
- Antimalarials: anticonvulsant effect possibly decreased with chloroquine

Levodopa (with carbidopa)

- Anaesthetics: risk of arrhythmias with volatile liquid anaesthetics such as halothane

Low molecular weight heparin

- ACEIs: increase risk of hyperkalemia when heparins given with ACEIs
- Analgesics: possible increase risk of bleeding heparins given with NSAIDs; increased risk of haemorrhage when heparin given with IV diclofenac; increase risk of haemorrhage when heparin given with ketorolac; anticoagulants effects of heparins enhanced by aspirin
- Angiotensin II receptor antagonists: increase risk of hyperkalemia when heparin given with angiotensin II receptor antagonist
- Clopidogrel: increased risk of bleeding when heparin given with clopidogrel
- Dipyridamole: anticoagulants effect of heparins enhanced by dipyridamole
- Nitrates: anticoagulant effect of heparins reduced by infusion of glyceryl trinitrates

Macrolides

- Includes erythromycin and clarithromycin
- Anticoagulants: macrolides possibly enhance anti coagulants effects of coumarins
- Antiepileptics: erythromicn increases plasma concentration of carbamazepine; clarithromycin inhibits metabolism of phenytoin (plasma

concentration increased); erythromycin inhibits metabolism of valporate (plasma concentration increased)

- Antifungal: clarithromycin increases the plasma concentration of itraconazole
- Antivirals: plasma concentration of erythromycin possibly increased by ritonavir
- Calcium channel blockers: erythromycin possibly inhibits the metabolism of verapamil (increased risk of toxicity)
- Cardiac glycosides: macrolides increase plasma concentration of digioxin (increased risk of toxicity)
- Corticosteriods: erythromycin possibly inhibits metabolism of methylprednisolone
- Ergot alkaloids: increase risk of ergotism when macrolides given with ergotamine - avoid concomitant use
- Lipid regulating medicines: possible increase risk of myopathy when erythromycin given with atrovastatin
- Estrogen: antibacterials that do not induce liver enzymes possibly reduce contraceptive effect of estrogen
- Sildenafil: erythromycin increase plasma concentration of sildenafil- reduce inital dose od slidenafil
- Theophylline: erythromycin inhibits the metabolism of theophylline

Magnesium salts

- Calcium channel blockers: profound hypotension reported with nifedipine and IV MgSO4 in pre-eclampsia

Methotrexate

- Anaesthetics: antifolate effect increased by nitrous oxide (avoid concomitant use)
- Analgesics: excretion reduced by aspirin, diclofenac, indomethacin and ibuprofen
- Antibacterials: antifolate effect increased by cotrimoxazole (avoid concomitant use)
- Cyclosporin: increased toxicity
- Corticosteroids: increased risk of haematological toxicity

Methyldopa

- Anaesthetics: enhanced hypotensive effect

Methylprednisolone

- ACEIs: corticosteroids antagonise the hypotensive effect of ACEIs
- Adrenergic neuron blockers: corticosteriods antagonise hypotensive effect of andrenergic neuron blockers
- Alpha-blockers: corticosteroids antagonise the hypotensive effect of alpha blockers
- Analgesics: increased risk of gastrointestinal bleeding and ulceration when corticosteriods given with NSAIMs; increased risk of GI bleeding and ulceration when corticosteriods given with aspirin, also corticosteroids reduce plasma concentration of salicylate

- Aginotensin II receptor antagonists: corticosteroids antagonise hypotensive effects of angiotension II receptor
- *See under* corticosteroids *under appendix 1*

Metoclopramide

- Cyclosporin: increased plasma-cyclosporin concentration

Metronidazole

- Anticoagulants: effect of warfarin enhanced
- Antiepileptics: metronidazole inhibits metabolism of phenytoin; phenobarbitone accelerates metabolism of metronidazole

Moxifloxacin

See under quinolones

Muscle Relaxants

- Non depolarizing relaxants includes atracurium, vencuronium while depolarizing muscle relaxant include suxamethonium
- Thiopentone sodium and succinylcholine solutions should not be mixed in the same syringe due to chemical interaction.
- General anaesthetics: potentiate non depolarizing muscle relaxants
- Anticholinesterase: reverses the action of non depolarising muscle relaxants
- Calcium channel blockers: verapamil and others potentiate both depolarizing and non-muscle relaxants
- Adrenaline: reduces action of non-depolarizing muscle relaxant by increasing Ach release

  Diuretics: diuretic induced hypokalemia enhances action of non-depolarizing *muscle* relaxants

Mycophenolate

- Antacids: absorption reduced by antacids
- Antiviral: may increase concentration of acyclovir

Nitrates

- Includes nitroglycerine, isosorbide dintrate
- Anticoagulants: excretion of heparin increased by glyceryl trinitrate infusion

NSAIMs

- Includes aspirin, ibuprofen, mefenamic acid and diclofenac
- ACE inhibitors and angiotensin II antagonists: antagonism of hypotensive effect
- Other analgesics: avoid concomitant administration of two or more NSAIMs (increased side effects)
- Antibacterials: NSAIMs possibly increase risk of convulsion with quinolones
- Anticoagulants: effect of warfarin enhanced; increased risk of bleeding with heparin
- Cyclosporin: increased risk of nephrotoxicity
- Cytotoxics: excretion of methotrexate reduced by aspirin

Diuretics

- Increased risk of nephrotoxicity with NSAIMs

- Indomethacin antagonize diuretic effect

Oestrogens

- Includes ethinyloestradiol and conjugated estrogen
- Antibacterials: contraceptive effect of estrogens possibly reduced by broad spectrum antibacterial and penicillin
- Anticoagulants: estrogens antagonize anti-coagulant effect of coumarins
- Antidepressants: estrogens antagonize anti-depressant effect of tricyclics
- Antiepileptics: metabolism of estrogens accelerated by carbamazepine and phenytoin
- Antifungals: metabolism accelerated by griseofulvin
- Antiviral: metabolism accelerated by nevirapine
- Barbiturates: metabolism accelerated by barbiturates

Opioid analgesics

- Includes codeine, morphine, tramadol, pethidine
- Antidepressants: tramadol increases risk of CNS toxicity with SSRIs (e.g., fluoxetine) and tricyclics (e.g. amitriptyline)
- Antiepileptics: effect of tramadol decreased by carbamazepine
- Antipsychotics: enhanced sedative and hypnotics effect

Oxytocin

- Anaesthetics: inhalational anaesthetics possibly reduce oxytocic effect (also enhanced hypotensive effect and risk of arrhythmias)

Oxymetazoline

See under *sympathomimitcs*

Pentoxifylline

- Analgesics: increased risk of bleeding with NSAIMs

Phenylephrine

See under sympathomimetics

Phenytoin

- Analgesics: plasma phenytoin concentration increased by aspirin and possibly other NSAIMs
- Antiarrhythmics: amiodarone increases plasma phenytoin concentration
- Antibacterials: plasma phenytoin concentration increased by chloramphenicol, isoniazid and metronidazole: plasma concentration and antifolate activity increased by cotrimoxazole; plasma phenytoin concentration reduced by rifampicin; plasma concentration of doxycycline reduced by phenytoin.
- Anticoagulants: metabolism of warfarin accelerated
- Anticonvulsants: antagonism of anticonvulsant effect
- Antifungals: plasma concentration of ketoconazole reduced
- Antimalarials: chloroquine occasionally reduces convulsive threshold
- Antipsychotics: antagonism of anticonvulsant effect
- Cyclosporin: metabolism of cyclosporin accelerated
- Corticosteroids: metabolism of corticosteroids accelerated

- Estrogens and progestogens: metabolism of OCP accelerated
- Ulcer healing medicines: omeprazole enhances the effect of phenytoin

Potassium salts

- ACE inhibitors and angiotensin II antagonists: increased risk of hyperkalemia
- Cyclosporin: increased risk of hyperkalemia
- Diuretics: hyperkalemia with potassium sparing diuretics

Progestogens

- Includes medroxyprogesterone
- Cyclosporin: increased plasma cyclosporin concentration

Proton pump inhibitors

- Includes omeprazole
- Anticoagulants: effect of warfarin enhanced by omeprazole

Quinine

- Antiarrhythmics: increased risk of ventricular arrhythmias with amiodarone
- Other antimalarials: avoid concomitant use with coartem®
- Cardiac glycosides: plasma concentration of digoxin increased

Quinolones

- Includes ciprofloxacin, norfloxacin, ofloxacin
- Analgesics: possible increased risk of convulsions with NSAIMs; manufacturer of ciprofloxacin advises avoid pre-medication with opioid analgesics
- Antiarrhythmics: increased risk of ventricular arrythmias with amiodarone
- Other antibacterial: increased risk of ventricular arrythmias with parenteral erythromycin
- Anticoagulants: anticoagulant effect of warfarin enhanced
- Antidepressants: increased risk of ventricular arrhythmias with tricyclics
- Antimalarials: avoid concomitant use with coartem®
- Antipsychotics: increased risk of ventricular arrhythmias with haloperidol
- Cyclosporin: increased risk of nephrotoxicity
- Theophylline: possibly increased risk of convulsions
- Zinc salts: zinc reduces the absorption of ciprofloxacin and norfloxacin

Ranitidine

- Antacids: reduce its absorption when taken at the same time with antacid preparations
- Antifungal: decreases absorption of ketoconazole

Rifampicin

- Other antibacterial: metabolism of chloramphenicol accelerated; plasma concentration of dapsone reduced
- Anticoagulants: metabolism of warfarin and acenocoumarol accelerated
- Antiepileptics: metabolism of phenytoin accelerated
- Antifungals: metabolism of ketoconazole accelerated

- Calcium channel blockers: metabolism of nifedipine and verapamil accelerated
- Cyclosporin: metabolism accelerated by rifampicin
- Corticosteroids: metabolism of steroids accelerated
- Estrogens and progestogens: metabolism of both combined and progestogen-only contraceptive reduced

Sodium bicarbonate

See under antacids

Sucralfate

- Antbacterials: reduced absorption of ciprofloxacin, norfloxacin, ofloxacin and tetracyclines
- Anticoagulants: absorption of warfarin possibly reduced
- Antiepileptics: reduced absorption of phenytoin

Sympathomimetics

- Includes adrenaline
- Anaesthetics: risk of arrhythmias if adrenalinegiven with volatile liquid anaesthetics such as halothane
- Beta-blockers: severe hypertension with adrenalineand possibly with dobutamine

Tenofovir

- Lopinavir: plasma concentration of tenofovir increased
- Cidofovir: combination of tenofovir with cidofovir may increase plasma concentration of either drugs (or both)

Tetracyclines

- Includes doxycycline
- Cyclosporin: doxycycline possibly increases plasma cyclosporin concentration
- Antacids: reduced absorption with antacids
- Calcium salts: reduced absorption of tetracyclines
- Iron: reduced absorption of tetracyclines and vice versa

Theophylline

- Includes deriphylline
- Antibacterials: possible increased risk of convulsions with quinolones; plasma concentration increased by ciprofloxacin, erythromycin, isoniazid and norfloxacin; plasma concentration reduced by rifampicin
- Antifungals: plasma concentration increased by ketoconazole
- Calcium channel blockers: plasma theophylline concentration increased by verapamil

Thyroids hormones

- Includes thyroxine
- Anticoagulants: effect of warfarin enhanced

Tranexamic acid

- Chlorpromazine: may increase cerebral vasospasm and ischemia

Valproate

- Antidepressants: antagonism of anticonvulsant effect
- Antimalarials: chloroquine occasionally reduces convulsive threshold
- Antipsychotics: antagonism of anticonvulsant effect

Vancomycin

- Cyclosporin: increased risk of nephrotoxicity
- Cisplatin: increased risk of nephrotoxicity and possibly of ototoxicity
- Ether anesthetic: hypersensitivity - like reactions can occur with concomitant intravenous vancomycin
- Frusemide: increased risk of ototoxicity
- Gentamycin: increased risk of nephrotoxicity and ototoxicity
- Halothane, nitrous oxide, ketamine and thiopental: hypersensitivity like reactions can occur with concomitant intravenous vancomycin
- Streptomycin: increased risk of nephrotoxicity and ototoxicity

Venlafaxine

- Analgesics: increase risk of bleeding when venlafaxine give with NSAIMs and aspirin
- Anticoagulants: venlafaxine possibly enhances anticoagulant effects of warfarin
- Antidepressants: possible increase serotonergic effects when venlafaxine given with duloxetine; enhanced CNS effect and toxicity when venlafaxine given with MAOIs; after stopping SSRI-related antidepressants do not start moclobemide for at least one week
- Antipsychotics: venlafaxine increases plasma concentration of clozapine and haloperidol
- Dopaminergic: cautions with venlafaxine advised by manufacturer of entacapone; increase risk of hypertension and CNS excitation when venlafaxine given with selegiline

Vitamins

- Anticoagulants: effect of warfarin antagonized by vitamin k

Warfarin and other coumarins

- Includes warfarin
- Analgesics: aspirin increase risk of bleeding due to antiplatelet effect
- Antiarrhythmics: amiodarone enhances anticoagulant effect
- Antibacterials: anticoagulant effect reduced by rifampicin; effect enhanced by chloramphenicol, ciprofloxacin, cotrimoxazole, erythromycin, metronidazole and ofloxacin
- Antiepileptics: reduced anticoagulant effect carbamzepine and phenobarbital; anticoagulant effect possibly increased by valproate
- Antifungals: effect reduced by griseofulvin; effect enhanced by ketoconazole
- Antiplatelet medicines: aspirin increase risk of bleeding
- Barbiturates: anticoagulant effect reduced
- Corticosteroids: anticoagulant effect possibly altered
- Cytotoxics: effect enhanced by fluorouracil

- Estrogens and progestogens: OCP reduce anticoagulant effect
- Thyroids hormones: enhanced anticoagulant effect
- Vitamin k: reduced anticoagulant effect

Zinc

- Antibacterials: reduced absorption of ciprofloxacin and norfloxacin; tetracyclines reduce absorption of zinc and vice versa

Age Group	Medicine	Day 0	Day 1	Day 2	Day 3 to 13
Infant	Chloroquine	½ tab (7.5ml syrup)	½ tab (7.5ml syrup)	¼ tab (3.75ml syrup)	-
1- 4 years	Chloroquine Primaquine	1 tab (15ml syrup) ½ tab	1 tab (15ml syrup) ½ tab	½ tab (7.5ml syrup) ½ tab	- ½ tab each
4 - 8 years	Chlorquine Primaquine	2 tabs 1 tab	2 tabs 1 tab	1 tab 1 tab	- 1 tab each
8 - 14 years	Cholorquine Primaqune	3 tabs 1 ½ tabs	3 tabs 1 ½ tab	1 ½ tab 1 ½ tab	- 1½ tab each
14 years & above	Chloroqune Primaquine	4 tabs 2 tabs	4 tabs 2 tabs	2 tabs 2 tabs	- 2 tabs each

NOTE

- The dose for chloroquine is calculated as base. E.g. if you need to give 300mg of chloroquine, that will be equivalent to 2 tablets of chloroquine. For children under 5 years Chloroquine 50mg/5ml syrup may be used.
- Dosage should be calculated by per kilogram (kg) body weight in children wherever possible, viz. chloroquine, 10 mg/kg on day 0 and 1 and 5 mg/kg on day 2, and primaquine 0.25 mg/ kg.
- Primaquine treatment period is 14 days except for pregnant women and children under 1 year where it is contraindicated.
- If the patient vomits within 1 hr of taking the medicine, the dose should be repeated.

Treatment regimen for uncomplicated falciparum malaria: Protocol B

Patient category	Medicines	Daily dose	No. of days of treatment
< 5 kg	Quinine	10mg/kg IM 8 hrly (Max of 600mg/dose)	3 (may be extended up to 7 days depending on clinical response)
5 -14 kg	Artemether (ART) + lumefanthrine(L)	1 tablet at 0, 8, 24, 36, 48 and 60 hrs	3
15 – 24 kg	Artemether (ART) + lumefanthrine(L)	2 tablets at 0, 8, 24, 36, 48 and 60 hrs	3
25 – 34kg	Artemether (ART) + lumefanthrine(L)	3 tablets at 0, 8, 24, 36, 48 and 60 hrs	3
>35 kg	Artemether (ART) + lumefanthrine(L)	4 tablet at 0, 8, 24, 36, 48 and 60 hrs	3
1st trimester pregnancy	Quinine 300mg tab + proguanil 100mg + dapsone 100mg	600mg 8 hourly followed by dapsone (1/2 tab) 12 hourly + proguanil 1 tablet 12 hourly for 4 more days.	Three day quinine followed by 4 days of dapsone & proguanil.
* 2nd and 3rd trimester pregnancy	Quinine 300mg tab + dapsone 100mg + proguanil 100mg	100mg 12 hourly OR 300mg 8 hourly followed by dapsone (1/2 tab) 12 hourly + proguanil (1 tab) 12 hourly for 4 more days.	Three day quinine followed by 4 days of dapsone & proguanil.

Note:

- *The medicine must be administered under direct supervision; total 6 doses at 0, 8,24,36,48 and 60 hours are administered; the second dose is administrated after 8 hours and then there after the rest of the dose must be continued every 12 hourly till last dose at 60 hours*

- *If the patient vomits within 1 hour of taking the medicine, the dose should be repeated*
- *Coartem® is not recommended in pregnant women; for pregnant women in 1st ,2nd and 3rd trimester, the old regimen with quinine/artisunate with dapsone and proguanil will be followed. WHO recommends dual therapy in pregnancy with clindamycin (not on the EML).*
- *For uncomplicated P. falciparum infection, if the coartem® is out of stock or if it is not suitable for some patients due to hypersensitivity reaction, use artesunate/doxycycline combination for adult and artisunate/dapson/proguanil combination if doxycline is contraindicated.*
- *A stat dose of primaquine on day 3 should be given to treat gametocytes of falciparum except in pregnant women and children less than 5 years of age.*

Antimalarial medicines for the treatment of severe malaria: Protocol C

Medicine	Route of administration	Schedule
Artemether	IM	3.2mg/kg body weight IM given on admission then 1.6mg/kg IM once a day followed by a full course of combination therapy (coartem®) as soon as patient can swallow
Quinine	IV	Loading dose of 20mg/kg body weight of quinine given over a 4-hour period in IV fluid (glucose 5% preferred to prevent hypoglycaemia); then give maintenance dose of 10 mg/kg after 8 hours. This should be repeated until the patient is able to take quinine tablet orally. The oral dose of quinine is 10mg/kg body weight given every eight hours. The total duration of treatment is 7 days including both IV and oral treatment. Quinine can be given by IM injections in the same dosage if IV infusion is not possible. It should be diluted in 0.9% sodium chloride to a concentration of 60-100 mg/ml salt, the dose divided equally and administered on the two anterior thighs (not on the buttock).

Note: *Primaquine should be given to all cases except pregnant women and children under 1 year; dose of primaquine (each primaquine tablet is 7.5mg base) is as follows:*

Children 1-4 years:	7.5mg base (1 tablet)
Children 5-8 years:	15mg base(2 tablets)
Children 9-14 years:	22.5mg base (3 tablets)
Above 15 years :	30mg base (4 tablets)

A loading dose of quinine should not be given:

- If the patient has received quinine within the preceding 12 hrs, or the previous history of medicine intake cannot be ascertained

- The weight of the patient cannot be taken
- Facilities for controlled rate of flow of quinine infusion is not available
- Facilities to treat complications of quinine toxicity do not exist.

If above conditions exist, patient should be treated with maintenance dose of quinine only. If there is no clinical improvement after 48 hours of parenteral quinine therapy, the maintenance dose of parenteral quinine should be reduced by one-third to one half (i.e. 5-7 mg/kg quinine). Total daily dose of quinine in patients requiring parenteral therapy beyond 48 hours is as follows:

Adults:

- Day 0: 30-40 mg/kg of body weight
- Day 1: 30 mg/kg of body weight
- Day 2 and subsequent days: 15-21 mg/kg of body weight.

The maximum dosage should not exceed 2000mg per day.

Children:

- Day 0: 30-40 mg/kg of body weight
- Day 1: 20 mg/kg of body weight
- Day 2 and subsequent days: 10-14 mg/kg of body weight.

The maximum dosage should not exceed 600mg per dose or 1800mg per day.

- Loading dose of quinine can be given at recommended doses even in acute renal failure (ARF) or severe jaundice up to 48 hrs. Subsequent doses should be reduced to half. In such cases, the volume of infusion fluid for administration of quinine can be reduced to half (quinine dihydrochloride 10 mg salt/ kg body weight diluted in 5% dextrose, 5 ml/kg body weight, or 1 mg of quinine salt/ 0.5 ml of fluid)

- Quinine is not contraindicated in pregnancy
- Monitor pulse and blood pressure at least every 2 hrs while the patient is on quinine infusion
- Avoid standing and sitting postures of the acutely sick patient during quinine therapy to prevent severe postural hypotension.

An uncomplicated *P. falciparum* malaria patient can progress to severe and complicated state if not treated early and appropriate.

Appendix 3: Immunization schedule

Antigen	No of dose	Children/Age	Adult	Consideration
BCG	1	At birth	-	-
Hepatitis B	1	At birth (within 24 hours)		
Oral Polio Vaccine (OPV)	3	At birth (within 0-14 days), 6 weeks, 10 weeks, 14 weeks		
Inactivated polio vaccine (IPV)	1	14 weeks		
DPT-HepB-Hib (pentavalent)	3	6 weeks, 10 weeks, 14 weeks		
Measles, Mumps and Rubella (MMR) Vaccine	2	9 Months, 24 months		
DTP	1	24 Months		

Td	2	6 years, 12 years	2 dose at 1st pregnancy and 1 dose at subsequent pregnancy	
HPV	2	Class 6 girls only		
Hepatitis B (monovalent)	3	0,1 and 2 months		Health workers and high risk patients

Td vaccination schedule for adult including pregnant women (without documentation of Childhood immunization)

Vaccine	Dosage	Dose	Site/route
Td1	0.5ml	1stcontact or as early as possible in pregnancy	IM
Td2	0.5ml	After 4 weeks of Td1	IM
Td3	0.5ml	6 months after Td2 or one dose in subsequent pregnancy	IM
Td4	0.5ml	1 year after Td3 or one dose in subsequent pregnancy	IM
Td5	0.5ml	1 year after Td4 or one dose in subsequent pregnancy	IM

Td vaccination schedule for adult including pregnant women (without documentation of childhood immunization)

Sl. No	Category	No of Dose	Schedule
1	With documentary evidence of pry series	3 doses	2 dose at least 1 month apart; 3rd dose during next pregnancy
2	With documentary evidence of 3rd dose DPT booster at 6 years and 12 years of TT/Td vaccination	2 doses	1 dose at 1st contact; 2nd dose after 6 month or during next pregnancy
3	With documentary evidence of pry series, booster dose at 6 years and TT/Td vaccination at 12 years	1 dose	1 dose on 1st contact or 1st pregnancy

Appendix 4: Emergency treatment of poisoning (specific medicines)

These notes are only guidelines and it is strongly recommended that appropriate health professionals be consulted where there is a doubt.

HOSPITAL ADMISSION: All patients who show feature of poisoning should generally be admitted to hospitals. Patients who have taken poisons with delayed action should also be admitted, even if they appear well; delayed-action poisons include aspirin, iron, paracetamol etc.

GENERAL CARE

General care in principle is always ABC.

A. Airway

An obstructed airway requires immediate attention. Lift the chin, remove dentures and oral secretions, hold the jaw forward, and insert an oropharyngeal airway if available, and the turn the patient to semi prone position with the head down.

B. Breathing

Assisted ventilation by mouth-to-mouth may be needed; where available an ambu bag is a better choice. Oxygen is not a substitute for adequate ventilation but it should always be given in the highest concentration possible in poisoning especially in carbon monoxide poisoning and other irritant gases. Respiratory stimulants do not help and are potentially dangerous.

C. Circulation

Hypotension or shock is common in severe poisoning especially with CNS depressants. The patients should be carried head down on a stretcher and must be in this position in the ambulance also. Oxygen should be given to relieve hypoxia and an IV infusion set up if necessary. Cardiac conduction defects and arrhythmias may occur in any acute poisoning, e.g. tricyclic antidepressants. If serious ventricular arrhythmias are confirmed by ECG, the injection lignocaine 2% IV will be needed (bolus and infusion).

Body temperature

Hypothermia may develop in patients who have been deeply unconscious for several hours. It is best treated by wrapping the patients to conserve body heat. Hyperthermia is initially managed by removing all unnecessary clothing. Sponging with tepid water will promote evaporation; iced water should not be used. Both hypothermia and hyperthermia require urgent hospitalization for assessment and supportive treatment.

Convulsions

Diazepam 10-20mg by slow IV injection should be given if convulsions are protracted or reoccurs frequently. The dose may be repeated after 30-60minutes if necessary. Child: 200-300mcg/kg-body weight.

Removal and Elimination

Removal from the stomach

The dangers of attempting to empty the stomach have to be balanced against the toxicity of the ingested poison. Gastric emptying is clearly unnecessary if the risk of toxicity is small or if the patients arrive too late. Emesis induced by ipecacuaha has been used in adults (30ml) and children (5-15ml), but there is no evidence that it presents clinically significant absorption. It should only be considered if the patient is fully conscious, if the poison ingested is neither corrosive nor a petroleum distillation or if it is not adsorbed by activated charcoal.

Prevention of absorption

Given by mouth; activated charcoal can bind many poisons thereby reducing their absorption. The sooner it is given, the more effective it is. The usual dose for activated charcoal is as follows is as follows: ADULT: 50g every 2-4 hours; CHILD: 10-15g ever 2-4 hours.

Other Poisons

Snake Bites and Insect Stings

SNAKE BITE may cause local and systemic effects like pain, swelling, tender enlargement of lymph nodes, angioedema, hypotension, diarrhoea, vomiting, acute renal failure, ECG abnormalities and systemic bleeding. Anti-snake venom serum, 10ml is given by slow IV. A further 10-20ml may be given after 2 hours or less.

INSECT STINGS from ants, bees, and wasps cause local pain and swelling. If the sting is in the mouth or on the tongue, marked swelling may cause airway obstruction. The stings from these insects are usually treated by cleaning the area, applying ice and if necessary local application of steroids. Anaphylactic reactions require treatment with IM adrenaline.

Specific Medicines

General care should be given as above, the first and foremost being active elimination by vomiting. Other signs and symptoms may be treated specifically as outlined. The “remarks” column indicates specific actions that need to be taken

Medicines	Signs and Symptoms	Remarks
Salicylates e.g. aspirin, methyl salicylate, salicylic acid	Fast breathing, fever and sweating, dry tongue, drowsiness, nausea and vomiting	Other ways to remove salicylates from the body is by making the urine alkaline by giving sodium bicarbonate or by haemodialysis
Atropine, antihistamines, ephedrine and related substances	**Antihistamines** - drowsiness, dry mouth, headache, nausea, fast pulse, shallow breathing (Child-wide pupils, shaking, high temp, fits) **Atropine** - red, dry skin, wide pupils, blurred vision, dry mouth, confusion, fast pulse, fever, fits **Ephedrine** - nausea, vomiting, headache, irritability, hallucinations, fever, fast pulse, high BP, wide pupils	Do not use chlorpromazine to treat agitated patients who are poisoned by atropine
Aminophylline and theophylline	Nausea and vomiting, fast pulse, restlessness, headache, sleeplessness, hallucinations, fast breathing, unconsciousness in some cases, vomiting blood, fits which may occur suddenly, low BP, irregular pulse	Haemodialysis may be indicated in severe poisoning
Amitriptyline, chloroquine and quinine	**Amitriptyline** - dry mouth, blurred vision, fast-irregular pulse, shallow breathing, fits, low BP, hallucinations & confusion **Chloroquine** (within 3 hrs) - vomiting, diarrhoea, headache, dizziness, fits, low BP, irregular pulse. (*NOTE* the patient may be very ill within 1 hr and may die within 2-3 hrs of taking the medicine*)	

Medicines	Signs and Symptoms	Remarks
	Quinine - nausea and vomiting, large pupils, blurred vision, dizziness, headache, fever, excitement, fast pulse, fits, low BP, blindness (partial or complete), unconsciousness	
Phenobarbital, chlorpromazine, haloperidol and benzodiazepines (diazepam, lorazepam, etc.)	**Phenobarbital** - drowsiness, unconsciousness (may last for many days), low temperature, low BP, shallow breathing, skin blisters between the fingers or on body/knees/ankles, no bowel sounds (means that the gut has stopped working and poisoning is serious) **Chlorpromazine and Haloperidol** - drowsiness, unconsciousness, low BP, low temperature, fast/irregular pulse, rigid/stiff limbs, abnormal eye movements **Benzodiazepines** - staggering walk, slurred speech, drowsiness, shallow breathing and unconsciousness	If the patient is an epileptic taking phenobarbital, wait 48 hrs after the patient has woken up before you start giving doses of phenobarbital again
Carbamazepine, phenytoin & valporic acid	**Carbamazepine** - dry mouth, aggressive behaviour, drowsiness, wide pupils, blurred vision, shallow breathing, irregular pulse, jerking movements, nausea, vomiting and diarrhoea **Phenytoin** - nausea, vomiting, drowsiness, slurred speech, blurred vision, the patient cannot walk properly **Valporic acid** - confusion, restlessness, shallow breathing, low BP and drowsiness	Neither haemodialysis nor forced diuresis is useful for treating poisoning with any of these medicines

Medicines	Signs and Symptoms	Remarks
Dapsone	Signs may be delayed up to 24 hrs after a single dose: blue colour to skin and lips, restlessness, drowsiness, nausea, vomiting and severe belly pain, low BP, fast breathing, hallucinations, fits	Oxygen is not useful for treating cyanosis due to dapsone; dapsone poisoning is worse in patients who are deficient in G6PD
Digoxin	Nausea, vomiting, drowsiness, low BP, irregular pulse, weakness, confusion and hallucinations	
Insulin	Anxiety, confusion, shaking, sweating without fever, fast pulse, blurred vision, drowsiness, fits	
Glyceryl trinitrate, hydralazine and beta-blockers	**GTN**- throbbing headache, warm face, dizziness, palpitations, low BP **Hydralazine** - warm skin, nausea and vomiting, headache, fast irregular pulse and low BP **Beta-blockers** - slow pulse, hallucinations, drowsiness, low BP, fits, unconsciousness, the heart and breathing may stop completely	For bronchospasm, give IV salbutamol or aminophylline
Ibuprofen	Nausea, vomiting, headache, abdominal pain, shaking, drowsiness	Very rarely kidney failure may occur after acute overdose
Iron containing medicines	**Within 6 hrs**: vomiting, belly pain, diarrhoea, stools may be coloured black by the iron or may be dark because they contain blood.	

Medicines	Signs and Symptoms	Remarks
	Within 12-48 hrs: low BP, yellow skin caused by liver damage, lung oedema, low output of urine and signs of kidney damage; patients may die from liver failure	
Isoniazid	Nausea, vomiting, stomach pain, large pupils, fever, fits, fat pulse, low BP, shallow breathing	
Magnesium hydroxide, magnesium sulphate and senna	Diarrhoea, vomiting, stomach pain, blood in stools, low BP, fast pulse, unconsciousness	It is not necessary to make the patient vomit
Opiates	Very small pupils, drowsiness then unconsciousness, slow breathing, twitching, fits, low body temp, low BP, lung oedema; the patient may suddenly stop breathing and die	
Oral contraceptives	Nausea and vomiting; girls over 4 years of age may have bleeding like a monthly period	There is no need to do anything
Paracetamol	**Within 24 hrs**: nausea, vomiting and belly pain **After 24-48 hrs**: pain on the right side of the belly **After 2-6 days**: yellow colour to skin and whites of eye showing that liver is damaged, vomiting, fast pulse, confusion, unconsciousness	

Medicines	Signs and Symptoms	Remarks
Penicillin and tetracyclines	**If the patient is not allergic**: nausea, vomiting, and diarrhoea. **If the patient is allergic**: itching, rash, difficulty in swallowing, swelling around the eyes, weakness, dizziness, chest pain, weak pulse, low BP, unconsciousness. In severe cases, encephalopathy may occur	
Proguanil	Nausea, vomiting, diarrhoea, blood in the urine	
Rifampicin	Orange-red colour in the skin, urine, faeces, sweat, tears, itching and swelling of the face, nausea, vomiting, belly pain, lethargy, fits, signs of liver and kidney damage	
Salbutamol	Excitement, agitation, hallucinations, fast pulse, shaking, fits, lung oedema	Severe arrhythmias can be treated with slow IV injection of propranolol

Appendix 5: Equivalent analgesic dose

When changing medicines, equi-analgesic doses must be considered. It is wise to start at a lower dose than that indicated in the table because there may be incomplete cross-tolerance between opioids. Titrate the dose upwards depending on assessment of pain control. Use breakthrough doses of opioid as well, if required, to establish adequate analgesia.

Medicine (action at opioid receptors)	Dose equivalent to 10mg IM/SC morphine	Approx. duration of action	Active metabolite	Dose adjustment in renal Impairment	Clinical use
Codeine(agonist)	130mg IM; 200mg oral	3 - 4 hours	Morphine	Yes	Mild to moderate pain; do not exceed 60mg single dose
Morphine(agonist)	30mg oral	2 - 3 hours; controlled release 12 - 24 hours	Morphine 6 glucuronide (M6G), morphine 3 glucuronide (M3G)	Yes	M6G produces analgesia and some adverse effects; M3G is neuroexcitatory and can cause delirium
Pethidine (agonist)	75- 100mg IM/SC	2 - 3 hours	Norpethidine (CNS excitation)	Yes; contraindicated in renal failure	Use not recommended
Tramadol(agonist)	40 - 50mg IM;100mg oral	3 - 6 hours	Desmethyl tramadol	Yes	Moderate to severe pain

Appendix 6: Compounding formulae

Labelling instructions

Following details should be included in the label to be pasted on the container for extemporaneous liquid dosage forms:

1. Name and strength of the medicine
2. Expiry
3. "Shake well before use"
4. Prepared by.

PART A: EXTERNAL PREPARATIONS

1. Magnesium sulphate paste

Magnesium sulphate	**75g**
White soft paraffin	**25g**

Expiry: 6 months

Directions:

- Weigh magnesium sulphate and grind to a fine powder
- Weigh the white soft paraffin and gradually mix with the powder

Use: to draw pus from boils and infected wounds

2. Methyl salicylate (M/S) ointment

Methyl salicylate	**6ml**
White soft paraffin	**100mg**

Expiry: 1 year

Directions:

- Weigh the white soft paraffin
- Measure methyl salicylate and add gradually to the paraffin

Use: to be applied by rubbing on the site of muscular pain

3. Potassium permanganate 1:1000 Solution

Potassium permanganate	**1g**
Water	**to 1000ml**

Expiry: 10 days

Directions:

- Wash the bottle and mark for 1000ml
- Weigh the potassium permanganate and add 250ml of water to it; stir well
- Add to the bottle and use more water to dissolve the remaining crystals
- Add water to make up to 1000 ml

Use: cleaning of ulcers and abscesses, wet dressing; for gargle or mouthwash, it should be diluted 1 in 4

4. Salicylic acid 40% ointment

Salicylic Acid	**40g**
White Soft Paraffin	**60g**

Expiry: 6 months

Directions:

- Weigh the salicylic acid and grind to a fine powder
- Weigh white soft paraffin and gradually mix with the powder using a spatula

Use: warts (apply to the warts only, 3 times a day; protect the skin around it with vaseline

5. Sulphur 10% ointment

Sulphur	**10g**
White soft paraffin	**90g**

Expiry: 6 months

Directions:

- Weigh the sulphur powder and white soft paraffin
- Gradually mix together using a spatula

Use: antiseptic; treatment of scabies

6. Tincture iodine

Iodine	**20g**
Potassium iodide	**24g**
Spirit	**500ml**
Water	**to 1000ml**

Expiry: 6 months

Directions:

- Wash the bottle and mark 1000ml on it
- Measure the spirit
- Weigh iodine and potassium iodide and mix with a little spirit
- Add to the bottle and add the rest of the spirit
- Add water up to 1000ml

Use: antiseptic

7. Gentamycin 0.3% ointment

Gentamycin	**300mg (7. 5ml)**
White soft paraffin	**100g**

Expiry: 14 days

Directions:

- Measure gentamycin
- Weigh the white soft paraffin and mix well with the gentamycin

Use: bed sores and other infected wounds which are resistant to other antibiotics

8. Whitfield's ointment

Benzoic acid	**12g**
Salicylic acid	**6g**
White soft paraffin	**182g**

Expiry: 6 months

Directions:

- Weigh the benzoic acid and salicylic acid, grind together
- Weigh the white soft paraffin and gradually mix with the powders

Use: fungal infections (ringworms); apply 2-3 times daily for at least 2 weeks

9. Zinc oxide 15% ointment

Zinc oxide	**15g**
White soft paraffin	**85g**

Expiry: 6 months

Directions:

- Weigh the zinc oxide
- Weight the white soft paraffin and gradually mix with the powder

Use: to protect the skin and relieve skin irritation

10. Calamine lotion

Calamine	**80g**
Zinc oxide	**80g**
Water	**to 1000ml**

Expiry: 14 days

Directions:

- Wash the bottle and mark 1000ml on it
- Weigh the calamine and zinc oxide powder; mix well with a little water
- Rinse the container several times with water and add the mixture to it
- Add water to make up to 1000ml

Use: antipruritic (to relieve itching)

11. Calamine ointment

Calamine	**4g**
Zinc oxide	**3g**
White soft paraffin	**93g**

Expiry: 6 months

Directions:

- Weigh calamine and zinc oxide
- Weigh the white soft paraffin and gradually mix with the powders

Use: antipruritic (to relieve itching)

12. Coal tar and salicylic acid ointment

Coal tar solution	**6ml (7g)**
Salicylic acid	**2g**
White soft paraffin	**91g**

Expiry: 6 months

Directions:

- Weigh the salicylic acid and grind
- Weigh the white soft paraffin and gradually mix with the powder
- Measure coal tar solution and mix into the ointment

Use: psoriasis and other scaly skin conditions

13. Salicylic acid 2% ointment

Salicylic acid	**2g**
White soft paraffin	**98g**

Expiry: 6 months

Directions:

- Weigh the salicylic acid and grind
- Weigh the white soft paraffin and gradually mix with the powder

Use: to breakdown hard scaly skin

14. Boric acid 1% and zinc oxide ointment

Boric acid	**2.4g**
Zinc oxide	**34g**
White soft paraffin	**206g**

Expiry: 6 months

Directions:

- Weigh boric acid and zinc oxide and mix well
- Weigh white soft paraffin and gradually mix with the powder

Use: mild antiseptic and soothing ointment

15. Boroglycerine 10% paint

Boric acid	**10g**
Glycerine	**100ml**

Expiry: 6 months

Directions:

- Clean and measure the bottle
- Weigh boric acid and grind to a fine powder. Gradually add glycerine, mix well
- Add to the bottle and rinse the mortar until all the glycerine is added

Use: mild antiseptic for mouth lesions

16. Sodium bicarbonate 5% ear drops

Sodium bicarbonate	**5g**
Glycerine	**30ml**
Water	**to 100ml**

Expiry: 1 month

Directions:

- Wash the bottle and mark 100ml on it
- Weigh sodium bicarbonate and dissolve in a little hot water; add to the bottle
- Add glycerine
- Add water up to 100ml

Use: to soften wax; put into ear at night for 3 nights

17. Compound podophylline paint 15%

Podophylline resin	**15g**
Compound benzoin tincture	**to 100ml**

Expiry: 6 months

Directions:

- Wash the bottle and mark 100ml on it
- Weigh the podophylline resin and mix well with a little compound benzoin tincture
- Add to the bottle and rinse the mortar several times with benzoin tincture
- Add benzoin tincture up to 100ml

Use: genital warts

Cautions: *podophylline is irritant to the skin and eyes; use with care. Apply only to the wart and protect the surrounding skin with vaseline*

18. Salicylic acid 2% ear drops

Salicylic acid	**0.2g**
Spirit	**5ml**
Water	**to 10ml**

Expiry: 10 days

Directions:

- Weigh the salicylic acid and grind in a mortar
- Add spirit and then dissolve

Use: *Dermatitis* of the ear

19. Chlorine 0.1% solution

If using bleaching powder calculate the ratio of bleach to water by using the following formula:

% chlorine desired X 1000 = % chlorine in bleaching powder
No of gm of powder in 1 litre of water

Example: To make 0.1% Chlorine solution from calcium hypochlorite powder containing 30% active Chlorine

0.1% / 30% x 1000 = 3.3

Therefore, we must dissolve 3.3gms of chlorine hypochlorite (30%) in each litre of water used to make 0.1% chlorine solution

PART B: INTERNAL PREPRATIONS

Note: for internal medicines boiled and filtered water should be used

1. Lugol's iodine (aqueous iodine solution)

Iodine	**5g**
Potassium iodide	**10g**
Water	**to 100ml**

Expiry: 6 months

Directions:

- Clean and mark the bottle at 100ml
- Weigh iodine and potassium iodide; grind and dissolve in a little water
- Add to the bottle and add water to make it up to 100ml

Use: iodine supplements (1ml about 20 drops daily in water); use a glass bottle

2. Potassium chloride 10% mixture

Syrup	**200ml**
Potassium chloride	**100g**
Chloroform spirit (5%)	**50ml**
Water	**to 1000ml**

Expiry: 14 days

Directions:

- Wash the bottle and mark 1000ml on it
- Weigh KCl, grind and dissolve in a little water; add to the bottle
- Add chloroform spirit
- Add water to make up to 1000ml

Use: potassium supplement

3. Nystatin paste

Nystatin	**4 tablets**
Glycerine	**10ml**

Expiry: 6 months

Directions:

1. Crush the nystatin tablets and mix with 10ml hot glycerine
2. Add to the bottle; rinse the mortar with 10ml glycerine and add

Use: fungal infection of the mouth (1ml applied in the mouth 4 times a day, after meals)

4. Sugar syrup

Sugar	**5kg**
Benzoic acid	**6g**
Water	**to 6 litres**

Expiry: 14 days

Directions:

1. Boil sugar in water until it dissolves
2. Add benzoic acid, as a preservative
3. Add water to make up to 6000ml

Use: flavouring agent, preservative, vehicle for medicines

5. Magnesium sulphate syrup

Magnesium sulphate	**500mg**
Light magnesium carbonate	**50mg**
Chloroform spirit	**0.25ml**
Syrup	**0.5ml**
Peppermint spirit	**0.025ml**
Water	**to 5ml**

Expiry: 14 days

Directions:

1. Clean and mark the bottle
2. Weigh and dissolve magnesium sulphate in boiling water; add to the bottle
3. Weigh light magnesium carbonate and mix with water; add to the bottle
4. Measure the other liquids and add
5. Add water to make up to 5ml

Use: magnesium supplement

6. Deriphylline syrup

Deriphylline (300mg tab)	**1 tablet**
Syrup	**40ml**
Boiled and cooled water	**to 150 ml**

Each 5ml contains 10mg deriphylline

Expiry: 14 days

7. Digoxin syrup

Digoxin (0.25mg tab)	**5 tablets**
Syrup	**5ml**
Water	**to 25ml**

Each ml contains 0.05mg digoxin

Expiry: 14 days

8. Furosemide syrup

Furosemide (40mg tab)	**20 tablets**
Chloroform spirit	**1 drop**
Syrup	20ml
Water	**to 80ml**

Each ml contains 10mg furosemide

Expiry: 14 days

9. Metoclopramide syrup

Metoclopramide (10mg tab)	**10 tablets**
Syrup	**20ml**
Chloroform spirit	**2 drops**
Water	**to 100ml**

Each ml contains 1 mg metoclopramide

Expiry: 14 days

10. Paracetamol syrup

Paracetamol (500mg)	**200 tablets**
Syrup	**400ml**
Chloroform spirit	**20 drops**
Water	**to 1000ml**

Each ml contains 100mg paracetamol

Expiry: 14 days

11. Promethazine syrup

Promethazine (10mg)	**250 tablets**
Syrup	**150ml**
Chloroform spirit	**10 drops**
Water	**to 500ml**

Each ml contains 5mg promethazine

Expiry: 14 days

12. Isoniazid syrup

Isoniazid (300mg tab)	**2.5 tablets**
Syrup	**2.5ml**
Chloroform spirit	2 drops
Water	**to 10ml**

Each ml contains 75mg isoniazid

Expiry: 14 days

Isoniazid (100mg)	**22.5 tablets**
Syrup	**10ml**
Chloroform Spirit	**3 drops**
Water	**to 75ml**

Each ml contains 30mg isoniazid

Expiry: 14 days

13. Calcium lactate syrup

Calcium lactate (300mg)	**14 tablets**
Syrups	**30ml**
Chloroform spirit	**3 drops**
Water	**to 100ml**

Each 5ml contains 200mg calcium lactate

Expiry: 14 days

14. Zinc sulphate solution

Zinc sulphate 20mg	**10 tablets**
Syrup	**20ml**
Water	**to 100ml**

Each 5ml contains 10mg elemental zinc

Expiry: 14 days

15. Warfarin syrup

Warfarin (5mg tab)	**1.5 tablets**
Syrup	**10ml**
Chloroform spirit	2 drops
Water	**to 75ml**

Each 5ml contains 0.5mg warfarin

Expiry: 14 days

16. Rifampicin syrup

Rifampicin (150mg)	**3 tablets**
Syrup	**10ml**
Chloroform spirit	**3 drops**
Water	**to 75ml**

Each 5ml contains 30mg rifampicin

Expiry: 14 days

17. Amoxicillin syrup

Amoxicillin (250mg)	**50 capsules**
Sugar syrup	**20ml**
Water	**to 100ml**

Each ml contains 125mg amoxycillin

Expiry: 14 days

18. Phenytoin syrup

Phenytoin (100mg)	**50 tablets**
Syrup	**20ml**
Water	**to 100ml**

Each ml contains 50mg phenytoin

Expiry: 14 days

19. Acetazolamide syrup

Acetazolamide (250mg)	**50 tablets**
Syrup	**20ml**
Chloroform spirit	**5 drops**
Water	**to 100ml**

Each ml contains 50mg acetazolamide

Expiry: 14 days

20. Cotrimoxazole syrup

Cotrimoxazole (480mg)	**50 tablets**
Syrup	**20ml**
Water	**to 100ml**

Each ml contains 240mg cotrimoxazole

Expiry: 14 days

21. Erythromycin syrup

Erythromycin (250mg)	**50 tablets**
Syrup	**20ml**
Water	**to 100ml**

Each ml contains 125mg erythromycin

Expiry: 14 days

22. Pyridoxine syrup

Pyridoxine (25mg)	**100 tablets**
Syrup	**20ml**
Water	**to 100ml**

Each ml contains 25mg pyridoxine

Expiry: 14 days

23. Cephalexin syrup

Cephalexin (250mg)	**50 capsules**

Syrup	**20ml**
Water	**to 100ml**

Each ml contains 125mg cephalexin

Expiry: 14 days

24. Phenobarbitone syrup

Phenobarbitone (30mg)	**50 tablets**
Syrup	**20ml**
Water	**to 100ml**

Each ml contains 15mg phenobarbitone

Expiry: 14 days

25. Sodium citrate 0.3M solution

Sodium citrate powder	**7.74 g**
Citric acid	**5g**
Syrup	**25ml**
Water	**to 100ml**

Expiry: 14 days

Use: Give 15ml stat prior to c-section and prevent acid aspiration syndrome.

Appendix 7: Medicines in pregnancy and lactation

Pregnancy categories of medicines (As per United States FDA categorization)

Category A: adequate and well controlled studies have failed to demonstrate a risk to fetus in the first trimester of pregnancy (and there is no evidence of risk in later trimesters)

Category B: animal reproduction studies have failed to demonstrate a risk to the fetus and there are no adequate and well controlled studies in pregnant women or animal studies have shown and adverse effect, but adequate and well controlled studies in pregnant women have failed to demonstrate a risk to fetus in any trimester

Category C: animal reproduction studies have shown an adverse effect on the fetus and there are no adequate and well controlled studies in human, but potential benefits may warrant use of the medicine in pregnant women despite potential risks

Category D: there is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience or studies in humans, but potential benefits may warrant use of the medicine in pregnant women despite potential risks

Category X: studies in animals or humans have demonstrated fetal abnormalities and/or there is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience, and the risk involved in the use of medicine in pregnant women clearly out weight potential benefits

Table of medicines use in pregnancy and lactation

MEDICINE	PREGNANCY CATEGORY	LACTATION
Acetazolamide	C	Excreted in milk; not recommended
Acetylcysteine	B	Excretion unknown; use with caution
Acyclovir (topical)	B	Excretion unknown; systemic exposure minimal after tropical application
Acyclovir (oral)	B	Excreted in milk; use with caution
Adenosine	C	Potential for serious adverse reaction in nursing infants; decision to interrupt nursing after administration of adenosine or not should take into account the importance of medicine to mother

MEDICINE	PREGNANCY CATEGORY	LACTATION
Adrenaline	C	Excretion unknown; use with caution
Albendazole	C	Excretion unknown; use with caution
Allopurinol	C	Excreted in milk; use with caution
Aluminium hydroxide + Magnesium hydroxide	C	Excreted in milk; use with caution
Amikacin	D	Excretion unknown; not recommended
Amino acid solution	C	Excretion unknown
Amiodarone	D	Excreted in milk; not recommended
Amitriptylline	C	Excreted in milk; do not feed
Amlodipine	C	Excretion unknown; not recommended
Amoxicillin	B	Excreted in milk; use with caution
Ampicillin	B	Excreted in milk; use with caution
Antihaemorrhoidal ointment	C	Insufficient systemic absorption to produce detectable quantities in human milk; use with caution
Antisnake venom serum	NA	
Coartem®	C	Excretion unknown; use with caution
Artemether	X	Excretion unknown
Aspirin	C; D in 3rd trimester	Excreted in milk; decision should be made whether to discontinue feeding or medicine taking into account the importance of medicine to mother

MEDICINE	PREGNANCY CATEGORY	LACTATION
Atenolol	D	Excreted in milk; neonates born to mothers who are receiving atenolol at parturltion or breast feeding may be at risk for hypoglycemia and bradycardia; use with caution
Atorvastatin	X	Excreted in milk; do not feed
Atracurium besylate	C	Excretion in milk unknown; use with caution
Atropine sulphate	C	Excreted in breast; use with caution
Baclofen	C	Excreted in milk: not recommended
BCG vaccine	C	Excretion unkonwn;not recommended
Beclomethasone dipropionate	C	Excreted in milk; use only if benefits greatly out weight the risk
Benzathine benzylpenicillin	B	Excreted in milk; use with caution
Benzoic acid powder	C	Excreted in milk; use with caution
Benzylpenicillin	B	Excreted in milk
Betamethasone valerate (topical)	C	Excreted in milk; use with caution
Brimonidine eye drop	C	Excretion unknown; use only if the benefits out weight risk
Budesonide nasal spray	B	Excreted in milk; use only if the benefits out weight risk
Bupivacaine	C	Excretion unkonwn; not recommended
Caffiene Citrate	C; crosses placenta, can remain in fetus or neonates 64 to 300hrs	Excreted in milk; use with caution

MEDICINE	PREGNANCY CATEGORY	LACTATION
Calcium carbonate with Vit D3	C	Excreted in milk; safe
Calcium gluconate	C	Excreted in milk; use with caution
Calcium lactate	C	Excreted in milk; safe
Carbamazepine	D	Excreted in milk; not recommended
Carbimazole	C	NA
Carvedilol	C; D in 2nd and 3rd trimester	Excretion unknown; not recommended
Cefixime	B	Excretion unknown
Cefotaxime	B	Excreted in milk; use with caution
Ceftriaxone	B	Excreted in milk; use with caution
Cephalexin	B	Excreted in milk; use with caution
Cephazolin	B	Excreted in milk; use with caution
Cetirizine	B	Excreted in milk; not recommended
Chloramphenicol (ophthalmic)	C	Excreted in milk; do not feed
Chloramphenicol	C	Excreted in milk; do not feed
Chloroquine	Uncategorized	Excreted in milk; not recommended
Chlorpromazine	C; exposure during 3rd trimester of pregnancy are at risk for EPS or withdrawal symptoms after delivery	Excreted in milk; not recommended

MEDICINE	PREGNANCY CATEGORY	LACTATION
Ciprofloxacin (ophthalmic)	C	Excreted in milk; not recommended
Ciprofloxacin	C	Excreted in milk; not recommended
Clarithromycin	C	Excreted in milk; use with caution
Clobazam	C	Excreted in milk; effect on infants unknown
Clobetasol propionate (topical)	C	Excretion unknown; use with caution
Clofazimine	C	Excreted in milk; do not administer to breast feeding women unless clearly indicated
Clomiphene	X	Excretion unknown; use with caution
Clonazepam	D	Excreted in milk; not recommended
Clonidine	C	Excreted in milk; use with caution
Clopidogrel	B	Excretion unknown; not recommended
Clotrimazole (topical)	B (during 2nd and 3rd trimester; safety in 1st trimester is not established)	Excretion unknown; use with caution
Clotrimazole (as pessary)	B (during 2nd and 3rd trimester; safety in 1st trimester is not established)	Excretion unknown; use with caution
Cloxacillin	B	
Codeine phosphate	C; D if used for prolong periods or near term	Excreted in milk; use with caution
Compound benzoin inhalation	B	

MEDICINE	PREGNANCY CATEGORY	LACTATION
Compound solution of sodium lactate	C	Excretion unknown; use with caution
Conjugated oestrogen	X	
Cotrimoxazole	D	Avoid; near term kernicterus in the new born.
Cyclopentolate (ophthalmic)	C	Excretion in milk unknown; use with caution
Cyclophosphamide	D	Drug excreted in milk; donot feed
Cycloserine	C	Safe
Cyclosporin	C	Excreted in breast milk; do not feed
Dapsone	C	Excreted in breast milk; not safe
Deflazacort	C	
Dexamethasone 4mg tab	C	Excreted in breast milk; not recommended
Dextrose	A; maternal or fetal hyperglycemia may occur during labour and delivery; monitor	Excretion in milk unknown; use with caution
Diazepam	D	Excreted in breast milk; not recommended
Diclofenac Sodium	C; D if >30 weeks after gestation	Excreted in breast milk; not recommended
Dicyclomine	B	Excreted in breast milk; not recommended
Digoxin	C	Excreted in breast milk; use with caution
Diltazem	C	Not safe; decision should be made either to discontinue medicine or feeding taking into account importance of medicine to mother

MEDICINE	PREGNANCY CATEGORY	LACTATION
Dopamine	C	Excretion unknown; use with caution
Doxorubicin	D	Excreted in breast milk; not recommended
Doxycycline	D	Excreted in breast milk; not recommended
Efavirenz	D	Excretion unknown; donot feed
Enalapril	C: 1st trimester; D; 2nd and 3rd trimester	Excreted in breast milk; not recommended
Ephedrine	C	Excreted in breast milk; not recommended
Ergotamine tartrate + Caffeine	X	Excreted in breast milk; do not feed
Erythromycin	B	Excreted in breast milk; use with caution
Ethambutol	B	Excreted in breast milk; use with caution
Ethinyloestradiol	X	
Ethionamide	C	Excretion unknown; use with caution
Etofylline +Theophylline	C	Excreted in breast milk; serious adverse effects in infants are unlikely unless mother has a toxic serum theophylline concentration
Fenofibrate 200mg tab	C	Excretion unknown; not recommended
Fentanyl citrate	C	Excreted in breast milk; not recommended
Ferrous sulphate + Folic acid	A	Excreted in breast milk; safe
Finasteride 5mg tab	X	NA
Fluconazole	D	Excreted in breast milk; use with caution
Fluconazole (topical)	D	

MEDICINE	PREGNANCY CATEGORY	LACTATION
Fluorouracil	D	Excretion unknown; do not feed
Fluoxetine	C	Excreted in breast milk; not recommended
Fluphenazine	C	Excreted in breast milk; not recommended
Folic acid	A	Excreted in breast milk; safe
Furosemide	C: close monitoring of fetal growth required because of risk for higher fetal birth weights	Excreted in breast milk; use with caution, may inhibit lactation
Gabapentin	C	Excreted in breast milk; use with caution
Gamma benzene hexachloride	No information available	No information available
Gentamicin	D	Excreted in breast milk; use with caution
Glipizide	C	Excretion unknown; not recommended
Glycerin suppository	C	Excretion unknown; probably compatible with feeding
Griseofulvin	X	Excretion unknown; do not feed
Haloperidol	C: neonates exposed to antipsychotic drugs during 3rd trimester of pregnancy are at risk of extrapyramidal or withdrawal symptoms after delivery	Excreted in breast milk; not recommended
Halothane inhalation		

MEDICINE	PREGNANCY CATEGORY	LACTATION
Hepatitis B vaccine	C	Excretion unknown
Homatropine (ophthalmic)	C	Excretion unknown; not recommended
Human Insulin (soluble)	B	Safe
Human Insulin (Isophane)	B	Safe
Human papiloma vaccine	B; not recommended for use in pregnant women	Excretion unknown; not recommended.
Human rabies immunoglobulin (HRIG	C	No adverse events reported; may be excreted in breast milk
Hyaluronidase	C	Excretion unknown; use with caution
Hydralazine	C	Excreted in breast milk; use with caution
Hydrochlorothiazide	B	Excreted in breast milk; use with caution
Hydrocortisone (topical)	C	Excreted in breast milk; use with caution
Hydrocortisone sodium succinate	C	Excreted in breast milk; use with caution
Hydroxychloroquine	C	Excreted in breast milk; safe to feed
Ibandronate	C	Excretion unknown; use with caution
Ibuprofen	C; D at ≥ 30 weeks gestation; may cause premature closure of ductus arteriosus	Excreted in breast milk; not recommended
Indomethacin	C; D at ≥ 30 weeks gestation; may cause premature closure of ductus arteriosus.	Excreted in breast milk; not recommended

MEDICINE	PREGNANCY CATEGORY	LACTATION
Iodine	Not studied	Excreted in breast milk; use with caution
Iohexol	B	Excretion unknown; not recommended
Enoxaparin	B	Excretion unknown; not recommended
Ipratropium respiratory	B	Excretion unknown; not recommended
Isoflurane inhalation	C	Use with caution
Isoniazid	C	Excreted in milk; safe
Isoprenaline		
Isosorbide dinitrate	C	Excretion unknown; not recommended
Kanamycin	D	Usually compatible
Ketamine	C	Excretion unknown; not recommended
Ketorolac (ophthalmic)	C; D in 3rd trimester (may cause premature closure of ductus arteriosus)	Excreted in milk; contraindicated
Lactulose	B	Excretion unknown; use with caution
Lamivudine	C	HIV+ women are advised not to breast feed
Lamotrigine	C	Excreted in milk; use with caution
Levetiracetam	C	Excretion unknown; not recommended
Levodopa + Carbidopa	C	Inhibits lactation; use with caution
Levofloxacin	C	Excretion unknown; not recommended
Levonorgestrel + Ethinyloestradiol	X	Excreted in milk; lactation inhibited; use with caution

MEDICINE	PREGNANCY CATEGORY	LACTATION
Levonorgestrel	X	Not recommended
Lignocaine	B	Excreted in milk; use with caution
Lignocaine + Adrenaline	C	Excretion unknown; use with caution
Lopinavir with ritonavir	C; increased risk for congenital adrenal hpyerplasia	Excretion unknown; HIV+ women should not breast feed anyway
Lorazepam	D	Excreted in milk; not recommended.
Losartan	D; use during 2nd and 3rd trimester reduces renal function and increases fetal morbidity and death	Excretion unknown; not recommended
Magnesium sulphate	D; fetal skeletal demineralizatin, hypocalcemia and hypermagnesia	Safe
Mannitol	C	Use with caution
Measles Rubella vaccine	C	Excretion unknown
Medroxyprogesterone acetate	X	Safe
Mefenamic acid	C; D if used for prolong periods, or near term (premature closure of ductus arteriosus)	Excreted in milk; contraindicated
Metformin	B	Excretion unknown; not recommended

MEDICINE	PREGNANCY CATEGORY	LACTATION
Methotrexate	X	Excreted in milk; do not feed
Methoxsalen (topical)	C	Excretion unknown; use with caution
Methylprednisolone	C	Excreted in milk; use with caution
Methyl salicylate (topical)	C	Excretion unknown
Methyldopa	B	Excreted in milk at low concentration; compatible with feeding
Methylergometrine	C	Excreted in milk; adverse effect on nursing infants; may inhibit lactation; not recommended or wait at least 12hrs after last dose to breastfeed
Metoclopramide	B	Excreted in milk; use with caution
Metoprolol	C	Excreted in milk; use with caution
Metronidazole	B	Excreted in milk; not recommended
Midazolam	D; should be avoided in 1st trimester due increased risk of congenital malformation	Excreted in milk; use with caution
Misoprostol	X	Excreted in breast milk; use with caution
Morphine	C; D if used near term	Excreted in milk; not recommended
Moxifloxacin (ophthalmic)	C	Excretion unknown; do not feed
Multivitamin	A	Safe
Mycophenolate mofetil	D	Excretion unknown; not recommended

MEDICINE	PREGNANCY CATEGORY	LACTATION
Naloxone	C	Excretion unknown; use with caution
Neomycin + Polymixin + Bacitracin (topical)	C	Excretion unknown; use with caution
Neostigmine	Unknown; use with caution	Excretion unknown; use with caution
Nevirapine	C	HIV+ women are not advised to feed
Niclosamide		
Nifedipine	C	Excreted in milk; safe
Nitrofurantoin	B; but contraindicated in 3rd trimester	Excretion milk; do not feed
Nitrofurazone		
Nitroglycerin	C	Excretion unknown; use with caution
Norethisterone	X	Excretion unknown; use with caution
Norfloxacin	C; crosses placenta	Excreted in milk; do not feed
Nystatin	C	Excretion unknown; use with caution
Olanzapine	C; exposure during 3rd trimester increases the risk for EPS or withdrawal symptoms after delivery	Excretion unknown; not recommended
Omeprazole	C	Excreted in milk; use with caution
Omnipaque	B	Excretion unknown; not recommended
Ondansetron	B	Excretion unknown; use with caution
Oral polio vaccine	B	Excretion unknown

MEDICINE	PREGNANCY CATEGORY	LACTATION
Oxybutynin	B	Excretion unknown; use with caution
Oxygen	NA	
Oxymetazoline (ophthalmic)	C	Excretion unknown
Oxytocin	X	May be excreted in milk, commencement of feeding should be delayed for at least one day when discontinued, use with caution
Paracetamol	B; crosses placenta, safe to use in all stage of pregnancy for a short term	Excreted in milk; use with caution
Penicillin V	B	Excreted in milk; safe
Pentoxifylline	C	Excreted in milk; do not feed
Pethidine	B; use for prolonged periods or near term not estabilished	Excreted in milk; not recommend
Phenobarbitone	D	Do not feed
Phenylephrine	C	Safe
Phenytoin	D; prenatal exposure may increase the risk for congenital malformation and other adverse development outcomes; risk of fetal hydantion syndrome	Excreted in milk; not recommended
Phytomenadione	C	Excreted in milk; use with caution

MEDICINE	PREGNANCY CATEGORY	LACTATION
Pilocarpine (ophthalmic)	C	Excretion unknown; use with caution
Pioglitazone	C	Excretion unknown; do not feed
Podophyllum	X	Excretion unknown; do not feed
Potassium chloride	C	NA
Potassium iodide	D; increased risk of thyroid suppression in fetus	Excreted in milk
Povidone Iodine Solution (topical)	B	
Pralidoxime	C	NA
Prednisolone	C	Excreted in milk; use with caution
Procaine Benzylpenicillin	B	Excreted in milk; use with caution
Promethazine	C	Excretion unknown; do not feed
Propofol	B	Excreted in milk; effect on nursing infant unknown
Propranolol	C; intrauterine growth retardation, small placentas and congenital abnormalities reported but no adequate and well controlled studies conducted	Use is controversial;amount excreted in milk insignificant
Protamine sulphate	C	Excretion unknown
Pyrazinamide	C	Excreted in milk
Pyridoxine	A; C when exceeded RDA	Safe

MEDICINE	PREGNANCY CATEGORY	LACTATION
	recommendation.	
Quetiapine	C; exposure during 3rd trimester are at risk for EPS or withdrawal symptom after delivery	Excreted in milk; not recommended
Quinine	X; 1st trimester	Excreted in milk
Ranitidine	B	Excreted in milk; use with caution
Retinol	A(oral); C (doses exceeding RDA); X (above 6000 units/day administered parenterally)	Excreted in milk; safe at RDA levels
Rifampicin	C; reported to cross placental barrier; congenintal malformation	Excreted in milk
Risperidone	C; exposure during third trimester are at risk for EPS or withdrawal symptoms after delivery.	Excreted in milk; do not feed
Salbutamol	C	NA
Salmeterol + Fluticasone MDI	C	Excretion unknown; use with caution (salmeterol plasma levels very low following inhalation
Salicylic acid powder	C	NA
Senna	C	Not excreted in milk; compatible

MEDICINE	PREGNANCY CATEGORY	LACTATION
Silver sulphadiazine (topical)	C; X (near term)	Excretion unknown; use with caution
Sodium bicarbonate	C	Excretion unknown
Sodium chloride	A	Not excreted in milk; safe
Sodium citrate	C	NA
Sodium cromoglycate (ophthalmic)	B	Excretion unknown; use with caution
Sodium valproate	D; known to cause neural tube defects	Excreted in milk; use with caution
Spironolactone	C	Excretion unknown; do not feed
Streptomycin	D	Excreted in milk; compatible to feed
Sulphur sublime (topical)	C	Insufficient data; medicine absorbed through intact and broken skin
Suxamethonium	C	Excretion unknown; effect on nursing infant unknown
Tacrolimus	C	Excreted in milk; not recommended
Tamsulosin	B	NA
Tenofovir	B	HIV+ women are advised not to feed
Tetanus immunoglobulin	C	Excretion unknown; no adverse effect reported
Tetatus Diptheria (Td)	C	Excretion unknown; use with caution.
Thiamine	A; C(if >RDA)	safe
Thiopental sodium	C	NA
Thyroxine	A	Excreted in milk; use with caution
Timolol maleate (ophthalmic)	C	Excreted in milk; do not feed

MEDICINE	PREGNANCY CATEGORY	LACTATION
Tobramycin (ophthalmic)	B	Excretion unknown; do not feed
Tramadol	C	Excreted in milk; not recommended
Tranexamic acid	Not indicated in pregnant women	
Triamcinolone acetonide	C	Excretion unknown; use with caution
Trihexyphenidyl 2mg tab.	C	No data, may inhibit lactation
Tropicamide	C	Excretion unknown
Tropicamide + Phenylephrine	C	Excretion unknown
Vancomycin	C (injection); B (oral)	Excretion unknown; not recommended
Vecuronium	C	Excretion unknown; use with caution
Venlafaxine	C	Excreted in milk; not recommended
Verapamil	C	Excreted in milk; not recommended
Vincristine	D	Excretion unknown; do not feed
Visipaque	B	Excretion unknown; not recommended
Vitamin B complex	A (not exceeding RDA)	Safe
Vitamin B12	A; C (for doses exceeding RDA and for intranasal products)	Excreted in milk; safe
Vitamin C	A; C (dose exceeding RDA)	Excreted in milk; safe
Warfarin	D (for women with	Because of potential serious adverse reactions,

MEDICINE	PREGNANCY CATEGORY	LACTATION
	mechanical heart valves who are at risk for thromboemboli sm); X for other pregnant population	including bleeding in breast fed infant, consider developmental and health benefits breast feeding along with mother's clinical need for therapy; monitor breast fed infant for bruising or bleeding
Zidovudine 300mg tab	C	HIV + women are advised not to feed
Zinc oxide powder 450g	C	Excretion unknown
Zinc sulphate 20mg tab	A	Excreted in milk; use with caution

Appendix 8: Renal Impairment

Table of medicines to be avoided or used with caution in renal impairment

Medicine	Degree of impairment	Comment
Acetazolamide	Mild	Avoid; metabolic acidosis
Acetylsalicylic Acid	Severe	Avoid; sodium and water retention; deterioration in renal function; increased risk of GI bleeding
Acyclovir	Mild	Reduce intravenous dose
	Moderate to severe	Reduce dose
Allopurinol	Moderate to severe	100-200mg daily; increased toxicity; rashes 100mg on alternate days (max 100 mg daily)
Aluminium Hydroxide	Severe	Aluminium is absorbed & may accumulate
Amikacin	Mild	Reduce dose (individualized dosing)
Amoxicillin	Severe	Reduce dose; rashes more common
Ampicillin	Severe	Reduce dose; rashes more common
Artemether + Lumefantrine	Severe	Caution; monitor ECG & plasma potassium
Atenolol	Moderate	Reduce dose (excreted unchanged); start with small dose; higher plasma conc. after oral administration
	Severe	may reduce renal blood flow and adversely affect renal function
Baclofen	Severe	Avoid

Medicine	Degree of impairment	Comment
	Mild to moderate	Reduce dose
Benzathine Benzylpenicillin	Severe	Neurotoxicity-high doses may cause convulsions
Benzyl Penicillin	Severe	Max 6g daily; Neurotoxicity-high dose may cause convulsions
Carbamazepine		Manufacturer advises caution
Chloramphenicol	Severe	Avoid unless no alternative; dose-related depression of haematopoiesis
Chloroquine	Mild to moderate	Reduce dose in rheumatic disease; Reduce dose for malaria prophylaxis
Chlorpromazine	Severe	Start with small doses; Increased cerebral sensitivity; Monitor kidney function-dose dependent; increase in serum creatinine and urea during first few weeks may necessitate dose reduction
Ciprofloxacin	Moderate	Use half normal dose
Cloxacillin	Severe	Reduce dose
Codeine	Moderate to severe	Reduce dose or avoid; increased and prolonged effect; increased cerebral sensitivity
Colchicine	Moderate	Reduce dose
	Severe	Avoid or reduce dose if no alternative
Diazepam	Severe	Start with small doses; increased cerebral sensitivity

Medicine	Degree of impairment	Comment
Digoxin	Mild	Reduce dose; toxicity increased by electrolyte disturbances
Doxycycline	Mild	Use with caution; avoid excessive doses
Efavirenz	Severe	No information available; caution advised
Enalapril	Mild to moderate	Use with caution and monitor response; initial dose 2.5mg once daily
Ephedrine	Severe	Avoid; increased CNS toxicity
Ergotamine	Moderate	Avoid; nausea and vomiting; risk of renal vasoconstriction
Ethambutol	Mild	Reduce dose; if cc less than 30 ml/min monitor plasma ethambutol concentration; optic nerve damage
Fluphenazine	Severe	Start with small dose; increase cerebral sensitivity
Furosemide	Moderate	May need high dose; deafness may follow rapid IV injection
Gentamicin	Mild	Reduce dose; monitor plasma concentration
Glipizide	Mild to moderate	Increased risk of hypoglycaemia
Haloperidol	Severe	Start with small doses; increased cerebral sensitivity
Heparin	Severe	Risk of bleeding increased
Hydralazine	Mild	Reduce dose if cc less than 30 ml/minute
Hydrochlorothiazide	Moderate	Avoid; ineffective

Medicine	Degree of impairment	Comment
Ibuprofen	Mild	Use lowest effective dose and monitor renal function; sodium and water retention; deterioration in renal function possibly leading to renal failure
Iohexol	Moderate to Severe	Increased risk of nephrotoxicity; avoid dehydration
Isoniazid	Severe	Maximum 200 mg daily for peripheral neuropathy
Lamivudine	Mild	Reduce dose; consult manufacturer's literature
Levetiracetam	Severe	Max. 1g daily if cc less than 30ml/min
	Moderate	Max. 1.5g daily if cc 30-50ml/min
	Mild	Max. 2g daily if cc 50-80ml/min
Lopinavir + Ritonavir		Avoid oral solution due to propylene glycol content in severe impairment
Magnesium sulfate	Moderate	Avoid or reduce dose; increased risk of toxicity
Mannitol		Avoid unless test dose produces diuretic response
Metformin	Mild	Avoid; increased risk of lactic acidosis
Methotrexate	Mild	Reduce dose; accumulates; nephrotoxic
	Moderate	Avoid
Methyldopa	Moderate	Start with small dose; increased sensitivity to hypotensive and sedative effect

Medicine	Degree of impairment	Comment
Metoclopramide	Severe	Avoid or use small dose; increased risk of extrapyramidal reactions
Morphine	Moderate to severe	Reduce dose or avoid; increased and prolonged effect; increased cerebral sensitivity
Neostigmine	Moderate	May need dose reduction
Nitrofurantoin	Mild	Avoid; peripheral neuropathy; ineffective because of inadequate urine concentrations
Phenobarbital	Severe	Avoid large doses
Polyvidone-Iodine	Severe	Avoid regular application to inflamed or broken mucosa
Potassium chloride	Moderate	Avoid routine use; high risk of hyperkalaemia
Procainamide	Mild	Avoid or reduce dose
Procaine benzylpencillin	Severe	Neurotoxicity high doses may cause convulsions
Proguanil	Mild	100 mg once daily
	Moderate	50 mg on alternate days
	Severe	50 mg once weekly; increased risk of haematological toxicity
Propranolol	Severe	start with small dose; higher plasma concentrations after oral administration; may reduce renal blood flow and adversely affect renal function
Quinine		Reduce parenteral maintenance dose for malaria treatment
Ranitidine	Severe	Use half normal dose; occasional risk of confusion

Medicine	Degree of impairment	Comment
Sodium Chloride	Severe	Avoid
Sodium Valproate	Mild to Moderate	Reduce dose
Spironolactone	Mild	Monitor plasma K+; high risk of hyperkalaemia in renal impairment
Stavudine	Mild	20 mg twice daily (15 mg if body weight less than 60 kg)
	Moderate to severe	20 mg once daily (15 mg if body wt less than 60 kg)
Streptomycin	Mild	Reduce dose; monitor plasma concentration
Sulfamethoxazole + Trimethoprim	Mild	Use half normal dose if cc 15-30 ml/minute; avoid if cc less than 15 ml/minute and if plasma sulfamethoxazole concentration cannot be monitored
Tranexamic acid	Mild	Dose reduction required
Vencomycin	Mild	Reduce dose - monitor plasma vancomycin concentration and renal function regularly
Vecuronium	Severe	Reduce dose; duration of block possibly prolonged
Warfarin	Severe	Avoid
Zidovudine	Severe	Reduce dose; manufacturer advises oral dose of 300-400 mg daily in divided doses or intravenous dose of 1 mg/kg 3-4 times daily

Appendix 9: Hepatic Impairment

Table of Medicine to be avoided or used with caution in Hepatic impairment

Medicine	Comment
Acetylsalicylic acid	Avoid - increased risk of gastrointestinal bleeding
Allopurinol	Reduce dose
Aluminium hydroxide	In patient with fluid retention, avoid antacids containing large amounts of sodium; also avoid those causing constipation (can precipitate coma)
Amitriptyline	Sedative effects increased (avoid in severe liver disease)
Artemether + Lumefantrine	Caution in severe impairment; monitor ECG and plasma potassium
Bupivacaine	Avoid (or reduce dose) in severe liver disease
Carbamazepine	Metabolism impaired in advanced liver disease
Ceftriaxone	Reduce dose and monitor plasma concentration if both hepatic and severe renal impairment
Chloramphenicol	Avoid if possible- increased risk of bone marrow depression; reduce dose and monitor plasma-chloramphenicol concentration
Chlorphenamine	Sedation inappropriate in severe liver disease - avoid
Chlorpromazine	Can precipitate coma; hepatotoxic
Ciclosporin	May need dose adjustment
Ciprofloxacin	Hepatic dysfunction reported
Cloxacillin	Cholestatic jaundice may occur up to several weeks after treatment has been stopped; administration for more than 2 weeks and increasing age are risk factor
Codeine	Avoid or reduce dose – may precipitate coma

Medicine	Comment
Contraceptives, Oral	Avoid in active liver disease and if history of pruritus or cholestasis during pregnancy
Diazepam	Can precipitate coma
Doxycycline	Avoid (or use with caution)
Efavirenz	In milk to moderate liver disease, monitor liver function; avoid in severe hepatic impairment
Enalapril	Closely monitor patients with impaired liver function
Ergotamine	Avoid in severe liver disease – risk of toxicity increased
Erythromycin	May cause idiosyncratic hepatotoxicity
Ethinylestradiol	Avoid, see also contraceptives, oral
Fluorouracil	Caution advised
Fluphenazine	Can precipitate coma; hepatotoxic
Furosemide	Hypokalaemia may precipitate coma (use potassium-sparing diuretic to prevent this); increased risk of hypomagnesaemia in alcoholic cirrhosis
Glipizide	As for glibenclamide
Griseofulvin	Avoid in severe liver disease
Haloperidol	Can precipitate coma
Halothane	Avoid if history of unexplained pyrexia or jaundice following previous exposure to halothane
Heparin	Reduce dose in severe liver disease
Hydralazine	Reduce dose
Hydrochlorothiazide	Avoid in severe liver disease; hypokalaemia may precipitate coma (potassium-sparing diuretic can prevent this); increased risk of hypomagnesaemia in alcoholic cirrhosis
Ibuprofen	Increased risk of gastrointestinal bleeding and can cause fluid retention; avoid in severe liver disease

Medicine	Comment
Isoniazid	Use with caution; monitor liver function regularly and particularly frequently in the first 2 months
Levonorgestrel	Avoid in active liver disease and if history of pruritus or cholestatis during pregnancy
Lidocaine	Avoid (or reduce dose) in severe liver disease
Lopinavir + Ritonavir	Avoid oral solution because of propyleneglycol content; use capsules with caution in mild to moderate hepatic impairment and avoid in severe impairment
Magnesium sulphate	Avoid in hepatic coma if risk of renal failure
Medroxyprogesterone	Avoid in active liver disease and if history of pruritus or cholestasis during pregnancy
Metformin	Withdraw if tissue hypoxia is likely
Methotrexate	Dose-related toxicity-avoid in non-malignant conditions (for example, rheumatic disorders)
Methyldopa	Manufacturer advises caution in history of liver disease; avoid in active liver disease
Metoclopramide	Reduce dose
Metronidazole	In severe liver disease, reduce total daily dose to one-third and give once daily
Morphine	Avoid or reduce dose-may precipitate coma
Nevirapine	Caution in moderate hepatic impairment; avoid in severe hepatic impairment
Nifedipine	Reduce dose
Nitrofurantoin	Cholestatic jaundice and chronic active hepatitis reported
Ofloxacin	Hepatic dysfunction reported, reduce dose in severe liver disease
Paracetamol	Dose-related toxicity- avoid large doses
Phenobarbital	May precipitate coma
Phenytoin	Reduce dose to avoid toxicity
Prednisolone	Adverse effects more common

Medicine	Comment
Procainamide	Avoid reduce dose
Promethazine	Avoid – may precipitate coma in severe liver disease; hepatotoxic
Propranolol	Reduce oral dose
Pyrazinamide	Avoid-idiosyncratic hepatotoxicity more common
Ranitidine	Increased risk of confusion; reduce dose
Rifampicin	Impaired elimination; may be increased risk of hepatotoxicity; avoid or do not exceed 8 mg/kg daily

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