

Program Title **Midwifery Level-III**

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Acronyms

ADR	Adverse drug reaction
ART	Ant retro viral treatment
BID	Bi a day
CBT	Cognitive behaviour therapy
CD4	Cluster of differentiation cell 4
CNS	Central nerves system
DW	Dextrose in water
FDA	Food and drug administration
GI	Castro-intestinal
HCL	Hydro chloric acid
HIV/AIDS	Human immune deficiency virus/ Acquired immune deficiency syndrome
IUGR	Intra uterine growth retardation
LFT	Liver function test
LSCS	Low social class status
MDR-GN	Multi drug resistant- gram negative
NNRTI	Non-nucleoside reverse transcriptase inhibitor
NRTI	nucleoside reverse transcriptase inhibitor
OTC	Over the counter
PI	Protease inhibitor
PIH	Pregnancy induced hypertension
RTI	Reverse transcriptase inhibitor
TID	Trice a day
UTI	Urinary tract infection
WBC	White blood cells
WHO	World health organization

Introduction to Relating range of medication in Midwifery practices

Pharmacology is the study of substances that interact with living systems through chemical processes, especially by binding to regulatory molecules and activating or inhibiting normal body processes. These substances may be chemicals administered to achieve a beneficial therapeutic effect on some process within the patient or for their toxic effects on regulatory processes in parasites infecting the patient. Such deliberate therapeutic applications may be considered the proper role of medical pharmacology, which is often defined as the science of substances used to prevent, diagnose, and treat disease. In other words it is the study of the actions, mechanisms, uses and adverse effects of drugs.

Midwives play an integral role in administering medication to patients, and depending on the environment in which they work, they may be doing this every few minutes. Thus, Midwives must be equipped with extended pharmacology knowledge that will allow them to recognize therapeutic responses to drugs and adverse drug reactions to ensure patient safety and to respond to patients' needs accordingly. This module is aimed to empower you through an understanding of the basic principles of pharmacology and demonstrate the principles of range of medication administration in the field of midwifery practices.

Therefore, it is of utmost importance to describe the pharmacological basis of therapeutics in order to maximize the benefits and minimize the risks of drugs to recipients in field of your study.

Module units

- Apply pharmacology in the field of midwifery practice
- Minimize potential risk to the safe administration of medications
- Prepare for administration of medications
- Administer medications within the legal parameters
- Respond appropriately to the signs of pain
- **Monitor and report client's response to administer medication.**

Learning objectives of the Module

At the end of this session, the students will able to:

- Apply pharmacology in the field of midwifery practice
- Minimize potential risk to the safe administration of medications
- Prepare for administration of medications
- Administer medications within the legal parameters
- Respond appropriately to the signs of pain
- Monitor and report client's response to administer medication.

Module Learning Instructions:

- Read the specific objectives of this Learning Guide.
- Follow the instructions described below.
- Read the information written in the information Sheets
- Accomplish the Self-checks
- Perform Operation Sheets
- Do the "LAP test"

Unit One: Apply pharmacology in the field of midwifery practice

Instruction sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Introduction to basic pharmacology
- Applying basic pharmacology
- pharmacological substances commonly used in midwifery practice

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Explain the basic pharmacological concepts in the field of midwifery practice
- Apply basic pharmacology in the field of midwifery practice
- show drug calculations, correct route of administration, side effects, mechanism of action, toxicity is given
- Check and or maintain drug before, during and after administration .

1.1. Introduction to basic pharmacology

1.1.1. Definition of terms.

- **Pharmacology:** is the study of interaction of drugs with living organisms. It also includes history, source, physiochemical properties, dosage forms, methods of administration, absorption, distribution mechanism of action, biotransformation, excretion, clinical uses and adverse effects of drugs.
- **Clinical Pharmacology:** It evaluate the pharmacological action of drug preferred route of administration and safe dosage range in human by clinical trials.
- **Drugs:** Drugs are chemicals that alter functions of living organisms. Drugs are generally given for the diagnosis, prevention, control or cure of disease.
- **Pharmacy:** It is the science of identification, selection, preservation, standardization, compounding and dispensing of medical substances.
- **Pharmacodynamics:** The study of the biological and therapeutic effects of drugs (i.e., “what the drug does to the body”).
- **Pharmacokinetics:** Study of the absorption, distribution metabolism and excretion (ADME) of drugs (“i.e. what the body does to the drug”).
- **Pharmacotherapeutics:** It deals with the proper selection and use of drugs for the prevention and treatment of disease.
- **Toxicology:** It’s the science of poisons. Many drugs in larger doses may act as poisons. Poisons are substances that cause harmful, dangerous or fatal symptoms in living substances.
- **Chemotherapy:** It’s the effect of drugs upon micro-organisms, parasites and neoplastic cells living and multiplying in living organisms.
- **Pharmacopoeia:** An official code containing a selected list of the established drugs and medical preparations with descriptions of their physical properties and tests for their identity, purity and potency e.g. Indian Pharmacopoeia (I.P), British Pharmacopoeia (B.P).
- **Prophylaxis:** treatment given or action taken to prevent disease.
- **Mechanism of action:** how a drug or other substance produces an effect in the body.

1.1.2. Mechanism of action

Introduction

The interactions between a drug and the body are conveniently divided into two classes. The actions of the drug on the body are termed pharmacodynamics processes. These properties determine the group in which the drug is classified, and they play the major role in deciding whether that group is appropriate therapy for a particular symptom or disease. The actions of the body on the drug are called pharmacokinetic processes. Pharmacokinetic processes govern the absorption, distribution, and elimination of drugs and are of great practical importance in the choice and administration of a particular drug for a particular patient

Sources of drugs

1. **Minerals:** Liquid paraffin, Magnesium sulphate, Magnesium trisilicate, etc.
2. **Animals:** Insulin, thyroid extract, heparin, antitoxin sera, etc.
3. **Plants:** Morphine, digoxine, atropine, castor oil etc.
4. **Synthetic sources:** Asprine, sulphonamides, paracetamol etc.
5. **Micro-organisms:** Penicillin, streptomycin etc.
6. **Genetic engineering:** Human insuline, human growth hormone etc.

Out of all the above sources, majority of the drugs currently used in therapeutics are from synthetic sources.

Drug nomenclature : A drug generally has three categories of names:

Chemical name: - describes the substance chemically. This is cumbersome and not suitable for use in prescribing.

Non-proprietary (generic) name: - It is the name accepted by a competent scientific body. e.g. Omeprazole.

Proprietary (Brand) name:-It is the name assigned by the manufacture(s) and its property or trade mark. One drug may have a multiple proprietary names.

Dosage Forms:

A medicinal agent becomes a medication only after formulation suitable for therapeutic use. The following are few of the dosage forms:

- **Tablets:-** are the most extensively used dosage forms, have disc like shape produced by mechanical compression of active substances, filler and excipients. The filler provides bulk enough to make, easy to handle and swallow.

Tablets may be coated to:

- protect perishable drugs from decomposition
- mask disagreeable taste or odour
- facilitate passage on swallowing
- Permit Colour coding

There are different types of coating: Enteric, Sugar, Film coating.

- **Capsules:-** Consist of an oblong casing made of gelatin that contains the drug in powder or granulated form. Two types of capsules: hard and soft capsules. Liquid dosage forms may be prepared in the form of solutions, in which the particles are totally soluble in the solvent and a homogeneous mixture is formed; suspensions, the solutes are insoluble in the solvent but are suspended when shake until a dose is withdrawn and emulsions, in which insoluble liquid particles are dispersed in a solvent.
- **Aerosols:-** are suspensions of fine, solid or liquid particles in a gas. They are used to apply drugs to the respiratory tract and skin.
- **Suppositories:-** are conical or ovoid, solid preparations for insertion in to the rectum or vagina. Vaginal suppositories often are called pessaries.

1.1.2.1. Pharmacodynamics

Involves how the drugs act on target cells to alter cellular function.

Receptor and non-receptor mechanisms:

- Most of the drugs act by interacting with a cellular component called receptor. Some drugs act through simple physical or chemical reactions without interacting with any receptor. Receptors are protein molecules present either on the cell surface or within the cell e.g. adrenergic receptors, cholinergic receptors, insulin receptors, etc.
- The endogenous neurotransmitters, hormones, autacoids and most of the drugs produce their effects by binding with their specific receptors. Aluminium hydroxide and magnesium trisilicate, which are used in the treatment of peptic ulcer disease act by non-receptor mechanism by neutralizing the gastric acid. Many drugs are similar to or have similar chemical groups to the naturally occurring chemical and have the ability to bind onto a

receptor where one of two things can happen- either the receptor will respond or it will be blocked.

A drug, which is able to fit onto a receptor, is said to have affinity for that receptor. Efficacy is the ability of a drug to produce an effect at a receptor. An agonist has both an affinity and efficacy whereas antagonist has affinity but not efficacy or intrinsic activity.

When a drug is able to stimulate a receptor, it is known as an agonist and therefore mimics the endogenous transmitter. When the drug blocks a receptor, it is known as antagonist and therefore blocks the action of the endogenous transmitter (i.e. it will prevent the natural chemical from acting on the receptor). However, as most drug binding is reversible, there will be competition between the drug and the natural stimulus to the receptor.

The forces that attract the drug to its receptor are termed chemical bonds and they are (a) hydrogen bond (b) ionic bond (c) covalent bond (d) Vander Waals force. Covalent bond is the strongest bond and the drug-receptor complex is usually irreversible.

Site of drug action:- A drug may act:- (i) Extracellular e.g.: osmotic diuretics, plasma expanders. (ii) On the cell surface e.g.: digitalis, penicillin, catecholamine's (iii) Inside the cell e.g.: anti-cancer drugs, steroid hormones.

Dose Response relationship

The exact relationship between the dose and the response depends on the biological object under observation and the drug employed. The lowest concentration of a drug that elicits a response is minimal dose, and the largest concentration after which further increase in concentration will not change the response is the maximal dose.

Structural activity relationship

The activity of a drug is intimately related to its chemical structure. Knowledge about the chemical structure of a drug is useful for:

Synthesis of new compounds with more specific actions and fewer adverse reactions

Synthesis of competitive antagonist and Understanding the mechanism of drug action.

Slight modification of structure of the compound can change the effect completely

1.1.2.2. Pharmacokinetics

Pharmacokinetics deals with the absorption, distribution, metabolism and excretion of drugs in the body.

- **Bio-transport of drug:**

It is translocation of a solute from one side of the biological barrier to the other.

- ✓ **Structure of biological membrane:** The outer surface of the cell covered by a very thin structure known as plasma membrane. It is composed of lipid and protein molecules.
- ✓ The membrane proteins have many functions like
 1. contributing structure to the membrane
 2. acting as enzyme
 3. acting as carrier for transport of substances
 4. acting as receptors.

The plasma membrane is a semi-permeable membrane allowing certain chemical substances to pass freely e.g. it allows water, glucose, etc. but it won't allow sucrose until it is converted into glucose and fructose.

- ✓ **Passage of drug across membrane: 9 a)-passive transfer vs b)- specialized transport**

A. Passive

1. Simple diffusion: Movement of a solute through a biological barrier from the phase of higher concentration to phase of lower concentration. No need of energy e.g. highly lipid soluble drugs.

2. Filtration: Is the process by which water soluble drug of relatively low molecular weight crosses the plasma membrane through pores as a result of hydrodynamic pressure gradient across the membrane e.g. urea and ethylene glycol.

B. Specialised

1. Facilitated diffusion: It means the passage of drug across the biological membrane along the concentration gradient by the protein carrier mediated system also called as carrier mediated diffusion. It depends on number of carrier e.g. tetracycline, pyrimidine.

2. Active transport: The process by which drugs pass across the biological membrane most often against their concentration gradient with the help of carriers along with the expenditure of energy e.g. alpha methyl dopa.

3. Endocytosis: It is the process by which the large molecules are engulfed by the cell membrane and releases them intra cellular e.g. protein, toxins (botulinum, diphtheria)

- **Drug absorption:** Absorption is the process by which the drug enters in to the systemic circulation from the site of administration through biological barrier. In case of intravenous or intra-arterial administration the drug bypasses absorption processes and it enters into the circulation directly.
- **Drug distribution:** Penetration of a drug to the sites of action through the walls of blood vessels from the administered site after absorption is called drug distribution. Drugs distribute through various body fluid compartments such as (a) plasma (b) interstitial fluid compartment (c) trans-cellular compartment.
- **Metabolism of drugs:** Drugs are chemical substances, which interact with living organisms and produce some pharmacological effects and then, they should be eliminated from the body unchanged or by changing to some easily extractable molecules. The process by which the body brings about changes in drug molecule is referred as drug metabolism or biotransformation.
- **Excretion:** Elimination of unchanged drug or metabolite from the body – terminating its activity. The major routes of excretion include renal excretion Hepatobiliary excretion and pulmonary excretion. The minor routes of excretion are saliva, sweat, tears, breast milk, vaginal fluid and hair. The rate of excretion influences the duration of action of drugs. If the drug is excreted slowly, the concentration of drug in the body is maintained and the effects of the drug will continue for longer period.

✓ **Renal excretion**

Although some drugs are excreted through extra-renal pathways, the kidney is the primary organ of removal for most drugs especially for those that are water soluble and not volatile.

✓ **Hepatobiliary Excretion**

The conjugated drugs are excreted by hepatocytes in the liver. After excretion of drugs through bile to the intestine; certain amount of drug is reabsorbed in to the portal vein leading to an enterohepatic cycling which can prolong the action of drug e.g. chloramphenicol, estrogen.

✓ **Castro intestinal excretion**

When a drug is administered orally, part of the drug is not absorbed and excreted in the faeces. The drug which do not undergo enterohepatic cycling after excretion in to the bile are subsequently passed with stool. eg. Aluminium hydroxide changes the stool Colour in to white, Ferrous sulphate darkens it and Rifampicine gives orange red Colour to the stool.

✓ **Pulmonary excretion-** Many inhalation anaesthetic and alcohol are excreted through the lungs.

✓ **Sweat-e.g.** Rifampicine, metalloid like arsenic are excreted in to the sweat.

✓ **Mammary excretion-** Many drugs are excreted in to breast milk. Therefore lactating mothers should be cautious about the intake of these drugs because they may enter in to baby through milk and produce harmful effects in the baby. e.g. Ampicillin, Asprine, Chlorodizepoxide, Streptomycine.

Clearance: is the volume of plasma cleared off the drug by metabolism (hepatic) and excretion (renal) and other organs. It measures the ability of the body to eliminate the drug. The rate of elimination is directly proportionate to drug concentration

Total clearance is calculated by:- $C_t = C_h + C_r + C_{others}$, where

C_t = total clearance

C_h = hepatic clearance

C_r = renal clearance.

Half-life ($t_{1/2}$): Half-life ($t_{1/2}$) of a drug is the time taken for the concentration of drug in the plasma to decline to half of original value or the amount of drug in the body to be reduced by 50%.

The fundamental mechanisms of drug action can be distinguished in to four categories.

1. **Physical action:-** Physical property of the drug is responsible for its action. E.g. Osmotic activity- magnesium sulphate.
2. **Chemical action:-** The drug acts according to simple chemical equation. e.g. Antacids neutralize gastric HCl.
3. **Through enzymes:** - Enzymes are very important sites of drug action. Drugs can either increase or decrease the rate of enzymatically mediated reactions; which can be either stimulation or inhibition.

4. **Through receptors:** - Most of the drugs act by interacting with a cellular component called a receptor. Receptors are protein molecules present either on the cell surface or within the cell. eg. Adrenergic receptors, cholinergic receptors, insulin receptors.

A drug which is able to fit on to a receptor is said to have affinity for that receptor.

Efficacy is the maximum response produced by a drug. An agonist has both an affinity and efficacy whereas an antagonist has affinity but not

efficacy or intrinsic activity. When a drug is able to stimulate a receptor, it is known as an agonist and therefore mimics the endogenous transmitter. When a drug blocks a receptor, it is known as an antagonist and therefore blocks the action of the endogenous transmitter .i.e. it will prevent the natural chemical from acting on the receptor.

Other Mechanisms of actions are

- Antagonism
- Agonists
 1. Full agonists
 2. Partial agonists- fails to produce maximal effects even if all receptor sites are occupied.
E.g.: Stadol® (butorphanol)
 - μ antagonist (lowers addiction) and κ agonist (analgesic effect)
 - Weak partial antagonists can seem to be like competitive antagonists
 - Partial antagonist drugs: acts as antagonist or agonist depending on the circumstance.

Eg: Pindolol can act as an antagonist if a -full agonist like Isoproterenol is present.

$D + R \rightarrow DR \rightarrow \text{Biological effect,}$

Where D= Drug, R = Receptor DR = Drug Receptor Complex.

1.2. Applying basic pharmacology

1.2.1. Drug category related to pregnancy

Drugs used in obstetrics have a huge impact on the outcome of both mother and baby. Drugs used during first trimester can produce congenital malformation and the period of greatest risk is from the third to eleven weeks of pregnancy. During second and third trimester drugs can affect the growth and functional development of the foetus or they can have toxic effect on foetus tissues. But clinically, many women require drug treatment during pregnancy due to chronic conditions such as epilepsy, diabetes, hypertension (high blood pressure), or asthma.

To withhold drug treatment would be dangerous for both mother and baby. In addition, women are having babies at a later age, which can boost the number of women with chronic conditions. Accessible and understandable pregnancy and lactation information is important for women and their health care provider's to assess risk versus benefit.

1/3 to 1/2 of pregnant women take at least one prescription drug and most take more. Some used to treat pregnancy side effects like Nausea, Pre-eclampsia or constipation. Some medications are used to treat chronic disorders like hypertension, diabetes, epilepsy, cancer or infections. Some are taken because they are drugs of abuse (alcohol, nicotine, cocaine, heroin)

Must balance risks vs. benefits of drugs during pregnancy as:

- It affects fetus more than mother, have teratogenic effects and or mother's health affects fetus- for example chronic asthma is more dangerous to the fetus than the drugs used for treatment (For mothers who do not take medication for asthma the incidence of stillbirths is doubled!!)
- Pregnancy alters drug disposition and excretion processes
- By 3rd trimester renal blood flow is doubled with an increase in glomerular filtration and elimination of drugs increases (therefore will need an increased dosage of drug to compensate)
- Tone and motility of intestines (peristalsis) decrease in pregnancy (more time for drugs to be absorbed)
- All drugs can cross the placenta- lipid soluble cross more easily-ionized, highly polar or protein bounds cross with difficulty leading to Nicotine (smaller babies), alcohol (dependence), cocaine/heroin/morphine (addictive to fetus), and teratogenesis.

Teratogenesis:- "to produce a monster"-- gross malformations like cleft palate, club-foot, hydrocephalus, spinal bifida, or behavioural and biochemical anomalies. Major structural abnormalities occur in ~ 6% of fetus {only 3% of all birth defects due to drugs. Sensitivity of fetus to drug is dependent upon developmental stage and when drug is given in relation to the developmental stage. When drug is given during pre-implantation and embryonic stages the teratogenic acts in an all-or-none response, i.e. , dose is high enough the fetus will die, if dose is sub lethal fetus will recover. But gross malformations produced by exposure to teratogens

during the embryonic period (1st trimester). Exposure during the 2nd and 3rd trimesters usually results in organ dysfunction rather than gross malformations. Therefore, pregnant women should avoid taking drugs as much as possible. According to FDA there are 5 drug category related to pregnancy

Table: FDA drug category related to pregnancy

Category	Interpretation	Details	Examples of drugs
A	Human studies show no risk	Adequate, well-controlled studies in pregnant women have not shown an increased risk of fetal abnormalities to the fetus in any trimester of pregnancy	Thiamine, Pyridoxine, Folic acid, Bisacodyl, Dextromethorphan, Doxylamine, Levothyroxine, Isoniazid
B	No evidence of risk in studies	Animal studies have revealed no evidence of harm to the fetus, however, there are no adequate and well-controlled studies in pregnant women. OR Animal studies have shown an adverse effect, but adequate and well-controlled studies in pregnant women have failed to demonstrate a risk to the fetus in any trimester.	PenicillinV, PenicillinG, Benzathine, Amoxicillin, Amoxicillin/Clavulanate, Ampicillin, Cloxacillin, Ceftriaxone, Cephalexin, Azithromycin, Erythromycin, Metronidazole
C	Risk cannot be ruled out	Animal studies have shown an adverse effect and there are no adequate and well-controlled studies in pregnant women. OR No animal studies have been conducted and there are no adequate and well-controlled studies in pregnant women.	Fluoroquinolones
D	Positive evidence of risk	Adequate well-controlled or observational studies in pregnant women have demonstrated a risk to the fetus. However, the benefits of therapy may outweigh the potential risk. For example, the drug may be acceptable if needed in a life-threatening situation or serious disease for which safer	Gentamycine, neomycine, doxycycline, tetracycline, fluconazole, Phenytoine,

X	Contraindicated in pregnancy	drugs cannot be used or are ineffective. Adequate well-controlled or observational studies in animals or pregnant women have demonstrated positive evidence of fetal abnormalities or risks. The use of the product is contraindicated in women who are or may become pregnant.	Valproate, Oxytocin
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1.2.2. Drug calculations

- **Loading doses** - one or a series of doses that may be given at the onset of therapy with the aim of achieving the target concentration rapidly.
- **Maintenance doses:** The plateau can be maintained with smaller dose called maintenance dose.

▪ Dose calculation Based on Age

Young's Equation (preferably from one to twelve years of age)

$$\text{Dose of Child} = \frac{\text{Age in Years}}{\text{Age in years} + 12} \times \text{Adult Dose}$$

Cowlings Equation

$$\text{Dose of Child} = \frac{\text{Age in Years at next years}}{24} \times \text{Adult dose}$$

Fried Equation (preferably from birth to one years of age)

$$\text{Dose of Child} = \frac{\text{Age in month}}{150} \times \text{Adult dose}$$

▪ Dose calculation Based different rules

Determination of drug dosage

There are different rules to determine the dose in children.

1. **Fried's rule** -(for infants under 2 years)

$$\text{Infant dose} = \frac{\text{age in month} \times \text{adult dose}}{150}$$
2. **Clark's rule** -(for children over 2years)

$$\text{Child dose} = \frac{\text{weigh in lb} \times \text{adult dose}}{150}$$

Or

$$= \frac{\text{weigh in Kg}(0.45)(\text{adult dose})}{150}$$

NB- 1 lb=0.45kg

3. **Young's rule**

$$\text{Child dose} = \frac{\text{Age in years} \times \text{adult dose}}{\text{Age in years} + 12}$$
4. **Surface area** -is the most accurate method.

$$\text{Child dose} = \frac{\text{Surface area in sqm} \times \text{adult dose}}{1.75}$$

$$\text{Note -surface area in sqm} = \frac{4W + 7}{W + 90}$$

Where W is weight in kg.

5. **Dose in mg/kg.**

In order to administer drugs to children safely one should know about previous five rights and the right of the parent and child to know).

▪ Dose per medication calculation

Calculating medication dose appear to be impossibly difficult, unless you break them down into small steps.

A memorable formula

To help make sure you get it the right way up, remember '**WIG**':

What you want x what it's in / **w**hat you've got

✓ Type A calculations

When the dose you want is not a whole ampoule.

For example: Prescription states 200mg (milligrams)

You have an ampoule of 500mg (milligrams) in 4ml (milliliters).

What volume contains the dose you need?

If you have an ampoule of 500mg in 4ml, and you need 200mg, it can appear to be a daunting calculation. The first step is to find out what volume contains 1mg (4/500) and then multiply it by how many mg you want (200). The easy way to remember this is the famous nursing equation: 'What you want, over what you've got, times what it's in'

In this instance: $200\text{mg} \times 4\text{ml} / 500\text{mg} = 1.6\text{ml}$

The common error here is to get it upside down, and divide what you've got by what you want. This fortunately gives you an answer, which is obviously wrong, in this case 10ml. You already know that you need a fraction of an ampoule and not two and bit ampoules, which highlights the error.

Converting units

All weights, volumes and times in any equation must be in the same units. With weights the unit changes every thousand. For example, you need 1000 micrograms (mcg) to make 1 milligram (mg) and 1000 milligrams to make one gram (g) (Box 2).

Type B calculations

These are infusion rate calculations.

For example: Prescription states 30 mg/hour

You have a bag containing 250mg in 50ml, then at what rate (ml/hr) do you set the pump?

These are the same as type A calculations, only once you have worked out the volume that contains the amount of drug you need, you set the pump to give that amount per hour.

In this instance, work out how many ml contain ONE mg of drug

Using the WIG equation: $30 \times 50 / 250 = 6\text{ml}$

Therefore the calculation shows that, to give 30mg per hour, the infusion pump rate would need to be set at 6ml per hour. This calculation is straightforward when the rate you want (30mg/hour) and the amount of the drug in the bag (250mg) are both in the same units (mg). However, if the infusion required that 600 micrograms were to be infused each hour instead, this would first need to be converted into mg before the infusion rate was calculated, that is, 600 micrograms = 0.6mg.

The equation for infusion rate calculation is dose stated in prescription (milligrams per hour) times volume in syringe (in millilitres) divided by the amount in the syringe (in milligrams) equals the infusion rate (millilitres per hour), or:

$\text{Dose (mg/hr)} \times \text{volume in syringe (ml)} / \text{Amount in syringe (mg)} = \text{Infusion rate}$

Type C calculations

Infusion rate is required, but dose is 'mg per kg'.

For example: Prescription states 0.5mg/kg/hour

You have a bag of 250mg in 50ml and your patient weighs 70kg

At what rate (ml/hr) do you set the pump?

To do this calculation you still use the WIG equation as above, but with one extra step to work out the 'what you want'.

First you need to convert the mg per kg into total mg by multiplying it by the patient's weight. So for a person who weighs 70kg, 0.5mg per kg is the same as 35mg. Once you have calculated this, the infusion rate can be worked out as in the Type B calculations.

In this instance: $0.5\text{mg/kg/hr} \times 70\text{kg} \times 50\text{ml} / 250\text{mg} = 7\text{ml/hr}$

Type D calculations

Infusion rate required, but dose is in mg/kg/min.

For example: Prescription states 0.5mg/kg/min

You have a syringe of 250mg in 50ml and your patient weighs 70kg

At what rate (ml/hr) do you set the pump?

As before, you will need to calculate what you want by multiplying the amount per kg by the patient's weight. In this case: $0.5\text{mg} \times 70\text{kg} = 35\text{mg}$

This time, however, the prescription states the rate per minute. The pump demands that the rate be set in ml per hour, therefore the rate per minute will need to be converted before the equation can be completed, by multiplying 35 by 60; that is, 35mg/min (35 milligrams per minute) is converted to 2100mg/hr (2100 milligrams per hour).

From here, once again we use the type B calculation to find the infusion rate, which as shown will be 420ml/hr

$$2100 \times 50 / 250\text{mg} = 420\text{ml/hr}$$

Type E calculations

Infusion rate is required, but the dose is in mcg/kg/min.

For example: Prescription states 3 micrograms (mcg)/kg/min

You have a syringe of 100mg in 50ml and your patient weighs 70kg

At what rate do you set the pump (ml/hr)?

As before, what you want is calculated by multiplying the amount per kg by the patient's weight, that is: 3mcg/kg for a 70kg person is 210mcg

Next the prescription rate needs to be converted into rate per hour, that is,

$$210\text{mcg/min} = 12\,600\text{mcg/hr}$$

The prescription is in micrograms, but in your syringe you have milligrams. Both need to be in the same units, so you must convert one to the other, in this case mcg to mg. 12 600mcg/hr is the same as 12.6mg/hr. The calculation is then as follows: $12.6 \times 50 / 100 = 6.3\text{ml/hr}$

1.2.3. Route of drug administration

A. Oral route: taking medication by mouth or PO- per os

E.g. Paracetamol/PCM tablet can be taken by PO

Advantages of oral route: This route is safe, convenient and economical.

Disadvantages of oral route: Onset of drug action is slow, irritant drugs cannot be administered and it is not useful in vomiting and severe diarrhoea, gastric acid and digestive enzymes may destroy some drugs, and water soluble drugs are absorbed poorly.

B. parenteral route: giving injection by injecting the person using syringe and needle

1. Intra-dermal/Id: This is given into the layers of the skin e.g. B.C.G. vaccine

2. Subcutaneous/Sc: Non-irritant substances are given into subcutaneous tissue injecting at an angle of 15° e.g. insulin

3. Intramuscular/IM: Soluble substances, mild irritants, suspensions and colloids can be injected by this route. These injections can be given to deltoid or gluteal muscle by injecting or positioning the needle at 90° to the site. This route is one of the more common routes.

E.g. multivitamins, streptomycin, etc.

Advantages: rate of absorption is uniform, onset of action is faster than oral and it can be given in diarrhoea or vomiting.

Disadvantages: Pain at local site of injection, the volume of injection should not exceed 10 ml.

4. Intravenous: Drugs directly given into a vein, produce rapid action, no need of absorption as they enter directly into blood, can be given as **bolus** e.g. furosemide, morphine, or as continuous **infusion** e.g. fluids like normal saline/NS during shock or dehydration.

Advantages: It can be given in large volumes, production of desired blood concentration can be obtained with a well-designed dose.

Disadvantages: Drug effect cannot be halted if once the drug is injected, expertise is needed to give injection.

5. Intrathecal: Injected into sub arachnoid space of spinal cord e.g. spinal anesthetics.

6. Intraperitoneal: Injections given into the abdominal cavity e.g. infant saline, glucose.

7. Intra-articular: Injected directly into a joint e.g. hydrocortisone.

C. Topical/ local route: The absorption through skin is a passive process. The absorption occurs more easily through the cell lining e.g. dusting powder, paste, lotion, drops, ointment, suppository for vagina and rectum.

D. Inhalation: Drugs may be administered as dry powders, and nebulized particles when sprayed as fine droplets get deposited over the mucous membrane producing local effects and may be absorbed for systemic effects e.g. salbutamol spray used in bronchial asthma and volatile general anesthetics.

1.2.4. Side effects

The drugs that produce useful therapeutic effect may also produce unwanted or toxic effects. It has been estimated that about 0.5% of patients who die in hospitals do so as a result of their treatment rather than the condition for which they were being treated.

- Serious systemic drug toxicity may result from overdoses.
- There is always an exaggeration of a drugs pharmacological action and sometimes it is predictable, e.g. Hypotension following antihypertensive drugs.
- Hypoglycemia following insulin.

ADR(Adverse drug reaction) defined as any response to a drug that is noxious and unintended and that occurs at doses used in man for prophylaxis, diagnosis or therapy (WHO).

The adverse effects are: Side effects; untoward effects; allergic reactions; idiosyncratic reactions; and teratogenic effects.

Side effects: are in fact pharmacological effects produced with a therapeutic dose of the drug. e.g. Dryness of mouth with atropine which is troublesome in peptic ulcer patients and useful when used as a pre-anaesthetic medication.

Untoward effects: develop with therapeutic dose of a drug. They are undesirable and if very severe, may necessitate the cessation of treatment. E.g.: Diarrhoea with ampicillin and potassium loss with diuretics.

1.2.5. Toxicity

Drug toxicity occurs when a person has accumulated too much of a drug in his bloodstream, leading to adverse effects on the body. Drug toxicity may occur when the dose is given is too high or the liver or kidneys are unable to remove the drug from the bloodstream, allowing it to accumulate in the body.

With certain medications, drug toxicity can also occur as an adverse drug reaction (ADR). In this case, the normally given therapeutic dose of the drug can cause unintentional, harmful and unwanted side effects. In some cases, such as with the drug lithium, the threshold between what is an effective dose and what is a toxic dose is very narrow.

E.g. More severe symptoms of acute lithium toxicity may appear in the form of:

- Ataxia (poor muscle control, resulting in clumsy movements)
- Coma
- Hand tremors
- Heart problems (in rare cases)
- Muscle twitches
- Nystagmus (involuntary jerking of the eyeball)
- Seizures
- Slurred speech

The chemical structure, how much the body can absorb and the body's ability to detoxify and eliminate the substance mainly determine the toxicity of a toxin or prescription drug.

1.3. Pharmacological substances commonly used in midwifery practice

1.3.1. Parenteral oxytocic drugs

Oxytocics are the drugs that have the power to excite contractions of the uterine muscles.

Among a large number of drugs belonging to this group the ones that are important and extensively used are:- Oxytocin, ergot derivatives and prostaglandins.

- **Oxytocin:** is an octapeptide synthesized in the hypothalamus and stored in the posterior pituitary.

Preparations: Synthetic oxytocin available for parenteral use includes:-

- ✓ Syntocinon : 5units/ml in ampoules of 1 ml
- ✓ Pitocin 10 units/ml in ampoule of 0.5 ml
- ✓ Syntometrine : A combination of Syntocinon on 5 units & ergometrine 0.5mg
- ✓ Oxytocin solution 40 unit/ml
- ✓ Actions: Acts directly on myofibrils producing uterine contractions & stimulates milk ejection by the breasts

Indications

Pregnancy: To induce abortion, labour, to expedite expulsion of hydatidiform mole, for oxytocin challenge test, to stop bleeding following evacuation.

Labour: To augment labour, in uterine inertia, to prevent & treat post-partum haemorrhage

Post-partum: To initiate milk let-down in breast engorgement.

Contraindications

In late pregnancy: Grand multi para, Contracted pelvis, history of LSCS or hysterectomy, mal-presentation

During labour: All contraindications mentioned in pregnancy, obstructed labour, uncoordinated uterine action

Anytime: Hypovolemic state, cardiac disease

- ✓ Adverse effects: Hypertonic uterine activity, fetal distress & fetal death, uterine rupture, hypotension, neonatal jaundice, water retention & water intoxication
- ✓ Dosage & routes of administration

Controlled IV infusion (10 units of oxytocin in 1 L of RL/5% Dextrose in water)

Nasal spray for milk let- down

Nursing considerations

1. Assess Patient I/O Ratio, Uterine contraction, BP, pulse & respiration
2. Administer By IV infusion After having crash cart available in the ward
3. Evaluate patient Length & duration of contractions and Notify physician of contractions lasting over one minute or absence of contractions.

- **Ergot derivatives:** Ergot alkaloids are either natural or semi synthetic

Preparations:

- Ergometrine- 0.25mg/ 0.5mg ampoules & 0.5-1 mg tablets
- Methergine - 0.2 mg ampoules & 0.5-1 mg tablets
- Syntometrine Ergometrine - 0.5 mg+ Syntocinon 5.0 units ampoules.

NOTE: Ergometrine & Methergine can be used parentally or orally. As the drug produces titanic uterine contractions, it should only be used after delivery of the anterior shoulder or following delivery of baby. It should not be used in induction of labor or abortion. Syntometrine should always be administered IM

- **Mode of Action:** Ergometrine acts directly on the myometrium.

It stimulates uterine contractions & decreases bleeding.

- **Indications**

Therapeutic: To stop the atonic uterine bleeding following delivery, abortion/ expulsion of hydatidiform mole

Prophylactic: As a prophylaxis against excessive hemorrhage , it may be administered after the delivery of the anterior shoulder with crowing / following delivery of baby.

- **Contraindications:** Suspected plural pregnancy, Organic cardiac disease, Severe Pre eclampsia & Eclampsia Adverse effects, Rise of BP due to vasoconstriction action, Prolonged use in puerperium may interfere by decrease concentration of prolactin & gangrene of toes due to vasoconstriction.

- **Dosage and routes of administration**

For active management of 3rd stage of labour: 0.2mg (amp) to be given IM.

For control of atonic PPH -Iamp slowly over 60seconds may be repeated after 2hrs.

For excessive lochia and subinvolution-I tablet (0.125mg)TDS for 3 days.

Nursing considerations

1. Assess patient BP, pulse, respiration, signs of hemorrhage
2. Administer orally/IM deep, have emergency cart readily available
3. Evaluate for decrease blood loss
4. Advised patient to report for increased blood loss, abdominal cramps, headache, sweating, nausea, vomiting/ dyspnea

1.3.2. Anticonvulsant

● **Magnesium sulphate**

- Preparation: Injection- Iamp=2ml contains 1gm Mgso4, Tablet-64mg
- Action: Decreased acetylcholine in motor nerve terminals, which is responsible for anticonvulsant properties, thereby reduces neuromuscular irritability. It also decreases intracranial edema & helps in diuresis. Its peripheral vasodilatation effect improves the uterine blood supply. Has depressant action on the uterine muscles & CNS
- Indications: It is a valuable drug lowering seizure threshold in women with pregnancy-induced hypertension, used in pre term Labor to decrease uterine activity.

- Contraindications: Heart block, impaired renal function, pregnant women, actively progressing labor.

Adverse effects

- Maternal: Severe CNS depression, evidence of muscular paresis
- Fetal: Tachycardia, hypoglycemia

Dosage & routes of administration

1. For control of seizures, 20 ml of 20% solution IV slowly in 3-4 mins, to be followed immediately by 10ml of 50% solution IM & continued 4 hourly till 24 hours postpartum.
2. Repeat injections are given only if knee jerks are present, urine output exceeds 100 ml in 4 hours & respiration is more than 10/ minute. The therapeutic level of serum magnesium is 4-7 mEq/L 2. 4gm IV slowly over 10 min, followed by 2 gm/hr and then 1gm/ hr in drip of 5% dextrose for tocolytic effect

Nursing considerations

1. Assess patient's Vital signs 15 min after IV dose; do not exceed 150 mg/min
2. Monitor magnesium level If using during labour, time of contractions, determine intensity
3. Urine output should remain 30 ml/hr or more if less notify physician
4. Examine patient Reflexes-knee jerk, patellar reflex.
5. Administer Only after calcium gluconate is available for treating magnesium toxicity Using infusion pump/monitor carefully, IV at less than 150mg/min ,circulatory collapse may occur
6. Provide Seizure precautions:
7. place client in single room with decreased stimuli, padded side rails
8. Positioning of client in left lateral recumbent position to decrease hypotension & increased renal blood flow
9. Evaluate patient mental status, sensorium, memory, respiratory status & Reflexes.
10. Discontinue infusion if respirations are below 12/min, reflexes severely hypotonic, urine output below 30ml/hrs or in the event of mental confusion/ lethargy/ fetal distress

1.3.3. Anti-hypertensive

Here are the choice of drugs given during pregnancy are:-

A. Alpha and Beta blockers

● ELabetalol hydrochloride

- Preparation: Injection-5mg/ml in 20ml vial, Tablets- 100mg,200mg ,300mg

- Action :Reduced peripheral vascular resistance as a result of alpha and beta blockade.
- Indications: Hypertension, Hypertensive emergencies
- Contraindications: Hypersensitive to drug or its component, bronchial asthma, hepatic or heart failure, pprolonged hypotension, ssevere bradycardia
- Adverse effects: Dizziness, fatigue, nausea or vomiting, headache, vertigo
- Dosage and route of administration: 50mg or 100mg tablet OD orally. 20mg/20ml Inj IV bolus wait for 10min if no response then give 40mg slow bolus.

Nursing considerations

1. Advised patient to remain in supine position for 3hrs after infusion.
2. Monitor BP frequently
3. In diabetic patient monitor glucose level closely.
4. Advised patient that dizziness can be minimized by rising slowly and avoiding sudden position change

B. Calcium channel blockers

● Nifedipine

Preparations

- Capsule-10mg,20mg
- Tablet-20mg,30mg,60mg,90mg

Action: Thought to inhibit calcium ion reflex across cardiac and smooth muscle cells, decreasing contractility and oxygen demand and also dilates arteries and arterioles.

Indications: Hypertension, classic chronic stable angina pectoris.

Contraindications: Heart failure, Hypo-tension, Severe GI narrowing

Adverse effects: Dizziness, ssyncope, heart failure, muscle cramps, peripheral edema

Dosage and route of administrations: 5-20mg OD orally.

Nursing considerations

- ✓ Monitor BP & HR regularly
- ✓ Advise patient to avoid taking this drug with grapefruit juice.
- ✓ Watch for symptoms for heart failure.

- ✓ Advise patient if chest pain worsen immediately report to doctor.

C. Aalpha blockers

● Methyldopa

- Preparations: Tablet-250mg,500mg, Inj-50mg/ml
- Action: Inhibit the central vasomotor center, decreasing sympathetic outflow to the heart, kidney and peripheral vasculature.
- Indications: Hypertension, hypertensive crisis
- Contraindications: Hepatic disease or liver cirrhosis, lactating mother
- Adverse effects: Decrease mental acuity, sedation, headache or depression, bradycardia, hepatic necrosis, hepatitis
- Dosage and routes of administration: 250mg BD or TDS max 2g daily titrated by BP

Nursing considerations

- Monitor BP regularly.
- Monitor patient coomb's test result.
- Report for involuntary movements.
- Tell patient to check weight daily and notify if he gains 2 or more pounds in a week

C. Vvasodilators

● Hydralazine hydrochloride

- Preparation: Inj-20mg/ml in 1ml vial, Tablet-10mg,25g,50mg,100mg
- Action: Direct acting peripheral vasodilator that relaxes arteriolar smooth muscle.
- Indications: Hypertension, severe essential hypertension
- Contraindications: Coronary artery disease, rheumatic heart disease, stroke, severe renal impairment
- Adverse effects: Neutropenia, leukopenia, thrombocytopenia, orthostatic hypotension
- Dosage and route of administration : 25mg tablet BD and if necessary may increase to 50mg BD and 5mg diluted in 10ml of NS slow IV at 15-20minutes interval.

Nursing considerations

- ✓ Monitor patient BP, pulse rate, body weight frequently.
- ✓ Monitor patient for muscle and joint pain, fever or throat pain.
- ✓ Advised patient to take drug after food to increase absorption

E. Ddiuretics

Diuretics are used in the following conditions during pregnancy: PIH with massive edema, Eclampsia with pulmonary edema. severe anaemia in pregnancy with heart failure, prior to blood transfusion in severe anaemia, as an adjunct to certain anti-hypertensive drugs.

● Furosemide (Lasix)

- Preparation: Inj-10mg/ml, Tablets-20mg,40mg,80mg,500mg
- Action: Inhibits sodium and chloride re absorption at proximal and distal tubules and loop of Henley.
- Indications: Acute pulmonary edema, edema, hypertension
- Contraindications: Anuria, hepatic cirrhosis, allergic to sulphonamides

Adverse effects

- Maternal: Weakness, fatigue, muscle cramps, hypokalemia
- Fetal: May occur due to decreased leading to fetal compromise, hypernatremia.

Dosage and routes of administration : 40 mg tablet, daily following breakfast.

In acute conditions, the drug is administered parentally in doses of 40-120 mg daily.

Nursing considerations

- Monitor weight, BP and pulse rate routinely for long term use.
- Monitor patient I/O chart.
- Watch the signs for hypokalemia such as muscle weakness and cramps.
- Monitor uric acid if patient is having gout.
- Advise the patient to take drug in the morning after food.
- Advise patient to avoid direct sunlight to prevent photosensitivity reactions.

● Anti-hypertensive drugs contraindicated in pregnancy

ACE inhibitors, Sodium Nitroprusside, atenolol, propranolol and the likes should be avoided because they may cause poor fetal renal function, malformation or can cause IUGR.

I.3.4. Parenteral antibiotics.

Introduction

Antibiotics are a common medication that doctors prescribe to fight bacteria. Antibiotics are powerful medicines that fight certain infections and can save lives when used properly. They either stop bacteria from reproducing or destroy them. Before bacteria can multiply and cause symptoms, the immune system can typically kill them. White blood cells (WBCs) attack harmful bacteria and, even if symptoms do occur, the immune system can usually cope and fight off the infection. Sometimes,

however, the number of harmful bacteria is excessive, and the immune system cannot fight them all. Antibiotics are useful in this scenario.

The first antibiotic was penicillin. Penicillin-based antibiotics, such as ampicillin, amoxicillin, and penicillin G, are still available to treat a variety of infections and have been around for a long time.

Several types of modern antibiotics are available, and they are usually only available with a prescription in most countries. Topical antibiotics are available in over-the-counter (OTC) creams and ointments.

When antibiotics are needed

Antibiotics may be used to treat bacterial infections that:

- are unlikely to clear up without antibiotics
- could infect others
- could take too long to clear without treatment
- carry a risk of more serious complications

People at a high risk of infection may also be given antibiotics as a precaution, known as antibiotic prophylaxis.

Antibiotics can come as:

- Tablets, capsules or a liquid that you drink – these can be used to treat most types of mild to moderate infections in the body
- Creams, lotions, sprays and drops – these are often used to treat skin infections and eye or ear infections.
- Injections – these can be given as an injection or through a drip directly into the blood or muscle, and are used for more serious infections

Common Side effects of antibiotics

The most common side effects of antibiotics affect the digestive system. Side effects of antibiotics that affect the digestive system include: vomiting, nausea (feeling like you may vomit), diarrhea, bloating and indigestion, abdominal pain and loss of appetite.

Antibiotic allergic reactions

Some people develop an allergic reaction to antibiotics, especially penicillin and cephalosporins. In most cases, the allergic reaction is mild to moderate and can take the form of a raised, itchy skin rash (urticarial, or hives), coughing, wheezing and tightness of the throat, which can cause breathing difficulties

These mild to moderate allergic reactions can usually be successfully treated by taking antihistamines. In rare cases, an antibiotic can cause a severe and potentially life-threatening allergic reaction known as anaphylaxis. Initial symptoms of anaphylaxis are often the same as a mild allergic reaction. They include:

- feeling light headed or faint
- breathing difficulties – such as fast, shallow breathing
- wheezing
- a fast heartbeat
- clammy skin
- confusion and anxiety
- collapsing or losing consciousness

There may be other allergy symptoms, including an itchy, raised rash (hives), feeling or being sick, swelling (angio-edema), or stomach pain. Anaphylaxis is a medical emergency and can be life-threatening.

Classification of antibiotics

Each antibiotic is effective only against certain types of bacteria. In selecting an antibiotic to treat a person with an infection, doctors evaluate which bacteria are likely to be the cause. For example, some infections are caused only by certain types of bacteria. Sometimes one antibiotic is predictably effective against all of the bacteria that are most likely to be causing an infection and so further testing may not be needed.

If infections may be caused by many different types of bacteria or by bacteria that are not predictably susceptible to antibiotics, a laboratory is asked to identify the infecting bacteria from samples of blood, urine, or tissue taken from the person. The infecting bacteria are then tested for susceptibility to a variety of antibiotics. Results of these tests usually take a day or two and thus cannot guide the initial choice of antibiotic if the infection needs to be treated immediately. In such cases, doctors typically start treatment with an antibiotic that is effective against the bacteria most likely to be causing the infection. When test results are back, doctors change the antibiotic if needed.

Antibiotics that are effective in the laboratory do not necessarily work in an infected person. The effectiveness of the treatment depends on

- How well the drug is absorbed into the bloodstream (for drugs taken by mouth)

- How much of the drug reaches the sites of infection in the body
- How quickly the body eliminates the drug.

These factors may vary from person to person, depending on other drugs being taken, other disorders present, and the person's age.

In selecting an antibiotic, doctors also consider the following:

- ✓ The nature and seriousness of the infection
- ✓ The status of the person's immune system (how well it can help the drug fight the infection)
- ✓ The drug's possible side effects
- ✓ The possibility of allergies or other serious reactions to the drug
- ✓ The cost of the drug

Doctors also consider how hard it may be for people to take antibiotics for the entire time prescribed and complete the full course of treatment. People may find it more difficult to complete treatment if the drug must be taken very often or only at specific times (such as before meals, during meals, or after meals).

Combinations of antibiotics may be needed to treat the following:

- ✓ Severe infections, particularly during the first days when the bacteria's susceptibility to antibiotics is not known
- ✓ Certain infections caused by bacteria that rapidly develop resistance to a single antibiotic
- ✓ Infections caused by more than one type of bacteria if each type is susceptible to a different antibiotic

Antibiotics are classified into one of the following classes:

- penicillin's, fluoroquinolones, cephalosporins, macrolides, beta-lactams with increased activity (e.g. amoxicillin-clavulanate), Tetracyclines, trimethoprim- sulfamethoxazole, lincosamides (e.g. clindamycin), urinary anti-infective, and other so on.
- Antibiotics can also be classified based up on the body system they act on or the route of administration by which they are taken, group of bacteria the deal with.

The following group of antibiotics are generally considered safe during pregnancy:

- Penicillin's, including amoxicillin (Amoxil, Larotid) and ampicillin
- Cephalosporins, including cefaclor and cephalexin (Keflex)
- Clindamycin (Cleocin, Clinda-Derm, Clindagel)

Table 1: Pharmacotherapeutics classification of antibiotics.

Classification	Adverse Reactions	Clinical Pearls
Penicillins: Penicillin G, oxacillin, ampicillin, amoxicillin Beta-lactam inhibitor combinations: Amoxicillin-clavulanate, ampicillin-sulbactam, piperacillin-tazobactam Cephalosporins: Cefazolin, ceftriaxone, ceftazidime, cefepime, ceftaroline Carbapenems: Ertapenem, imipenem, meropenem, doripenem Monobactams: Aztreonam Fluoroquinolones: Ciprofloxacin, Moxifloxacin, Levofloxacin Tetracyclines: Doxycycline, Minocycline, Tigecycline	GI upset (nausea, diarrhea) Hypersensitivity reactions Leukopenia, thrombocytopenia (rare) Neurologic (altered mental status, seizures) Interstitial nephritis Hepatotoxicity (oxacillin) GI upset (nausea, vomiting, diarrhea) Neurologic (dizziness, AMS, seizures) Phototoxicity Tendonitis, cartilage erosion QT prolongation Dysglycemia Peripheral neuropathies GI upset (nausea, vomiting, epigastric distress) Photosensitivity Teeth discoloration Vertigo (minocycline)	Generally drugs of choice for bacteria once susceptibility known (e.g. MSSA, penicillin-susceptible <i>S. pneumoniae</i> , ampicillin-susceptible enterococci) Excellent anaerobic activity Sulbactam has unique activity against <i>Acinetobacter</i> spp. (doses based on sulbactam, >6 g/day) Consider amox-clav 500-125 mg q8h dosing for gram-negative, anaerobic, or mixed infections (more clavulanate) Cross-reactivity with penicillin allergy Generally reserved for multidrug resistant gram-negatives (MDR-GN) Excellent anaerobic activity Cross-reactivity with penicillin allergy <5% Generally reserved for severe penicillin allergy (e.g. anaphylaxis), but may cross-react with ceftazidime allergy Increasing resistance may limit use, particularly with <i>E. coli</i> Higher dose for <i>P. aeruginosa</i> (e.g. cipro 750 mg q12h, levo 750 q24h) Highly bioavailable, PO = IV Moxifloxacin = poor urine penetration (not used for UTIs) QT prolongation risk = moxi > levo >> cipro Highly bioavailable, PO = IV (doxy, mino)

Macrolides: Erythromycin, azithromycin, clarithromycin Glycopeptides: Vancomycin	GI upset (nausea, vomiting, diarrhea)	
	G I upset (diarrhea > nausea, vomiting) Elevated LFTs (minor)	Red man syndrome can be prevented by slowing infusion rates or premedicate with diphenhydramine IV vanc for systemic infections, PO vanc for C. difficile infection
Sulfonamides: Trimethoprim-sulfamethoxazole	Hypersensitivity reactions Leukopenia, anemia Hyperkalemia, renal failure	Highly bioavailable, PO = IV Dose for severe infections = 15 mg/kg/day based on TMP component
Nitroimidazole: Metronidazole	I upset (nausea) Peripheral neuropathy Taste disturbances (metallic)	Highly bioavailable, PO = IV Excellent anaerobic activity Avoid alcohol due to disulfiram reaction Higher risk for peripheral neuropathies with long-term therapy
Aminoglycosides: Gentamicin, tobramycin, amikacin	Nephrotoxicity Ototoxicity Vestibular toxicity	Tobramycin preferred for P. aeruginosa infections May be used synergistically for severe gram-positive infections Ami = may have activity even if gent or tobra resistant

Source: (Pocket Guide for Antibiotic Pharmacotherapy)

Commonly prescribed antibiotics for women health

▪ Ceftriaxone

Preparation: Injection, 0.25g, 0.5 g, 1 g, 2 g in vial

Indications: serious infections due to sensitive bacteria, including septicemia, pneumonia, and meningitis, surgical prophylaxis, prophylaxis of meningococcal meningitis, gonorrhea.

Cautions: penicillin sensitivity; renal and hepatic impairment; premature neonates, may displace bilirubin from serum albumin; pregnancy and breast feeding; false positive urinary glucose and false positive coomb's test.

Drug interactions: furosemide and warfarin. Do not admix with aminoglycosides in same bottle/bag.

Contraindications: cephalosporin hypersensitivity, porphyria, neonates with jaundice, hypoalbuminaemia, acidosis or impaired bilirubin binding.

Side effects: Diarrhoea, nausea and vomiting, abdominal discomfort, headache, antibiotic-associated colitis, allergic reactions including rashes, pruritus, urticarial, serum sickness - like reactions, fever and arthralgia, and anaphylaxis, erythema multiform, toxic epidermal necrosis's, disturbances in liver enzymes, transient hepatitis and cholestasis jaundice, eosinophilia and blood disorders, reversible interstitial nephritis, hyperactivity, nervousness, sleep disturbances, confusion, hypertonia and dizziness, calcium ceftriaxone precipitates in urine or in gall bladder - consider discontinuation if symptomatic, rarely prolongation of Prothrombin time, pancreatitis.

Dose and Administration:

Infections due to susceptible organisms: IM, IV injection (over 3 - 4 minutes) or IV infusion:

Adult: 1 g daily; severe infections 2 - 4 g daily.

Infant and Child: 20 - 50 mg/kg daily, up to 80 mg/kg daily in severe infections; by IV infusion (over 60 minutes).

Neonate: less than 1 week 20 - 50 mg/kg once daily, **Neonates:** 1-4week and weigh 2kg or less 50mg/kg. If above 2kg, 50-75mg/kg once daily.

Uncomplicated gonorrhea: IM: Adult: 250 mg, adolescent: 125mg as a single dose.

Surgical prophylaxis: IM, IV injection (over at least 2 to 4 minutes), 1 g as a single dose.

Colorectal surgery (with antibacterial active against anaerobes), IM or IV (over at least 2 - 4 minutes), or by IV infusion, 2 g as a single dose.

Storage: prior to reconstitution, store at room temperature.

Premixed solution store at -20o C; once thawed, solutions are stable for 3 days at room temperature of 25o C or for 21 days refrigerated at 5o C. Do not refreeze.

▪ **Vancomycin**

Preparation: Injection, 500 mg in vial, 1gm

Indications: generally reserved for the treatment of infections due to cloxacillin - resistant staphylococci and enterococci; also as an alternative agent for prophylaxis and treatment of endocarditis in penicillin allergic patients.

Cautions: renal impairment.

Drug interactions: ototoxic and nephrotoxic agents, e.g. aminoglycosides.

Contraindications: hearing abnormalities.

Side effects: nephrotoxicity including renal failure and interstitial nephritis, ototoxicity, blood disorders, nausea, chills, fever, eosinophilia, anaphylaxis, rashes, including exfoliative dermatitis, Stevens Johnson syndrome, and vasculitis; phlebitis; on rapid infusion, severe hypotension, wheezing, dyspnoea, urticaria, pruritus, flushing of the upper body, pain and muscle spasm of back and chest.

Dose and Administration:

IV infusion: Adult: over at least 1 hour, 500 mg 6 hourly or 1 g 12 hourly. **Child:** over at least 1 hour, 10 mg/kg 6 hourly or 20 mg/kg 12 hourly.

Neonates: under 1 week old, initially 15 mg/kg followed by 10 mg/kg 12 hourly; 1 week - 1 month old, 15 mg/kg followed by 10 mg/kg 8 hourly.

Storage: Vancomycin reconstituted IV solutions are stable for 14 days at room temperature or refrigeration.

▪ **Metronidazole**

Preparation: Tablet, 250mg, Intravenous infusion, 5mg/ml in 100ml Cream, 0.75%, 1%

Indications: treatment of anaerobic infection, bone and joint infection, meningitis, bacterial endocarditis, prophylaxis of perioperative infection during colorectal surgery, lower respiratory tract infection including pneumonia, empyema and lung abscess, bacterial septicemia, skin and soft tissue infection, inflammatory bowel disease, antibiotic associated colitis, Helicobacter pylori associated duodenal ulcer;

Cautions: disulfiram like reaction with alcohol; hepatic impairment and hepatic encephalopathy, pregnancy; breastfeeding; clinical and laboratory monitoring in courses lasting longer than 10 days; see also interactions.

Note: Avoid Alcohol use.

Drug interactions: phenytoin, coumarin or indandion derivative anticoagulant, warfarin, disulfiram, alcohol, cimetidine, fluorouracil, lithium, phenobarbitone.

Contraindications: chronic alcohol dependence

Side effects: nausea, vomiting, unpleasant metallic taste, furred tongue and gastrointestinal disturbances; rarely headache, drowsiness, dizziness, ataxia, darkening of urine, erythema multiform, pruritus, urticarial, angioedema, and anaphylaxis; abnormal liver function tests, hepatitis, jaundice, thrombocytopenia, aplastic anemia, myalgia, arthralgia, peripheral neuropathy, epileptiform seizures, leukopenia, on prolonged or high dosage regimens

Dose and Administration:

Adult: Antibacterial (systemic), anaerobic infections: Oral: 7.5mg (base) per kg of body weight up to a maximum of 1 gm, every 6 hours for 7 days or longer; IV-infusion, 15mg (base) per kg of body weight initially, then 7.5mg per kg of body weight up to a maximum of 1gm, every six hours for seven days or longer; Inflammatory bowel disease: Oral: 500mg (base) four times a day.

Antibiotic associated colitis: Oral: 500mg (base) three or four times a day.

Helicobacter - pylori associated gastritis or duodenal ulcer: Oral: 500mg (base) three times a day with amoxicillin for one to two weeks.

Perioperative infections, colonic (prophylaxis): IV infusion: 15mg (base) per kg of body weight one hour prior to start of surgery and 7.5mg per kg of body weight six and twelve hours after the initial dose.

Child: Anaerobic infection: Oral: 7.5mg (base) per kg of body weight every 6 hours, or 10mg per kg of body weight every 8 hours. Anaerobic infection - for preterm infants: IV infusion: 15mg per kg of body weight (base) as an initial dose, then 7.5mg per kg of body weight every 12 hours starting 48 hours after the initial dose. Term infants, IV infusion, 15mg (base) per kg of body weight as an initial dose, then 7.5mg per kg of body weight every 12 hours starting 24 hours after the initial dose. For infants greater than 7 days of age and children IV infusion, 15mg

(base) per kg of body weight as an initial dose, then 7.5 mg per kg of body weight every 6 hours.

Storage: Room temperature, in a well closed, light resistant container. Protect from freezing

▪ **Gentamicin**

Injection, 40mg/ml; 80mg/ 2ml; 20mg/2ml

Indications: biliary tract infection, bone and joint infection, meningitis, ventriculitis, urinary tract infection, peritonitis, bacterial septicemia.

Cautions: in premature infants and neonates, elderly, patients with renal function impairment (check renal function test) or dehydration, and in those with eighth-cranial nerve impairment. Prolonged use should be avoided.

Drug interactions: avoid concurrent and/or sequential use of two or more aminoglycosides or aminoglycosides with capreomycin, antimythenic, methoxyflurane or polymyxin, cephalosporins, ciclosporin, cisplatin, neostigmine, pyridostigmine, suxamethonium, vecuronium, furosemide, penicillin's and indomethacin.

Contraindications: pregnancy, myasthenia gravis, previous allergic reaction to one aminoglycoside.

Side effects: nephrotoxicity, increased thirst, loss of appetite, nausea or vomiting; neurotoxicity (muscle twitching, numbness, seizures, tingling); ototoxicity, auditory damage (loss of hearing, ringing or buzzing a feeling of fullness in the ears), vestibular damage (clumsiness, dizziness, nausea, vomiting, unsteadiness)

Dosage and Administration:

Adult: Antibacterial (systemic): IM or IV infusion: 1-1.7mg (base) per kg of body weight every eight hours for seven to ten days or more. Urinary tract infection (bacterial, uncomplicated):IM or IV infusion: Adults (< 60kg body weight) - 3mg (base) per kg of body weight once a day, or 1.5mg per kg of body weight every 12 hours. For adults (≥ 60kg of body weight) 160mg (base) once a day, or 80mg every 12 hours. Usual adult prescribing limit - up to 7mg (base) per kg of body weight daily in severe, life threatening infections.

Child: Antibacterial (systemic):IM or IV infusion: premature or full term neonates up to 1 week of age: 2.5mg (base) per kg of body weight every 12 or 24 hours for seven to ten days or more.

Older neonates and infants: 2.5mg (base) per kg of body weight every 8 to 16 hours for 7-10 days or more.

Child: 2 to 2.5mg (base) per kg of body weight every 8 hours for 7-10 days or more.

Storage: store at room temperature and protect from freezing

▪ Amoxicillin

Preparation:

Tablet, 500 mg, Capsule, 250 mg, 500 mg, Injection, 250 mg, 500 mg in vial Syrup, 125mg/5ml, 250 mg/5ml

Indications: urinary tract infections, upper respiratory tract infections, bronchitis, pneumonia, otitis media, dental abscess, osteomyelitis, Lyme disease in children, endocarditis prophylaxis, post-splenectomy prophylaxis, gynecological infections, gonorrhea, and Helicobacter pylori eradication

Cautions: history of allergy, renal impairment, erythematous rashes common in glandular fever, chronic lymphatic leukaemia, and possibly HIV infection.

Drug interactions: probenecid (except in cases of gonorrhea and other STD), allopurinol, oral contraceptives, methotrexate, warfarin.

Contraindications: known hypersensitivity (allergy) to any penicillines.

Side effects: allergic reaction, specifically anaphylaxis (bronchospasm, sudden or severe decrease in blood pressure), skin rash, joint pain, fever, GIT reaction (mild diarrhoea, nausea, vomiting), oral candidiasis (sore mouth or tongue), pseudomembranous colitis (severe abdominal or stomach cramps and pain, abdominal tenderness, watery and severe diarrhoea).

Dose and Administrations:

Infections due to sensitive organisms: Oral:

Adult and Child over 10 years, 250 mg every 8 hours, doubled in severe infections;

Child up to 10 years, 125mg every 8 hours, doubled in severe infections.

Severe or recurrent purulent respiratory-tract infections: Oral:

Adult: 3 g every 12 hours.

Pneumonia: Oral:

Adult: 0.5 to 1 g every 8 hours.

Short Course Oral therapy, Dental abscess:

Adult: 3 g repeated after 8 hours.

Urinary tract infections:

Adult: 3 g repeated after 10 – 12 hours.

Otitis media:

Child 3 – 10 years, 750 mg twice daily for 2 days or IM: 500 mg every 8 hours;

Child, 50 to 10 mg/kg daily in divided doses, or IV injection or infusion: 500 mg every 8 hours increased to 1g every 6 hours.

Child, 50 to 100 mg/kg daily in divided doses

Adults Meningitis (in combination with another antibiotic if necessary):IV infusion: 2 g every 4 hours for at least 5 days in meningococcal disease or for 10 – 14 days in listerial meningitis. Enterococcal endocarditis (in combination with another antibiotic if necessary): IV infusion: 2 g every 4 hours.

Storage: at room temperature in a tight container; oral suspension remains stable for 14 days at room temperature or if refrigerated.

Note: Reconstitution and Administration: According to manufacturer's directions.

▪ Ampicillin

Preparation: Capsule, 250 mg, 500 mg, Oral suspension; 125 mg/5ml, 250 mg/5ml, Drop, 100 mg/ml, Injection, (sodium), 250 mg, 500 mg, 1 g in vial

Indications: broad spectrum activity against several Gram⁺positive organisms, Gram-negative cocci and some bacilli. Used in respiratory tract infections, cholecystitis and gastrointestinal tract infections, including typhoid

Cautions, Drug interactions, Contraindications and Side effects;

Same as for Amoxicillin

Dose and Administration:

Adult: Oral:250-500mg 6 hourly (up to 1g 6 hourly for severe infections).IM: 500mg 6 hourly. IV: by slow injection or infusion over 30-60 minutes, 500mg 4-6 hourly (up to 12g daily for severe infections).Meningitis/septicaemia:IV: 1-2g 3-4 hourly; maximum 300 mg/kg/day or 16g.Renal impairment: GFR 10 to 50ml/min, dose interval 6-12 hours; GFR <10ml/min, 12-24 hours.

Child: Oral, IM or IV: under 20kg, 10-25 mg/kg/dose 6 hourly; over 20kg, as for adults.

Meningitis or severe infections: **IV:** 50mg/kg dose 6 hourly.

Neonates: IM or IV: 50mg/kg/dose (meningitis 100mg/kg/dose) 12

hourly in the first week of life, 8 hourly from 1-3 weeks old, 6 hourly thereafter.

Storage: at room temperature; after reconstitution oral suspension is stable for 7 days at room temperature or for 14 days under refrigeration.

▪ **Cloxacillin sodium**

Preparation: Capsule, 250mg, 500mg , Syrup, 125mg, 250mg in each 5ml, Injection, 250mg, 500mg in vial

Indications: infections due to beta-lactamase-producing, staphylococci including impetigo, cellulitis and other soft-tissue infections; staphylococcal endocarditis, septicaemia, pneumonia and osteomyelitis.

Cautions: history of allergy, renal and hepatic function impairment, GIT disease especially ulcerative colitis, and regional enteritis, antibiotic associated colitis, heart failure; pregnancy and breastfeeding.

Drug interactions: probenecid, chloramphenicol, erythromycin, sulfonamide, and tetracyclines.

Contraindications: known hypersensitivity or allergy to penicillines.

Side effects: nausea and vomiting, diarrhea, hypersensitivity reactions including urticaria, fever, joint pain, rashes, angioedema, anaphylaxis, serum sickness-like reactions, haemolytic anaemia, interstitial nephritis; neutropenia, thrombocytopenia, coagulation disorders; antibiotic-associated colitis; hepatitis and cholestatic jaundice may be delayed in onset; electrolyte disturbances; pain, inflammation, phlebitis or thrombophlebitis at injection sites.

Dose and Administration:

Adult: Oral: 250 to 500mg (base) every six hours. Maximum dose up to 6 gm (base) a day

IV 250 to 500mg (base) every six hours maximum 6gms (base) daily.

Child: Infants and children up to 20kg of body weights: Oral: 6.25 to 12.5mg (base) per kg of body weight every six hours or IV: 6.25 to 12.5mg (base) per kg of body weight every six hours.

Note: continue medicines for full time of treatment and take on empty stomach.

Storage: store at room temperature. After reconstitution, solutions retain their potency for 14 days if refrigerated

▪ **Penicillin G, Benzathine**

Preparation: Injection, 0.6, 1.2, 2.4 million IU in Vial

Indications: streptococcal pharyngitis, diphtheria carrier state, syphilis and other treponemal infections (yaws, pinta, bejel); rheumatic fever prophylaxis.

Cautions: history of allergy (see notes above); renal failure; pregnancy and breast feeding

Drug interactions: methotrexate

Contra indications: see under penicillin G, sodium crystalline; and neurosyphilis

Side effects: see under penicillin G, sodium crystalline

Dose and Administrations:

Deep IM injection

Streptococcal pharyngitis: primary prophylaxis of rheumatic fever:

Adult and Child over 30 Kg body-weight, 900 mg as a single dose, Child under 30 Kg body – weight, 450 – 675 mg as a single dose.

Secondary prophylaxis of rheumatic fever: Adult and Child over 30 Kg body-weights, 900 mg once every 3 – 4 weeks; Child under 30 Kg body-weight, 450 mg once every 3 – 4 weeks.

Early syphilis: Adult 1.8 g as a single dose, divided between 2 sites.

Late syphilis: Adult 1.8 g divided between two sites, once weekly for 3 consecutive weeks.

Congenital syphilis (where no evidence of CSF involvement): Child up to 2 years, 37.5 mg/kg as a single dose.

Adult: 900 mg as a single dose; Child 450 mg as a single dose.

Reconstitution and Administration: According to manufacturer's directions.

Storage: store between 2 and 8o c.

▪ **Penicillin G, Sodium crystalline**

Preparation:

Injection, 1m IU, 10 million IU, 20 million IU in vial. 1 million unit equivalent to 600 mg

Indications: throat infections, pneumonia, otitis media, lyme disease in children; streptococcal endocarditis; meningococcal disease; necrotizing enterocolitis, necrotizing fasciitis; leptospirosis, neurosyphilis, anthrax; actinomycosis; brain abscess; gas gangrene; cellulitis; osteomyelitis.

Cautions: history of allergy (see notes under 8.1.1); renal failure; heart failure; pregnancy and breastfeeding.

Drug interactions: methotrexate, probenecid (decrease renal tubular secretion of the penicillin), aminoglycosides (inactivated by high doses of IV benzylpenicillin; should not be administered in same giving set).

Contraindications: penicillin hypersensitivity, avoid intrathecal route

Side effects: hypersensitivity reactions including urticarial, fever, joint pains, rashes, angioedema, anaphylaxis, serum sickness like reactions, hemolytic anemia and interstitial nephritis; neutropenia, thrombocytopenia, coagulation disorders and central nervous system toxicity including convulsions reported (especially with high doses or in severe renal impairment), paraesthesia with prolonged use; diarrhea and antibiotic associated colitis; see also notes above.

Dose and Administration:

Mild to moderate infections due to sensitive organisms: IM or slow IV injection or infusion:

Adult: 0.6 – 2.4 g daily in 2 – 4 divided doses, with higher doses in severe infections and duration of treatment depending on disease.

Neonate: 50 mg/kg daily in 2 divided doses;

Infant 1 to 4 weeks, 75 mg/kg daily in 3 divided doses;

Child 1 month to 12 years, 100 mg/kg daily in 4 divided doses, with higher doses in severe infections.

Bacterial endocarditic: slow IV injection or infusion:

Adult up to 7.2g daily in 6 divided doses.

Meningococcal meningitis: slow IV injection or infusion:

Adult up to 14.4 g daily in divided doses;

Premature infant and Neonate 100 mg/kg daily in 2 divided doses;

Infant 150 mg/kg daily in 3 divided doses;

Child 1 month to 12 years, 180 – 300 mg/kg daily in 4 – 6 divided doses.

Suspected meningococcal disease (before transfer to hospital): IM or slow IV injection:

Adult and Child over 10 years, 1.2 g; Child 1 to 9 years, 600 mg;

Child less than 1 year, 300 mg.

Neurosyphilis: slow IV injection:

Adult: 1.8 – 2.4 g every 4 hours for 2 weeks.

Congenital syphilis, IM or slow IV injection:

Child up to 2 years, 30 mg /kg daily in 2 divided doses for 10 days,

Child over 2 years, 120 – 180 mg/Kg (to max of 1.44g) daily in divided doses for 14 days.

Reconstitution and Administration: According to manufacturer's directions

Storage: at room temperature. Prior to reconstitution

1.3.5. IV fluids, Vitamin K

▪ IV fluids

Many disease processes result in changes that could result in rapid deterioration of the patient and death. Anyone caring for surgical patients should have a basic knowledge of fluid, electrolyte, acid and base disturbances, as well as their causes and their management.

Moles or millimoles: number of particles present per unit volume

Equivalents or milliequivalents: number of electric charges per unit volume.

Osmoles or milliosmoles: number of osmotically active particles or ions per unit volume.

Normal distribution of body fluids

The total body water constitutes 50 – 85% of total body weight depending on age and lean Body mass (muscle mass). In regard to this, 55% - 60% of body weight for a 70 Kg young 6 Man is water. Females have lower body water (45 –60%) because of the high fat content of Their body. The total body water in neonates is 80%-85%, which is higher than in adults.

Total body water is further divided into two:

1. Intracellular fluid, comprising 2/3 of total body water
2. Extra cellular fluid, comprising 1/3 of total body water. The extra cellular fluid is

Sub divided into Intravascular (plasma) comprising 2/3 of extra cellular fluid and Interstitial which comprises 1/3 of extra cellular fluid.

N.B. Physiologically all compartments of body water are interdependent.

Chemical composition of body fluid compartments

Plasma Intracellular fluid Interstitial fluid

Average daily water exchange

Out put

- Urine: 1500 ml
- Insensible loss: 1000 ml (up to 1700 in hot climate)
- Stool: 200 ml
- **Total:** 2700-3400ml

Intake Endogenous: 200 ml (from oxidation of ingested food.)

Net requirement: 2500-3200

N.B: A minimum urinary output of approximately 400 ml in 24 hours is required to excrete the end products of metabolism.

Table 2: Commonly available replacement or IV fluids

Fluid	Ions (millimol per liter)			Carbohydrate (gram per liter)	Used for replacement of
	Na ⁺	Cl ⁻	Ka ⁺		
Physiologic saline (Normal saline)	154	154	0	0	Blood/ extra cellular fluid loss
Hartmann's solution (Ringer's lactate) (Contains lactate and calcium)	131	112	5	0	Blood, intracellular fluid loss
5% glucose in water (D/W)	0	0	0	50	Maintenance and for medication

Vitamin K(phytonadione)

At birth, the newborn does not have bacteria in the colon that necessary for synthesizing fat soluble vitamin k. Therefore newborns have decreased level of Prothrombin during the first 5 to 8 days of life.

Preparation INJ- 2ml vial=2mg/ml Action

It promotes the hepatic formation of the clotting factors II,VII,IX and X.

Indicated to treat or prevent certain bleeding problems, help liver to produce blood clotting factors.

Contraindication: Hypersensitivity

Adverse effects: Pain and edema may occur at injection site, allergic reaction such as rash and urticarial may occur, Hyperbilirubinemia

Dosage and routes of administration: 0.5mg IM within 1 hour of birth.

Nursing considerations

- Document the giving of the medication to newborn to prevent an accidental doubling.
- Observe for bleeding usually occurs on 2nd and 3rd day.
- Observe for jaundice and local inflammation.

1.3.5. ARV drugs

Antiretroviral drugs are those drugs prescribed to improve quality of life of people living with HIV/AIDS.

Categories of Antiretroviral:

The effectiveness of ART is assessed by clinical observations (OIs, weight gain etc), determination of plasma viral load, CD4 cell count. ART should not be delayed until the immune system is irreversibly damaged.

Considerations to be made on ART includes the regimen's pill burden, dosing frequency, food requirements, toxicity and possible drug interactions

Currently in use Anti-Retroviral drugs belong to two main classes.

1. Reverse Transcriptase Inhibitors (RTIs) which is further divided into two groups.

- Nucleoside Reverse Transcriptase Inhibitors (NRTIs)
- Non – Nucleoside Reverse Transcriptase Inhibitors (NNRTIs)

2. Protease inhibitors (PIs).

The **NRTI's** group includes:

- Zidovudine (ZDV) 300 mg twice daily
- Stavudine (d4T) 40 mg twice daily (30 mg twice daily if < 60 kg)
- Lamivudine (3TC) 150 mg twice daily
- Didanosine (ddl) 400 mg once daily (250 mg once daily if < 60 kg)
- Abacavir (ABC) 300 mg twice daily
- Tenofovir (TDF)
- Emtricitabin (FTC)

The **NNRTI's** group includes:

- Efavirenz (EFZ) 600 mg once daily
- Nevirapine (NVP) 200 mg once daily for 14 days, then 200 mg twice daily

The drugs under **Protease inhibitors** group are:

- Nelfinavir (NFV) 1250 mg twice daily
- Indinavir/ritonavir (IDV/r) 800mg/100 twice daily
- Lopinavir/ritonavir (LPV/r) 400 mg/100 mg twice daily
- Saquinavir/ritonavir (SQV/r) 1000 mg/100 mg twice daily

First-line regimens include (exact regimen depends on individual cases)

- Tenofovir + Emtricitabine (FTC) + Efavirenz (EFV) or Nevirapine (NVP)
- Zidovudine (AZT) + Lamivudine (3TC) + Efavirenz (EFV) or Nevirapine (NVP).

Efavirenz is preferred for patients on anti-TB. Nevirapine is preferred for pregnant women in the first trimester or women who might become pregnant. Nowadays DTG/dolutegravir is drug of choice in the first line regimen combinations. Please refer national guidelines for updates.

1.3.6. Analgesics (Pethidine, Morphine), Paracetamol, Indomethacin, Ibuprofen, ...

● Morphine Sulphate

Tablets, 5mg, 10 mg, 15mg, 20mg, 30mg, Oral solution, 5mg/5ml, 20mg/5ml, 50mg/5ml
10 mg/5ml, 100 mg/5ml, Suppository, 10mg, 15mg, 20mg, 30mg, Injection (as hydrochloride), 10 mg/ml, 20mg/ml in 1ml ampoule

Indications: analgesic, anti-diarrhea, anesthesia adjunct and antitussive; see also notes above.

Cautions: renal and hepatic impairment; elderly and debilitated, dependence; hypothyroidism; convulsive disorders; decreased respiratory reserve and acute asthma; hypotension, prostatic hypertrophy; pregnancy and breastfeeding, adrenocortical insufficiency, obstructive bowel disorders, myasthenia gravis, withdraw gradually, not drive or operate machinery; see also notes above.

Drug interactions: CNS depressants; e.g alcohol, anaesthetic agents; antidiarrheal; anticholinergic, antihypertensive; cimetidine; metoclopramide; MAO inhibitors.

Contraindications: acute respiratory depression, acute alcoholism, where risk of paralytic ileus; raised intracranial pressure or head injury; avoid injection in pheochromocytoma; during labour, diarrhea caused by poisons, antibiotic-associated pseudomembranous enterocolitis, acute abdominal conditions and biliary colic; see also notes above.

Side effects: nausea, vomiting, constipation, drowsiness, also dry mouth, anorexia, spasm of urinary and biliary tract, bradycardia, tachycardia, palpitations, euphoria, decreased libido, rash, urticarial, pruritus, sweating, headache, facial flushing, vertigo, postural hypotension, hypothermia, hallucinations, confusion, tolerance & dependence, meiosis, larger doses produce respiratory depression and hypotension.

Dose and Administration: Adult: IM or SC: 5 -15mg (usually 10 mg initially, based on an adult weighing 70 Kg); repeated 3-4 hourly as required. IV: 2.5 mg increments every 5 - 10

minutes, up to a maximum of 15 mg. Oral: 5 - 20 mg 4 hourly. When changing to a controlled release formulation, give the current total 24 - hour requirement in 2 divided doses. Controlled release tablets: Initially 10 - 20 mg twice daily, increased according to individual requirements.

Child: IM or SC: over one month old, 0.1-0.2 mg/kg.

Neonates: IM or SC: 0.1mg/kg. Note: Facilities must be available to provide ventilator support if necessary.

▪ **Pethidine Hydrochloride**

Tablet, 50mg, Injection, 50mg/ml in 1 and 2ml ampoules

Indications: analgesia in moderate to severe pain including labour, anesthesia adjunct;

Cautions: as for morphine above, also atrial fibrillation or other cardiac diseases where tachycardia might pose a problem.

Drug interactions: as for morphine, also MAO inhibitors, and cimetidine

Contraindications: as for morphine above, also renal failure or severe hepatic disease.

Side effects: as for morphine above; the effect on smooth muscle may be relatively less intense than with morphine and constipation occurs less frequently. Local reactions often follow injection of pethidine; general hypersensitivity reactions occur rarely. Pethidine given intravenously may increase the heart rate.

Dose and Administration: Adult: Oral: 50 - 150mg every 4 hours. IM (preferred), SC: 50 - 150mg (usually 100mg) every three to four hour as needed;

Child: Oral or IM: 0.5- 2.0mg/kg/dose, repeated 8 hourly if required. Maximum 6mg/kg/day.

▪ **Acetaminophen (paracetamol)**

Preparation: Tablet-80mg, 160mg, 500mg, suppository-80mg, 120mg, Oral solution- 16m/ml, 80mg/ml

Action: Produce analgesia by inhibiting prostaglandins and other substances that sensitizes pain receptors.

Indications: mild to moderate pain and fever mgt

Contraindications: Liver disease, hypersensitivity

Adverse effects: Neutropenia, hemolytic anemia, hypoglycemia, urticarial

Dosage and routes of administration: 500mg tablet thrice a day for 5 days

Nursing considerations:

- ✓ Advise the patient not to exceed the prescribed dose.
- ✓ Advise the patient that drug is only for short term use and avoid taking OTC drugs without prescription.
- ✓ Advise patient to take tablet after meal to prevent GI symptoms

▪ Indomethacin

Indomethacin is slightly more toxic but in certain circumstances more effective than aspirin. Indomethacin is well absorbed after oral administration and highly bound to plasma proteins. Metabolism occurs in the liver and unchanged drug and inactive metabolites are excreted in bile and urine.

Clinical Uses: treatment of patent ductus arteriosus, acute gouty arthritis and ankylosing spondylitis, pericarditis and pleurisy.

Adverse Effects: The gastrointestinal effects may include abdominal pain, diarrhea, gastrointestinal hemorrhage, and pancreatitis. CNS effects include be associated with dizziness, confusion, and depression. Serious hematologic reactions' including thrombocytopenia and aplastic anemia has been reported.

▪ Diclofenac

Diclofenac is a potent cyclooxygenase inhibitor with anti-inflammatory, analgesic, and antipyretic properties. The drug is rapidly absorbed following oral administration and has a half-life of 1-2 hours. It accumulates in the synovial fluid. The potency of diclofenac as a cyclooxygenase inhibitor is greater than that of naproxen. The drug is recommended for chronic inflammatory conditions such as rheumatoid arthritis and osteoarthritis and for the treatment of acute musculoskeletal pain. Adverse effects include gastrointestinal distress, occult gastrointestinal bleeding, and gastric ulceration

▪ Ibuprofen

Ibuprofen is extensively metabolized in the liver, and little is excreted unchanged. Gastrointestinal irritation and bleeding occur, though less frequently than with aspirin. In addition to the gastrointestinal symptoms, rash, pruritus, tinnitus, dizziness, headache, and fluid retention have been reported. Rare hematologic effects include agranulocytosis and aplastic anemia. Effects on the kidney include acute renal failure, interstitial nephritis, and nephrotic syndrome, occurring very rarely

1.3.7. Anesthetic drugs (Lidocaine, ketamine, procaine, N2O)

General anesthesia involves the physiological changes: Reversible loss of response to painful stimuli, loss of consciousness and loss of motor and autonomic reflexes. Loss of consciousness is associated with inhibition of the activity of reticular formation.

General anesthetics are administered by inhalation or by intravenous routes. They are classified into two on the basis of their route of administration as inhalation and intravenous anesthetics.

- **Inhalation anesthetics:** The main agents are: Halothane, nitrous oxide, enflurane and ether.

1. **Halothane:** Is the most widely used agent, highly lipid soluble, potent. It causes arrhythmia, hangover and the risk of liver damage is high if used repeatedly.

2. **Nitrous oxide:** Odorless and colorless gas. It is rapid in action and also an effective analgesic agent. Its potency is low, hence must be combined with other agents. It is a relatively free of serious unwanted effects.

- **Intravenous anaesthetics**

Intravenous anesthetics act much more rapidly, producing unconsciousness in about 20 seconds, as soon as the drug reaches the brain from the site of its injection. These agents used for induction of anesthesia followed by inhalation agent. The main induction agent in current use is: thiopentone, etomidate, propofol, ketamine and short acting benzodiazepine (midazolam).

- **Lidocaine Hydrochloride**

Indications: surface anesthesia of mucous membranes; infiltration anesthesia; peripheral and sympathetic nerve block; dental anesthesia; spinal anesthesia; intravenous regional anesthesia; arrhythmias.

Cautions: caution in patients with inflammation and/or infections at site of injection, and in very young, the elderly, acutely ill, or weak patients.

Drug interactions: avoid simultaneous use of lidocaine with vasoconstrictors (e.g. adrenaline) on the extremities such as the finger, toes etc.

Contraindications: known hypersensitivity.

Side effects: a transient burning sensation may occur at the site of injection.

Dose and Administration:

Inject indirectly into the tissue to be incised or in the immediate surgery area. It should be injected slowly, with frequent aspirations before and during the injection, to reduce the risk of inadvertent intravascular administration. The total dose should not exceed 300mg/dose (4.5mg/kg of body weight). Children should receive smaller amounts of lidocaine, generally in lower concentration than adults.

1.3.8. Suture materials

Suture is a thread like material used to close surgical wounds and unite two edges of cut tissue. Suture materials can generally be classified as absorbable and non-absorbable.

Absorbable: This is a type of suture material that gets absorbed by the tissue.

E.g. Catgut (natural or biologic type), Vicryl (Synthetic)

Non absorbable: This is a type of suture material that remains unabsorbed by the tissue.

E.g. Silk (natural or biologic type) Nylon (Synthetic)

Different surgical stitches are used in various types of tissues for different purposes. Important factors considered when selecting suture material for surgery include:

- Type and site of the operation
- Healing characteristics of the tissue involved
- Properties of the suture and needle
- Security of knots
- Behavior of the material in presence of infection
- Suture size (The commonest surgical suture size is between 4/0 and 1)

Self-check-I

Test-I.1: Match items in column A with items in Column

A	B
1. Medicinal drugs	A. Substances used for the prevention, treatment and diagnosis of disease.
2. Non medicinal (social) drugs	B. study of interaction of drugs with living organisms
3. Pharmacology	C. Substances used for recreational purposes.
4. Pharmacodynamics	D. study of the biological and therapeutic effects of drugs
5. Excretion	E. deals with the proper selection and use of drugs for the prevention and treatment of disease
6. Tteratogenesis	F. the science of poison
	G. Elimination of unchanged drug or metabolite from the bod
	H. “to produce a monster”

Test -I.2: Select the correct choice for the following questions

1. which route is safe, convenient and economical for administration of medication
 - A. IV
 - B. IM
 - C. SC
 - D. ID
2. A route by which a drug is directly administered into the blood circulation is
 - A. IV
 - B. IM
 - C. SC
 - D. ID
3. Group of drugs that have the power to excite contractions of the uterine muscles are
 - A. Antibiotics
 - B. Anticonvulsants
 - C. Tocolytics
 - D. Analgesics
4. Anticonvulsant drug that is prescribed to manage convulsion is
 - A. Magnesium sulphate
 - B. Ampicillin
 - C. Vitamin K
 - D. Ceftriaxone
5. An IF fluid with high sodium and chlorine Ions in Millimol per liter
 - A. NS
 - B. RL 5%
 - C. DW
 - D. %DW
6. Nursing considerations when administering anticonvulsant drug
 - A. Monitor patient BP, pulse rate, & body weight frequently.
 - B. Monitor patient for muscle and joint pain, fever or throat pain.
 - C. With hold the drug and report the case
 - D. All
7. Disulfiram like reaction with alcohol and unpleasant metallic test is a side effect of
 - A. Gentamycin
 - B. Vancomycin
 - C. Metronidazole
 - D. Benzathine penicillin

Test-I.3: Answer the following question

1. Diuretics are prescribed for pregnancy induced hypertension with massive oedema, eclampsia with pulmonary oedema.
2. List anti-hypertensive drugs contraindicated in pregnancy
3. In selecting an antibiotic, what are the concerns that should be in consideration? List and describe it.
4. What are factors to be considered when selecting suture material for surgery

Unit Two:- Minimize potential risk to the safe administration of medications

Instruction Sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Checking expiry dates of medication .
- Checking client medication chart.
- Checking, identifying and referring common contraindications and adverse reactions
- Checking client's for any known allergies.
- Ensuring infection control methods

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Check expiry dates of medication prior to administration.
- Check client medication chart.
- Check, identifying and referring common contraindications and adverse reactions
- Check client's for any known allergies.
- Ensure infection control methods are applied correctly

2.1. Checking the expiry date of medication before administration

Expiry date: The date after which the manufacturer will not guarantee the safety and quality of the medicine, despite optimum storage conditions. The table below gives guidance on the interpretation of the different expiry date formats used by manufacture of medicines.

Expiry date format used	Actual date of expiry
'Use by' '	End of the month stated
'Use before'	Beginning of the month stated
'Expiry date'	End of the month stated

You must review the expiry date on all medicines prior to administering them to patients. Expired medicines, and opened oral liquid medicines with no date of opening stated, must be given for disposal by the responsible body. The opening of a multi-use vial of local anaesthetic must be dated and disposed of after 3 days.

2.2. Checking patient medication chart

Knowledge and skill are important in ensuring client safety during medication administration. To administer medications safely, the nurse must do the following:

Interpretation of the order:

If the written order is not completely clear or contains unusual abbreviations, the nurse should consult the health care provider for clarification. Clarification of medication of the written order also may be necessary if important information, such as the route or frequency, is omitted.

The nurse should evaluate whether the amount and route ordered are likely to be safe for the client. The nurse needs to know, or look up, the dosage range, the route of administration, the contraindications, and the side effects before giving any medication.

If the nurse questions the safe use of any prescribed medication, he/she has the legal responsibility to consult with the health care provider rather than administer a medication that could potentially cause harm.

2.3. Common contraindications, adverse reactions and allergies

▪ Drug-drug interactions

Drug interactions are a key consideration when administering a medication. A drug interaction is where the active component of the medication might interfere or interact with another drug or product.

Medication errors are the number-one error in health care. Safe and accurate medication administration is an important and potentially challenging nursing responsibility. Medication administration requires good decision-making skills and clinical judgement, and the nurse is responsible for ensuring full understanding of medication administration and its implications for patient safety.

Table 3: key consideration and principles when administering a medication

PRINCIPLE	ADDITIONAL INFORMATION
Be vigilant when preparing medications.	Avoid distractions. Some agencies have a no-interruption zone (NIZ) , where health care providers can prepare medications without interruptions.
Check for allergies.	Always ask patient about allergies, types of reactions, and severity of reactions.
Use two patient identifiers at all times.	Use at least two patient identifiers before administration.
Assessment comes before medication administration.	All medications require an assessment (review of lab values, pain, respiratory assessment, cardiac assessment, etc.) prior to medication administration to ensure the patient is receiving the correct medication for the correct reason.
Be diligent in all medication calculations.	Errors in medication calculations have contributed to dosage errors, especially when adjusting or titrating dosages.
Avoid reliance on memory; use checklists and memory aids.	Slips in memory are caused by lack of attention, fatigue, distractions. Mistakes are often referred to as attentional behaviors where lack of training or knowledge is the cause of the error. Slips account for most errors in health care. If possible, follow a standard list of steps for every patient.
Communicate with your patient before and after administration.	Provide information to patient about the medication before administering it. Answer questions regarding usage, dose, and special considerations. Give the patient an opportunity to ask questions. Include family members if appropriate.
Avoid workarounds.	A workaround is a process that bypasses a procedure, policy, or problem in a system. For example, a nurse may “borrow” a medication from another patient while waiting for an order to be

	filled by the pharmacy. These workarounds fail to follow agency policy to ensure safe medication practices.
Ensure medication has not expired.	Medication may be inactive if expired.
Always clarify an order or procedure that is unclear.	Always ask for help whenever you are uncertain or unclear about an order. Consult with the pharmacist, charge nurse, or other health care providers and be sure to resolve all questions before proceeding with medication administration.
Use available technology to administer medications.	Bar-code scanning (eMAR) has decreased errors in administration by 51%, and computerized physician orders have decreased errors by 81%. Technology has the potential to help decrease errors. Use technology when administering medications but be aware of technology-induced errors.
Report all near misses, errors, and adverse reactions.	Reporting allows for analysis and identification of potential errors, which can lead to improvements and sharing of information for safer patient care.
Be alert to error-prone situations and high-alert medications.	High-alert medications are those that are most likely to cause significant harm, even when used as intended. The most common high-alert medications are anticoagulants, narcotics and opiates, insulins, and sedatives. The types of harm most commonly associated with these medications include hypo-tension, delirium, bleeding, hypoglycaemia, bradycardia, and lethargy.
If a patient questions or expresses concern about a medication, stop and do not administer it	If a patient questions a medication, stop and explore the patient's concerns, review the physician's order, and, if necessary, notify the practitioner in charge of the patient.

2.4. Infection control methods

Safe medication administration is one of the critical point that has to be checked and practiced by all health workers. Therefore all safety measures has to be in line with the national infection prevention guidelines and respective protocols. You will learn details of the process in your IP course.

Table 4: : Five key moments for hand washing

KEY MOMENTS	ADDITIONAL INFORMATION
1. Before initial contact with patient/client/resident or environment contact	Before touching a patient (e.g., feeding, toileting, or personal care) Before touching the patient's environment Before adjusting an IV rate Before taking a pulse or blood pressure
2. Before any clean (routine) or aseptic (sterile) procedure	Before applying clean or sterile gloves Before performing a sterile dressing change Before feeding a patient Before performing oral/dental care Before inserting eye drops Before inserting Foley catheter Before preparing medication
3. After blood or body fluid risk/exposure	After contact with body secretions, mucous membranes, or non-intact skin After glove removal (clean or sterile gloves) After handling waste (urine, drainage, wound care) After wound care or a sterile procedure When moving from a contaminated area on the body to a non-contaminated area
4. After contact /touching the patient /client /resident	After taking a blood pressure or pulse, touching a urinary catheter, or feeding or dressing a patient
5. After contact with the patient's /client's /resident's environment	After touching a bed table or bathroom light After touching personal toiletries After touching walkers or wheelchairs After touching electronic IV devices After taking blood pressure or pulse After changing bed linen

Self-check-2

Test-2.1: Say true or false and justify your answer

1. The nurse needs to know, or look up, the dosage range, the route of administration, the contraindications, and the side effects **after** giving any medication
2. The nurse is responsible for ensuring full understanding of medication administration and its implications for patient safety.
3. You are expected to provide information to pt about the medication before administering it.
4. **Low-alert medications** are those that are most likely to cause significant harm, even when used as intended

Test- 2.2: Select the correct answer for the following multiple choice questions.

1. What a nurse shall do if a patient asks a question
 - A. Answer questions regarding usage, dose, and special considerations.
 - B. Include family members if appropriate.
 - C. Always clarify an order or procedure that is unclear
 - D. All
2. What a nurse shall do if he/she faces a problem
 - A. Ask for help whenever you are uncertain or unclear about an order.
 - B. Consult with the pharmacist, charge nurse, or other health care providers
 - C. Be sure to resolve all questions before proceeding with medication administration.
3. For example, a nurse may “borrow” a medication from another patient while waiting for an order to be filled by the pharmacy, and this is called
 - A. Work around
 - B. Medical error
 - C. Vigilance
 - D. None

Test-2.3: Match items in column A with items items in column B

A	B
1. No-interruption zone (NIZ),	A. The date after which the manufacturer will not guarantee the safety and quality of the medicine
2. Expiry date:	B. The time, route, dosage, site of administration and the person who administered the medication should be filed.
3. Right Documentation	C. Where health care providers can prepare medications without interruptions.

Unit Three: . Prepare for Administration of Medications

Instructional Sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Explaining and ensuring the process of medication administration
- Determining precautions to each client's situation as per the medication orders
- Identifying Medication administration route correctly
- Positioning the client
- Considering the effect of commonly used medications
- Preparing medications in accordance with the legislative requirements and organizational guidelines
- Ensuring medication storage and disposing in accordance organizational policy and procedures.

This unit will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- The process of medication administration is explained to the client and ensures their readiness.
- The client is positioned appropriately prior to the administration of medication
- Medication administration route is correctly identified for each medication to be administered, using appropriate terminology.
- The effect of commonly used medications is considered on the body prior to medication administration.
- Medications are prepared in accordance with the legislative requirements and organizational guidelines.
- Medication administration techniques are applied, and precautions are specified to each client's situation and as per the medication orders.
- Ensure medication is stored and disposed in accordance with the medical instructions and organizational **policy and procedures**.

3.1. Explaining and ensuring the process of medication administration





You can plan and follow steps of standards to ensure process of Safe medication Administration




- Plan medication administration to avoid disruption:
 - ✓ Dispense medication in a quiet area.
 - ✓ Avoid conversation with others.
 - ✓ Follow agency's no-interruption zone policy.
- Prepare medications for ONE patient at a time.
- Follow the SEVEN RIGHTS of medication preparation (see below).
- Check that the medication has not expired.
- Perform hand hygiene.
- Check room for additional precautions.
- Introduce yourself to patient, explain the purpose, benefits as well as the whole process including route of administration and duration of treatment
- Confirm patient ID using two patient identifiers (e.g., name and date of birth) AND check against MAR.
- Check allergy band for any allergies, and ask patient about type and severity of reaction.
- Complete necessary focused assessments, lab values, and/or vital signs, and document on MAR.
- Provide patient education as necessary.
- If a patient questions or expresses concern regarding a medication, stop and do not administer.

3.2. Route of administration, preparing medication and patient positioning

Different route of drug administration with its details has been described und administration of medication and you can refer it. Steps of procedures including patient positioning, precautions to be considered and nursing responsibilities are also elaborated under it

Table 5: steps of Safe Medication Administration

STEPS	ADDITIONAL INFORMATION
1. Check MAR against doctor's orders.	<p>Check that MAR and doctor's orders are consistent.</p>  <p>Compare physician orders and MAR Compare MAR with patient wristband. Night staff usually complete and verify this check as well.</p>
<p>2. Perform the SEVEN RIGHTS x 3 (this must be done with each individual medication): The right patient</p> <p>The right medication (drug) The right dose The right route The right time The right reason The right documentation</p> <p>Medication calculation: $D/H \times S = A$ (D or <u>desired dosage</u>/H or <u>have available</u> x S or <u>stock</u> = A or <u>amount prepared</u>)</p>	<p>The right patient: check that you have the correct patient using two patient identifiers (e.g., name and date of birth).</p>  <p>Compare MAR with patient wristband. The right medication (drug): check that you have the correct medication and that it is appropriate for the patient in the current context. The right dose: check that the dose makes sense for the age, size, and condition of the patient. Different dosages may be indicated for different conditions. The right route: check that the route is appropriate for the patient's current condition. The right time: adhere to the prescribed dose and schedule.</p>  <p>Check the right patient, medication, dose, route, time, reason, documentation The right reason: check that the patient is receiving the medication for the appropriate reason. The right documentation: always verify any unclear or inaccurate documentation prior to administering medications. NEVER document that you have given a medication until you have actually administered it.</p>
3. The label on the medication must be checked for name, dose, and route, and compared with the MAR at three different times: When the medication is taken out of the drawer When the medication is being	 <p>Perform seven checks three times before administering</p>

poured When the medication is being put away/or at bedside	medication These checks are done before administering the medication to your patient. If taking the drug to the bedside (e.g., eye drops), do a third check at the bedside.
4. Circle medication when poured.	Pour medication. Circle MAR to show that medication has been poured.  Circle medication once it has been poured
2. Positioning: Position patient appropriately for medication administration. Ensure proper body mechanics for health care provider. Position patient safely and appropriately once medication is administered.	This ensures patient safety and comfort.  Position patient appropriately for medication administration
3. Post-medication safety check: Complete post assessment and/or vital signs (if applicable). Sign MAR; place in the appropriate chart. Perform hand hygiene.	This ensures patient safety. This step prevents the transfer of microorganisms.  Hand hygiene with ABHR

3.3. Administrating Medications

General principle of medication

The term drug is often used interchangeably with medication but there is a specific difference b/n them.

Medication: - is a substance administered for the diagnosis, cure, treatment, mitigation (relief), or prevention of disease.

Drug: - is any substance that alters physiologic function, with the potential for affecting health.

Thus, all medications are drugs, but not all drugs are medications.

Table 6: Common abbreviations in drug administration

Abbreviation	Meaning
Po	By mouth
Ac	Before meal
Pc	After meal
Qd	Every day
Qod	Every other day
Qid	Four times a day
Q2h	Every two hours
Qh	Every hour
Bid	Twice a day (every 12 hrs)
Tid	Three times a day (every 8 hrs)
Stat	Immediately
S	Without
S's	One half
Hs	At bed time
Prn	As needed
OD	Right eye
OS	Left eye
OU	Both eyes.

▪ **Factors affecting drug action**

- ✓ Age , Illness & disease
- ✓ Sex, The time of administration
- ✓ Weight. the client's environment
- ✓ Genetic factors, Psychological state

▪ **Nursing Responsibility for Administering Drugs.**

- ✓ Assessment of the patient and clear understanding of why the patient is receiving a particular medication.
- ✓ Preparing the medication to be administered (i.e. checking labels, preparing injections, observing proper aseptic technique with needles and syringes)
- ✓ Accurate dosage calculations
- ✓ Administration of the medication safely
- ✓ Documentation of medications given.
- ✓ Monitoring the patient's reaction and evaluating the patient's response.
- ✓ Educating the patient regarding his or her medication regimen.

I. Oral medication administration

Definition:- Oral medication administration is administration of drug by mouth.

Purpose:-

- To provide a safe, effective, economic route for administering medications
- Provide a sustained drug action with minimal discomfort.
- When local effects on the GI tract is required
- When prolonged systemic action is desired.

Types of medications: Tablets, capsules, syrups, powder

Precaution: drugs which are irritant to the mucus membrane of the GI tract, hepatitis patients, renal failure, alcohol addicted patients.

Contraindication: When a client cannot swallow or is nauseated or vomiting, unconscious patients, relative contraindications to giving oral medications include NPO status

Advantages: Usually the simplest & easiest to take, minimizes client discomfort & is associated with the fewest side effects of any route, oral medications tend to be less expensive.

Side effects: Nausea, vomiting, irritation of GI tract, abdominal disturbance, organ (deep) damage

Essential equipment: Medication tray, towel, bowl of water for used cups, measuring spoon, medicine cups, a jug of water, chart and medication care, ordered medication

Procedure

- ✓ Wash hands, assemble equipment, and inform the patient about the procedure
- ✓ Begin by checking the doctor's orders
- ✓ Read the label 3 times before taking the medicine from the cupboard, after taking the medicine from container, and before returning the container back on the shelf
- ✓ Place solution and tablet in separate containers
- ✓ For suspension shake the bottle well before pouring
- ✓ Take medicine to the patient's bedside
- ✓ Identify the patient by calling out his/her name and bed number
- ✓ Stay with patient until each medicine is swallowed
- ✓ Give water as necessary unless contraindicated
- ✓ Record the medicine given, refused, or vomited
- ✓ Take care of the equipment and return it to its place
- ✓ Wash hands
- ✓ Write report on nurse's report book

2. Adminstrating Intramuscular Injections

Definition: IM injection is parenteral medication administration via which medications are given into the muscle layer, beneath the dermis, and SC tissue.

Purpose:-

The speed of absorption by the IM route is faster than by the subcutaneous route b/c the blood supply to the body muscles is greater.

Muscles can usually take a larger volume of fluid with out discomfort than subcutaneous tissues can although the amount varies among individuals, chiefly with the muscle size and condition.

Medications that irritate subcutaneous tissue may safely be given by IM injection.

Types of medication: - solutions, suspensions, powders

Precautions:-

In thin individuals whose blood vessels & nerves are easily accessible,

In patients who have phobia to injections

In psychiatric patients

In patients of HIV/AIDS

In substance abused patients.

Contraindications:

Circulatory shock, reduced blood flow, muscle atrophy, severely wasted patients, progressive infection at the site of injection.

Complications:

Pain, nerve injury, bone injury, speed shock, infection of muscle or bone.

Sites for intramuscular injections

Although the site choices are influenced by the age of the client, the medication to be injected and the general condition of the client, the most common sites are: Gluteus muscle, deltoid muscle, vastus laterals

I. Deltoid muscle:

Although this site is easily accessible its use is limited, b/c the small muscle with little overlying subcutaneous fat is not capable of absorbing large amounts of medication.

Another possibly more critical limitation on the use of this site is the danger of injury to radial nerve and brachial artery. So carefully locate the site using the anatomic land marks.

It is considered for use in adults and children over 18 months of age b/c of the rapid absorption from the deltoid area. Children younger than 18 months have poorly developed deltoid muscle and should not receive IM injection into this site.

Location:

To locate the densest part of the muscle, palpate the lower edge of the acromion and the midpoint on the lateral aspect of the arm that is in the line with the axilla. A triangle with in these boundaries indicates the deltoid muscle about 5 cm below the acromion process. OR

To locate the densest part of the muscle, place four fingers across the deltoid muscle with the first finger on the acromion process the site is three fingers breadths below the acromion process.

II. Dorso-gluteal site

This is perhaps the most common of the four intramuscular injection sites for adults. The injection is given in to the gluteus medius muscle. B/C walking develops these muscles; this site should not be used for children unless the child has been walking for at least a year.

Position: prone position with toes pointing inward helps to locate the site accurately and relaxes the muscle. The pain and bleeding that may occur when injection is administered in this site are less likely in this position. An alternative position is the side lying position.

Location: two methods are used for locating this site:

The first and most traditional method of locating this site is to divide the buttock into quadrants and then give the injection in the upper outer quadrant. The landmarks of the Dorso-gluteal site are the upper iliac crest, the inner crease of the buttocks, the outer lateral edge of the patient's body and the lower edge of the buttock (inferior gluteal fold). These land marks should be palpated, not merely located by sight. Errors can easily be made, particularly in the location of the iliac crest. Once you have established the location of the upper outer quadrant, give the injection 2 to 3 inches below the crest of the ileum.

The second method for locating the same site is more accurate when the patient is in the side lying position. Draw an imaginary line b/n the posterior superior iliac spine and the greater trochanter of the femur. An injection is given laterally and superiorly to this line b/c it runs lateral to the sciatic nerve.

Problems with injecting drugs to Dorso-gluteal site are:-

- slow absorption of medication
- The sciatic nerve, bone and gluteal artery lies close to the site.
- Infants younger than 18 months and debilitated adults may not have enough muscle mass to allow a safe injection into this site.
- The thick layer of fat over this site in many people may make it difficult to reach muscle tissue consistently.

Note: Medication that irritate the subcutaneous tissue or that discolour it should be given by the Z-track method. The purpose of the Z-track technique is to administer the medication into the muscle tissue with no tracking of medications in to the subcutaneous tissue and skin needle is withdrawn preventing irritation and staining, an air lock of 0.4 ml that is above the level of the medication during injection is also recommended.

III. **Ventrogluteal site:** It is the gluteus medius muscle, which lies over the gluteus minimus.

Advantages over Dorso-gluteal site:

No large nerve, no large blood vessel, less fatty, further from the rectal area.

After children are three years old, they can receive volumes of up to 1ml in the Ventrogluteal site; preschoolers can be given 1.5 ml. This site is also suitable for adults, particularly for immobilized clients, whose Dorso-gluteal muscle may be atrophying

Toddlers should not receive injections into the Ventrogluteal site b/c muscles in this site are not well developed until a child begins to walk.

Older and debilitated clients who have lost muscle elsewhere often have enough muscle in the Ventrogluteal site.

Position: The patient can be placed in one of several positions: prone, side lying, standing,

Location: The landmarks of the Ventrogluteal site are the greater trochanter, the crest of the ileum and the superior anterior iliac spine. To locate this site first locate these landmarks on the patient and then place the heel of your opposite palm on the greater trochanter, point one finger toward the anterior superior iliac spine and an adjacent finger toward the crest of the ileum, forming a triangle with the iliac bone. The injection is then given in the center of the resulting triangle.

IV. **Vastus lateralis site:**

It is usually thick and well developed in both adults and children.

It is increasingly recommended as the site of choice for intramuscular injections for infants b/c there are no major blood vessels or nerves in the area.

Location:

In infants and children it is situated on the anterior lateral aspect of the thigh. It is established by dividing the area b/n the greater trochanter of the femur and the lateral femoral condyl in to thirds and selecting the middle third.

In adults it is located b/n one hand breadth above the knee and one hand breadth below the greater trochanter on the medial outer portion of the thigh.

Position: back lying or sitting position

V. Rectus Femoris Site:

This muscle runs down the anterior surface of the thigh.

This site can be used for occasional injections for infants and children and for adults. When other sites are contraindicated.

Advantage: Clients who administer medication by themselves can reach this site easily.

Disadvantage: Discomfort especially for those who have small muscle mass at this site.

▪ **Essential equipment's for IM medication administration**

The same as with other injections, except use larger needle and syringe

Procedure

- Wash hand and collect the necessary equipment
- Explain procedure to the patient and bring trolley to the bedside
- Draw the medicine
- Expel air from the syringe and needle
- Choose the site and clean it with an alcohol swab
- Stretch the skin and inject into the chosen site by holding the syringe and needle at about a 90° angle
- Draw back the plunger to check whether or not you are in a blood vessel. If blood returns, withdraw get a new needle, and re inject into a different spot
- If there is no blood, push the drug slowly into the muscle
- When completed, withdraw the needle and gently massage the area to aid absorption
- Place the patient in a comfortable position
- Chart the time and procedure
- Take care of equipment
- Observe any reaction
- Wash hands

3. Administering intra dermal injection

Definition: - ID injection is an injection given in to the dermal layer of the skin, the layer of the skin located beneath the skin surface

Purpose: - Diagnostic, allergic reaction test, tuberculin test, therapeutics

Sites of injection:

Inner for arm area (midway b/n the wrist & elbow), upper chest , upper arm, cross the scapula

Size of syringe and needle: 1ml syringe and small gauge needle of 25 – 28 gauge; small volume of medication (usually 0.25 ml or less) are injected slowly. E.g. BCG

Indication:

- For vaccine administration like BCG, for drug allergy test E.g. penicillin & TAT
- For tuberculin test of T.B Sub clinical infection (time test)

Equipment: Tray, Syringe & needle (sterile), Receiver, Drug (to be injected), File- alcohol swab, Marking pen, Water in the bowl to rinse syringe and needle

Procedure

- Take equipment to the patient's side
- Explain procedure to patient
- Get hold of the arm and locate the site of injection
- Clean the skin with swab and inject the drug about 0.1-0.2 inch in the epidermis after the level of the needle is no longer visible do not massage the site
- Check for the immediate reaction of the skin (10-15 minutes later for tetanus, 20-30 minutes later for penicillin)
- If it is for time test mark the area
- Chart the data and time of the administration of the drug
- Take care of the equipment and return to their places
- Do not forget to do the reading after 72 hrs if it is for time test (tuberculin test)

4. Administering subcutaneous injection

Definition: - are injections given into the subcutaneous tissue, the layer of fat located below the dermis and above the muscle tissue.

Purpose:

- Ensure more rapid absorption and action of a drug than can be achieved orally.

- Administer drugs to clients unable to take oral medications (i.e. unconscious, nausea/ vomiting NPO status.
- Administer medications that are not active by the oral route/inactivated by the digestive enzymes (i.e. heparin, insulin)

Site of SC injection:

Upper arm, Upper back, Abdomen, Upper buttocks, The thigh Speed of absorption varies with the site selected: medications injected into the abdomen are absorbed more rapidly, those injected into the arms are absorbed at an intermediate rate, and those injected into the thigh are absorbed at slowest rate.

Sites of abnormal SC tissue , such as areas lying underneath burns, birth marks, inflamed tissue, or scars, produce unpredictable medication absorption and should be avoided

Absorption may be slow or incomplete if subcutaneous medication is administered to a client with generalized edema, with severe peripheral vascular disease, or in cardiogenic shock.

Precaution: Anxiety related to fear for injections, specific drug precautions, in patients who have phobia to injections, in psychiatric patients, in patients of HIV/AIDS, in substance abused patients.

Indications: For administering medications for which other routes are inconvenient, to treat anaphylactic shock & bronchial asthma with adrenaline.

Contraindications: Circulatory shock, localized body areas of reduced tissue perfusion

Size of syringe and needle: Small amount of medication (0.5 – 2ml) may be injected subcutaneously using a syringe with 0.025 – 2 ml size and needle gauge of 25.

Essential equipment's: Tray containing: sterile syringe and needle; sterile forceps with jar, alcohol swabs; receiver, medication, file, medication chart, kidney dish, water for used syringe and needle

Procedure:

- ✓ Wash hands and collect equipment
- ✓ Explain procedure to the patient
- ✓ Take equipment to the bedside
- ✓ Draw the medication
- ✓ Expel the air from the syringe
- ✓ Clean the site

- ✓ Grasp the area between your thumb and forefinger
- ✓ Insert the needle at about a 45° angle
- ✓ Press the skin quickly and advance the needle
- ✓ Aspirate three times to determine that the needle has not entered a blood vessel
- ✓ If the needle is not in a blood vessel, inject the drug slowly
- ✓ After injecting, withdraw the needle and massage the area with an alcohol swab to facilitate absorption
- ✓ Chart the amount and time of administration
- ✓ Take care of equipment
- ✓ Watch for undesired reaction
- ✓ Wash hands

5. Administration of intravenous injection

Definition: - it is parenteral medication administration via which medications are given in catheters inserted into veins.

Purpose:

- To get rapid effect (immediate effect)
- For drug action in the blood stream or vessel
- It is used in emergencies, like shock.
- When the drug cannot be tolerated, if given by other routes.
- For treating varicose veins
- For diagnostic purposes
- To supply nutrients to the body.

Types of intravenous injections:

- IV push
- Intermittent infusion
- Continuous infusion

IV Push

Is used to administer medications that must be given rapidly to have the desired therapeutic effect or those that are incompatible with IV fluids (e.g. Phenytoin)

IV push medication may be given into a continuously infusing IV set or into a capped IV port (an intermittent infusion device or “heparin lock”)

IV push medications are usually given for at least 5 minute.

Intermittent infusion

Is used to administer medications that need to be infused for an intermediate length of time (usually, 30 minutes to 1 hrs) and for those that are not stable for long periods.

Intermittent infusions of medications may be given when a client doesn't require continuous IV fluids.

Medications administered by intermittent infusion are supplied in bags that contain 50 to 250 ml of IV fluid. These bags of fluid contain the medication dissolved in normal saline solution or in 5% DW.

NB: The nurse administering the medication is responsible for making sure that the medication supplied is the medication ordered; the medication, as ordered, is safe for the individual client; the IV catheter is patent and the medication is infused at the proper rate.

Continuous infusion: is used to infuse medications that must be given continuously to achieve the desired effect (e.g. heparin or theophylline) or medications that are toxic if given over short periods (e.g. multivitamins)

Precautions:

- Over dosage → results in poisoning & toxicity.
- Renal impairment → clients with renal impairment shouldn't receive large IV dose.
- Specific drug precautions: E.g. Prolonged IV administration of Quinine → hypotension, infected /inflamed IV site → sepsis/ phlebitis, cardiac disease→heart failure

Contraindications: Heart block, IV site infection, bleeding disorder, restlessness of the patient

Sites of injections

- Peripheral veins – cephalic veins
 - basilic veins
 - Scalp veins
 } → for children
- Central veins- femoral vein
 - Jugular vein
 } → for adults

Essential equipment: The same as with other types of injection but including tourniquet and rubber sheet

Procedure:

- ✓ Wash hands and assemble and collect the equipment
- ✓ Bring equipment to the bedside
- ✓ Position the patient properly
- ✓ Place rubber sheet and towel under his/her arm
- ✓ Expose the arm and apply tourniquet
- ✓ Ask the patient to open and close the fist
- ✓ Palpate the vein and clean the site of injection with an alcohol swab
- ✓ Hold the needle in line with the veins
- ✓ Puncture the vein and draw back the plunger to check whether you are in the vein
- ✓ Once you know that you are in the vein, release the tourniquet
- ✓ Gently lower the angle of the needle until it is nearly parallel to the vein and instill the medication
- ✓ Push the plunger very slowly
- ✓ Check the patient all the while, no complaint should be ignored. If there is any reaction, stop the procedure
- ✓ After all a the drug is injected, remove the needle and apply pressure to prevent bleeding
- ✓ Tell patient to apply pressure over the injection site
- ✓ Watch the patient for few minutes before leaving
- ✓ Remove equipment
- ✓ Make sure the patient is in a comfortable position
- ✓ Chart the procedure and any reaction
- ✓ Take care of the equipment-sterilize, wash hand return to their place
- ✓ Wash hands

Complications:-

- Systemic: -infection (sepsis), air embolism, febrile reaction, speed shock
- Local:- phlebitis (an inflammation of a veins), infiltration
- **Sepsis:** is systemic infection of the body

Cause: Break in an aseptic technique when preparing or administrating IV medication, Contamination of IV catheter site when IV dressing is changed, IV equipment's changed infrequently

C/M: redness, warmth, pain, fever, ↑sed leukocyte count, chills

Nursing measures:

Tape catheter securely to skin, check catheter insertion site frequently, cchange IV tubing of 48 – 72 hours.

Infiltration: is the entering of the fluid into the subcutaneous tissue.

Cause: - catheter migrated out of vein during client movement

Nursing mgt: avoid placing IV catheter close to client's wrist or elbow whenever, possible, tape catheter securely to skin

6. Administering intravenous infusions

Definition: - is infusion of a fluid into a vein to prevent or treat fluid or electrolyte imbalance or to deliver medications or blood products.

Purpose:-

- To supply the body with fluid when oral fluids are not tolerated.
- To supply the body with nutrients in the form of glucose, AAs, electrolytes, whole blood, etc.
- To dilute poisons, and to flush out kidneys.
- To force dilute poisons, and to flush out kidneys
- To force diuresis
- To provide an access route to administer medications intravenously.

Types of solutions:

IV solutions can be

▪ **Isotonic fluids:**

Hhave the same osmotic pressure as that found within the cell. Used to expand the intra vascular compartment and thus increase circulating volume. Do not alter serum osmolality. Are helpful for hypo tension caused by hypovolemia.

E.g.- Normal saline (0.9% NaCl), lactated Ringer's solution & 5% DW

▪ Hypotonic fluids:

Have less osmotic pressure than the cell. When these fluids are infused, they lower serum osmolality, causing body fluids to shift out of the blood vessels and interstitial space.

Used for cellular hydration.

E.g. - 0.45% NaCl

- 5%DW can also be used as Hypotonic fluid after the dextrose is metabolised.

▪ Hyper-tonic fluids:

Have greater osmotic pressure than the cell. When a hyper tonic solution is infused, it raises serum osmolality pulling fluid from the cells and the interstitial tissues into the vascular space.

E.g. - 3% saline, 5% saline, 5% DW with normal saline , 5% DW with lactated Ringer's solution , Higher concentration of dextrose such as 50%DW

Calculating flow rates of IV infusions:

The drip rate of IV infusion can be calculated as:

$$\frac{\text{Drop}}{\text{Min}} = \frac{(\text{Total volume inf used})(\text{drop factor})}{\text{Total time for infusion in minutes}} \quad \text{OR}$$

$$\frac{\text{drops}}{\text{min}} = \left(\frac{\text{Total volume inf used}}{\text{total time for infusion in hours}} \right)$$

E.g. if 100 ml of 5% D/W is ordered to run in 24 hrs, how many drops per minutes should run?

$$\frac{1000\text{ml} \times 15\text{gtt/ml}}{24 \times 60\text{min}} = \frac{1000 \times 15\text{gtt}}{24 \times 60\text{min}} = 10\text{gtt/min}$$

Regulating flow rates of IV infusions:

The flow rate of the infusion can be adjusted using the roller clamp until it corresponds with the prescribed rate of flow. And it needs to be monitored to confirm that the infusion is progressing at the ordered rate.

Factors affecting the flow rate of IV infusion:

- ✓ Height of the IV bottle
- ✓ The position of the extremity
- ✓ Kinking of the IV tubing
- ✓ The position of the needle with in the vein
- ✓ Patency of the catheter
- ✓ Diameter of the tubing and needle/cannula
- ✓ Length of the tubing
- ✓ Viscosity of the solution
- ✓ Clogged air vents

Equipment's: V fluid as ordered, sterile syringe & needle, rubber & towel, receiver, alcohol swabs, arm board, bandage& scissors, tourniquets, I.V. stand, adhesives tape, medication chart

Preparation of the patient

Since an infusion therapy takes several hours to complete, the patient should first be made conformable

Procedure

- ✓ Identify the right pt.
- ✓ Take equipment to the patient's bedside
- ✓ Explain the procedure to the pt.
- ✓ Remove air from the tubing
- ✓ Place rubber & towel under the arm
- ✓ Apply tourniquet about 3 cm above the intended site of entry
- ✓ Observe & palpate for suitable vein
- ✓ Cleanse the skin with alcohol swabs thoroughly& retract down the vein & soft tissue 4 cm below intended site of injection.
- ✓ Hold needle at 45° angle line with the vein
- ✓ Pierce the skin and puncture the vein

- ✓ Check if you are in the vein by drawing back of the plunger of the syringe, (blood returns if you are in the vein)
- ✓ Release the tourniquet gently
- ✓ Start the flow of solution by opening the clamps
- ✓ Support needle with sterile gauze or sterile cotton balls
- ✓ If necessary to keep it in proposition in the vein
- ✓ Anchor the I.V. tubing with the adhesive tape to prevent pull on the needle
- ✓ Place arm board or splint under the arm and bandage around
- ✓ Adjust the rate of flow

Note

The arm board should be long enough to extend beyond the wrist and elbow joint.

Board should be padded. Infusion bottle should be labelled with the date time infusion is started drops, per minute and any added medication, if more than one bottle as used in 24hrs, it should be labelled as bag 1,2,3...

Extend the arm in the most comfortable position.

Usual areas used for intravenous infusion are:

- ✓ The median basilica vein of the inner surface of arm
- ✓ A vein on top of the foot
- ✓ In an infant the jugular vein and the scalp vein

Nursing responsibility

- Checking the order to determine the correctness (e.g. the volume of the solution to be infused, the rate of flow per hour, any additives to the solution)
- Preparing the client by teaching about the type of the therapy ordered, and the role that he/she will play in maintaining therapy
- Selecting and preparing the site with 70% alcohol
- Performing the venipuncture.
- Securing the venipuncture device
- Monitoring intravenous infusions
- Maintaining intravenous therapy

7. Administering blood transfusion

Definition:- It is infusion of one person's whole blood or its components into the blood vessels of another, i.e. from donor to recipient.

Purpose:-

- To increase blood volume and blood pressure during haemorrhage, trauma, or burn
- To prevent shock especially during major surgery
- To ↑se oxygen carrying capacity in anaemia
- To provide antibodies, and leukocytes in severely ill patients
- To correct deficiencies of plasma proteins, clotting factors and hemophilic globulin, etc.
- To combat infections in patients with leukopenia

Blood groups and types:

Based on the type of antigen(s) present on their erythrocytes, there are 4 ABO blood groups:

Blood group	Antigen	Antibodies	Donate	Receive
A	A	Anti- B	A, AB	A, O
B	B	Anti- A	A, AB	B, O
A, B	A, B	-	AB	A, B, AB, O
O	-	Anti- A & Anti B	A, B, AB, O	O

As each person has antibodies in his blood, which react with foreign body proteins in the blood cells of another person, causing agglutinations or clumping of the red blood cells, blood test must be performed before transfusion.

NB:-

Individuals with blood group O are universal donors b/c they don't have any antigen A and B

Individuals with blood group AB are universal recipients b/c they have neither of the anti A, and anti B antibodies.

★ Types of blood which get agglutinated in the transfusion is said to be incompatible.

Rh Compatibility: Based on the presence of antigen D on the surface of their erythrocytes, individuals can be Rh^{-ve} or Rh^{+ve}, that is individuals with antigen D are Rh^{+ve} where as individuals without antigen D are Rh^{-ve}

If Rh^{+ve} blood is transfused to an Rh^{-ve} individual, the Rh negative blood cells produce antibodies to destroy the transfused cells. The effect of a first transfusion may be slightly effective but the individual becomes sensitive to the D factor and further transfusion, with Rh positive blood,

may produce fatal reaction. Thus, Rh factor must be determined before transfusion to prevent blood incompatibility.

Blood components: The client doesn't always need all components of whole blood, so certain blood components can be selectively transfused depending on the clinical needs of the client.

Common blood products for transfusion include:

I. Whole blood:

- Contains all blood components and is usually transfused to people who need both blood cells and volume replacement
- Used to treat hypovolemic shock 2⁰ to haemorrhage
- Not indicated for the management of anaemia.

II. Packed red cells:

- are red cells separated from whole blood by centrifuging /sedimentation
- indicated for chronic anaemia
- safer in CHF
- Contain less volume and less Na⁺ & K⁺. Thus, problems of fluid overload and electrolyte imbalances can be avoided by using the packed red cells.

III. Platelets: Used to initiate blood clotting, and haemostasis. Indicated for clients with thrombocytopenia & haemorrhage.

IV. Whole plasma: Used to correct hypovolemia due to selective loss of plasma, such as occurs in extensive burns. Electrolyte solutions and albumin often can replace it.

Indicated for patients with bleeding disorder due to coagulation factor deficiency

V. Albumin: Used as a volume expander, b/c fluid is pulled back in to the vasculature due to the oncotic pressure (force) the protein exerts. Unlike whole plasma, albumin carries no risk of hepatitis transmission. Indicated to administer for clients with hypovolemic shock and hypovolemia

VI. Cryoprecipitate: Is a plasma fraction rich in fibrinogen and blood clotting factor VIII.

Is used to treat haemophiliac, who are predisposed to bleeding problems b/c genetically they lack factor VIII.

Equipment's: Bottle containing blood, with the patient name, blood group and RH. Factor, blood giving set, sterile forceps in a sterile jar , sterile syringes and needle, alcohol swabs, sterile gauze, rubber sheet and towel, tourniquets, arm splint, bandages and scissors, adhesives tape, receiver for dirty swabs, I.V. stand, patient's chart

Procedure:

- ✓ Before blood transfusion is administered the nurse has to check the blood group & Rh factor, if cross match of the donor's & the recipient's blood is done and is compatible.
- ✓ Check for HIV.
- ✓ Prepare the tray with necessary items
- ✓ Before taking it to the patient's room check the patient's name, hospital number, bed number, blood group, Rh factor and the expiration date with a 2nd nurse or a doctor
- ✓ Blood should be used within 21 days of its withdrawal date
- ✓ Take it to the pt.'s room
- ✓ Explain procedure to patient
- ✓ Hang the bottle & remove the air from the tubing
- ✓ Put pt. in a comfortable position
- ✓ Place rubber & towel under the arm
- ✓ Check the vital sings before administering
- ✓ Choose the vein
- ✓ Apply tourniquet
- ✓ Clean the skin & feel for a distended vein & clean again
- ✓ Puncture the vein with the needle (the needle here should be short and wide so that it does not cause occlusion easily)
- ✓ After you make sure that you are in the vein release tourniquet & open the lamp.
- ✓ The drop / minute at the beginning should be very slow
- ✓ Watch patient closely for any reaction
- ✓ If there is no reaction from the patient regulate the rate of flow according to the patient's conditions & the order.
- ✓ Splint the arm & position it comfortably.
- ✓ Remove the equipment you have used, wash and return to its proper place.
- ✓ Record the time you started the blood& any other pertinent information
- ✓ Check pt. frequently.

NOTE

Always remember to have anti-histamine injection ready in case a patient has reaction from the blood.

Be familiar with the most usual symptoms of blood reactions which are:-

Immediate reaction: Headache, backache, chills, pyrexia, rash of the skin (Urticarial)

Late reaction: Dyspnea, hematuria, chest pain, rigor (rigidity)

Complications: Early complications:

Febrile reactions: Febrile reactions to blood products can occur b/c of the recipient's hypersensitivity to the donor's blood cells.

C/Ms: Fever, chills, headache and malaise

Nursing measures:

- Administer antipyretics, such as aspirin before blood transfusion
- Stop the infusion and keep the IV open with normal saline if symptoms occur after the infusion has been started.

Allergic reactions:

Allergic reactions may occur because the client has sensitivity to the plasma protein from the donor's blood.

CMs: - Flushing, Urticaria (hives), wheezing and a rash with itching.

Management: - stop the infusion and keep the IV open with normal saline.

Antihistamines to ↓se the severity

Haemolytic reaction: Is the most serious acute complication which occurs when the donor's blood is incompatible with the recipient's blood. When wrong blood is mistakenly administered to a client, hemolysis or destruction of red cells occur b/c the antibodies in the recipient's blood cells quickly react to the donor's blood cells.

- **Symptoms:** facial flushing, fever, chills, headache, low back pain, tachycardia, Dyspnea, hypo tension and blood in urine.
- **Nursing measures:** Vital signs should be monitored before starting the infusion and during the first 5 minutes when the blood is infused slowly. If haemolytic reaction is suspected, stop the infusion and keep the IV open with normal saline
- **Medical Measures:** Treat hypo tension

Septic reactions: Septic reactions can occur if the blood products have been contaminated with bacteria.

- Symptoms: Fever, chills, Vomiting diarrhoea, and hypo-tension
- Nursing measures: Stop the infusion
- Prevention: keep blood products refrigerated.

Late complications:

- Delayed haemolytic reactions- usually occur at about 2 to 14 days and are recognized by fever, mild jaundice & a gradual fall in Hgb level. This reaction is not dangerous but early recognition is important for preventative of acute Haemolytic reaction in subsequent transfusion.
- Transmission of infectious diseases: If donors are not carefully screened for diseases like jaundice syphilis, malaria, filarial, and AIDS, it may cause untoward reaction.
- Circulatory overload: it is due to the rapid flow; also, it may occur by giving whole blood to the severe chronic anaemic patient, and a patient with heart failure.
- Thrombocytopenia
- pulmonary embolism and Infiltration.

General responsibilities of Nurses in parenteral medication administrations

- Check the order, diagnosis, and name and age of the patient
- Check the indication for proper route for medication
- Assess medical history and history of allergies.
- Observe verbal & non-verbal responses of the patient toward receiving injection
- Check the site of injection
- Check the expiry date of medication and the form of medication available
- Identify the patient by checking the name, age, and d_x.
- Check the nurse's record to find the time at which the last dose was given.

8. Applying topical medications

Definition:- is the act of applying topical medications in to the surface of the skin or into the body cavities.

Purpose: - to obtain direct action at a particular site, although some systemic effect may also occur including the following:

- | | |
|-----------------------------------|----------------------|
| Eye instillations and irrigations | Nasal instillations |
| Ear instillations and irrigations | Vaginal applications |
| Skin applications | Rectal instillations |

Skin application

Definition:-is the act of applying a drug prepared in the form of powder ointment, creams, and oils or lotions on to the surface of the skin.

Purpose:-to treat local skin problems. It can also use to treat systemic problems

Note:- cleaning skin with soap and water and local heat when indicated increase absorption

Eye irrigation

Definition:-is washing or flushing of the conjunctival sac by a stream of liquid

Purpose:-

- To prepare for ophthalmic surgery
- To remove foreign particles
- To apply heat or cold
- To prepare the eye for medication administration

Position:-supine position with slightly turning of the head to the side to be irrigated

Solutions used: plain water, normal saline, boric acid, 2%, as an antiseptic, silver nitrate, 1%, as an antiseptic, acriflavin, 1%, as an antiseptic

Note

- The temp.of the solution should be about 98 to 100°F
- Eye irrigation is a sterile technique

Eye instillation

Definition:-is the act of administering medications in to the orbital cavity

Purpose:-to treat infections, inflammations, or other problems of the eye and when certain pharmacologic actions of drugs are required

Note: eye instillation is a sterile technique

Ear irrigation

Definition:- is the act of washing the external auditory canal with a stream of liquid.

Purpose:-

- To wash out impacted ear wax
- To remove foreign bodies
- To apply heat
- To cleanse ear, in case of purulent discharge, caused by the middle ear infection
- For antiseptic effect

Solutions used: boric acid, 2-4%, soda –bicarbonate solution, 1%, normal saline, hydrogen peroxide, plain water

Position:- sitting or lying position with the head tilted towards the affected ear

Ear instillation

Definition:- is the act of administering medications in to the ear.

Purpose: -to treat infection and relieve local inflammation

Position:- sitting or lying with the ear being treated upper most

Note; The temp. of the solution should be 98-100°F and both ear instillation and ear irrigation are sterile procedures.

Self-check-3

Test-3.1: Say true or false for the following statements

1. The drop / minute at the beginning of blood transfusion should be very **fast**
2. It is enough to check one time for the label on the medication for name, dose, and route, and compared with the MAR.
3. The speed of absorption by the IM route is slower than by the subcutaneous route
4. The purpose of the Z-track technique is to administer the medication into the muscle tissue with no tracking of medications in to the subcutaneous tissue

Test- 3.2: Select the correct answer for the following multiple choice questions.

1. When to check a medication for administration
 - A. When the medication is taken out of the drawer
 - B. When the medication is being poured
 - C. When the medication is being put away/or at bedside
 - D. All
2. **One is not a** Site for SC injection
 - E. Upper arm,
 - F. Upper back,
 - G. Upper buttocks
 - H. In the blood vessels
3. Key moments for hand hygiene doesn't include
 - A. Before initial contact with patient
 - B. Before any clean (routine) or aseptic (sterile) procedure
 - C. After blood or body fluid risk/exposure
 - D. None
4. Nursing Responsibility for Administering Drugs
 - A. Assessment of the patient clear understanding
 - B. Preparing the medication to be administered
 - C. Administration of the medication safely
 - D. Documentation of medications before giving.

5. An immediate action that a nurse can take when a patient develops adverse reaction while taking blood transfusion is
- Manage the Symptoms
 - Stop the infusion
 - keep blood products refrigerated
 - All

Test-3.3: Answer the following question

- List all the general responsibilities of Nurses in parenteral medication administrations
- Factors affecting the flow rate of IV infusion:
- List the different types of blood group and its compatibility
- Discuss the advantages and disadvantages of different route of drug administration

Operation sheet-I	Oral medication administration
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Title: Medication administration

Instruction: Safely administer oral medication as per order

Purpose:-

- To provide a safe, effective, economic route for administering medications
- Provide a sustained drug action with minimal discomfort.
- When local effects on the GI tract is required
- When prolonged systemic action is desired.

Precaution: Check the safety of the drug and the patient safety

Contraindication: When a client cannot swallow or is nauseated or vomiting, or unconscious patients,

Essential equipment: Medication tray, towel, bowl of water for used cups, measuring spoon, medicine cups, a jug of water, chart and medication care, ordered medication

Procedure

1. Wash hands, assemble equipment, and inform the patient about the procedure
2. Begin by checking the doctor's orders and the medication
3. Place solution and tablet in separate containers
4. Take medicine to the patient's bedside
5. Identify the patient by calling out his/her name and bed number
6. Give the medication and assist the patient to swallow
7. Stay with patient until each medicine is swallowed
8. Take care of the equipment and return it to its place
9. Wash hands
10. Record the medicine given, refused, or vomited
11. Write report on nurse's report book

Operation sheet-2	IM medication administration
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Title: Medication administration

Purpose:-

As the speed of absorption by IM route is faster and medications that irritate subcutaneous tissue may safely be given, treatment effect can be achieved safely.

Precautions:-

In thin individuals whose blood vessels & nerves are easily accessible, psychiatric patients or patients with special condition

▪ **Equipment:**

Medication tray, towel, , cotton bowl with antiseptic solution, chart and ordered medication, larger needle and syringe, safety box

Procedure

1. Wash hand and collect the necessary equipment
2. Explain procedure to the patient and bring trolley to the bedside
3. Prepare and draw the medicine, expel air from the syringe and needle
4. Choose the site and clean it with an alcohol swab
5. Stretch the skin and inject into the chosen site by holding the syringe and needle at about a 90° angle
6. Draw back the plunger to check whether or not you are in a blood vessel. If blood returns, withdraw get a new needle, and re inject into a different spot
7. If there is no blood, push the drug slowly into the muscle and withdraw the needle
8. Gently massage the area to aid absorption, place the patient in a comfortable position and observe any reaction
9. Chart the time and procedure
10. Take care of equipment
11. Wash hands

Unit Four: Administer medications within the legal parameters

Instruction sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Administering Medications within the scope of own role
- Ensuring infection control principles
- Storing medication in a safe manner

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Administer medications within scope of own role in line with the jurisdictional legislative requirements and organizational policy.
- Apply infection control principles in the administration of medication.
- Stored medications in a safe manner according to the legislative requirements and organizational policy

4.1. Administering Medications within the scope of own role

Before giving medication to any patient you must have individual patient medication card and medical registration card in hand. This enhances you to identify the patient's name, the name of the medication, the required dose and agreed time of administration.. Any possible side effects should be listed and/or the information leaflet that is normally supplied by the manufacturer made available. It is absolutely essential that you only accept medication that is in its original labelled container. It is good practice for the person receiving the medicine to check that the label indicates the drug is not expired, that the dose that prescribed have stipulated coincides with that detailed on the label and that the medicine is 'in date'. Where the medicine is in tablet or capsule form, they should if possible check the number provided.

4.2. Ensuring infection control principles

The basic principles of drug administration are in place to keep the patient safe. These steps are usually taken by the nurse in the process of administering medication. Wash hands, put on gloves, and get any supplies necessary to give medication via the prescribed route. Get the medication for that patient out of the drug storage area. Do not touch medication with ungloved hands. Verify the medication label against the patient chart with the patient wristband - if there is any discrepancy, do not administer. Get clarification from the prescriber first. Communicate with the patient about the medication being given and confirm they are aware. Answer any questions they have. If they are unsure, do not administer. Get clarification from the prescriber first. If no clarification is necessary, administer medication exactly as prescribed.

Discard any supplies used, if disposable, and clean up. Return medication to the locked storage area, if not individually packaged, and wash hands.

Chart administration of medication

4.3. Storing medication in a safe manner

Medicines can be classed as substances hazardous to health and as such must be stored securely. It is also important to note that some need to be stored at particular temperatures or away from light. This information will be on the medicine label and in the manufacturer's information leaflet. Most medicines should be kept in a locked cupboard. The key should be kept safely, and away from access to children.

Storage of Medications should consider the following concepts

- I. All drugs and non-Rx drugs must be locked
 - a. Schedule II double locked (standard of practice all controls double locked)
 - b. Key with the charge nurse
 - c. No Aides in medication room unless nurse present
 - d. Drug carts should not be stored in the hall
2. External drugs separate from internal drugs
 - a. Separate cabinet vs. separate shelf (both acceptable based on facility policy)
 - b. Poisons in a separate and distinct area
 - c. Cabinets clearly labelled
 - d. Med carts: external area and internal area
3. Refrigerated drugs
 - a. General use vs. medication refrigerator
 - b. Have a thermometer - 36 to 46 degrees F (USP Standard for drug storage)
 - c. Temperature Log
 - d. Handling problematic drugs
4. Out dated drugs
 - a. Procedures for checking: Rph + nurse
 - b. Cooperation with vendor pharmacist
5. Discontinued drugs
 - a. Procedure for handling control drugs
 - b. Procedure for handling non-control drugs
 - c. Drugs with resident at discharge
 - d. Drugs brought into the facility with no order
6. Treatment cart storage

- a. Where kept
 - b. Clean
 - c. Proper labels
 - d. Expiration dates
7. Inspection forms
 8. Storage of medication in a patient's room

Self ckeck-4

Test-4.1: Say true or false to the following statement

1. Before giving medication to any patient you must have individual patient medication card and medical registration card in hand
2. Any possible side effects should be listed and/or the information leaflet that is normally supplied by the manufacturer made available.
3. It is not good practice for the person receiving the medicine to check that the label indicates the drug is not expired.

Test-4.2: Select the appropriate choice for the following questions.

1. **Not true** about locking drugs and non-Rx drugs
 - A. Schedule II double locked (standard of practice all controls double locked)
 - B. The key be with the charge nurse
 - C. No Aides in med room unless nurse present
 - D. Drug carts should be stored in the hall
2. True about refrigerated drugs
 - A. Have a thermometer - 36 to 46 degrees F (USP Standard for drug storage)
 - B. Have Temperature Log
 - C. Handle problematic drugs separately
 - D. All

Test-4.3: Attempt the the question below

I. Explain how infection control principles can be ensured during administration of medication.

Unit Five: Respond appropriately to the signs of pain

Instruction sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Identifying Cause of pain
- Reporting Any irregular or abnormal findings
- Calming any fears or anxiety experienced by the client

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify cause of pain
- Report any irregular or abnormal findings to concerned body.
- Allay any fears or anxiety experienced by the client.

5.1. Identifying Cause of pain

Pain is a general term that describes any kind of unpleasant or uncomfortable sensation in the body. There are many different types and causes of pain, and these can be grouped into eight different categories to help with pain management:

Acute pain, chronic pain, Breakthrough pain, Bone pain, Nerve pain, Phantom pain, Soft tissue pain, Referred pain.

Acute pain: This starts suddenly and only lasts for a short period (i.e., minutes, hours, a couple of days, occasionally a month or two). It is usually caused by a specific event or injury, such as: A broken bone, a car crash or other type of accident, a fall, burns or cuts, dental work, labour and childbirth, surgery.

Chronic Pain: Chronic pain is pain that has persisted for longer than six months and is experienced most days. It may have originally started as acute pain, but the pain has continued long after the original injury or event has healed or resolved. Chronic pain can range from mild to severe and is associated with conditions such as: Arthritis, back pain, cancer, circulation problems, diabetes, fibromyalgia, and headache. Chronic pain can severely affect a person's quality of life and prevent them from returning to work or participating in physical activity. In some people, it may lead to depression or social isolation.

Breakthrough Pain: Breakthrough pain is a sudden, short, sharp increase in pain that occurs in people who are already taking medications to relieve chronic pain caused by conditions such as arthritis, cancer, or fibromyalgia. Breakthrough pain may also be called a pain flare and it may occur with exercise or physical activity, coughing, illness, stress, or during the period between pain medication doses. The pain level is often severe, but the location of the pain is usually the same as the person's chronic pain.

Bone Pain: This is a tenderness, aching or discomfort in one or more bones that is present during both exercise and rest. Bone pain is commonly associated with conditions or diseases that affect the structure or function of bone, such as cancer, a fracture (broken bone), infection, leukaemia, mineral deficiency, sickle cell anaemia, or osteoporosis. Many pregnant women experience pelvic girdle pain.

Nerve Pain: Nerve pain is caused by nerve damage or inflammation. It is usually described as a sharp, shooting, burning or stabbing pain and may also be called neuralgia or neuropathic pain.

Some people describe it as being like an electric shock and it is often worse at night. Nerve pain can severely interfere with a person's life and affect their sleep, work, and physical activity levels. They are often very sensitive to cold and may experience pain with even the slightest touch. Many people with chronic nerve pain also develop anxiety or depression. People with neuropathic pain are often very sensitive to touch or cold and can experience pain as a result of stimuli that would not normally be painful, such as brushing the skin.

Common causes of nerve pain include:

Alcoholism, an injury to the brain, a nerve, or the spinal cord, cancer, circulation problems
Diabetes, herpes zoster (shingles), limb amputation, multiple sclerosis, stroke, vitamin B12 deficiency.

Phantom Pain: Phantom pain is pain that feels like it is coming from a body part that is no longer there. It is common in people who have had a limb amputated, but is different from phantom limb sensation, which is usually painless. Historically, Doctors believed phantom pain was a psychological problem but they now realize these are real pain sensations that originate in the spinal cord and brain. It often gets better with time, but managing phantom pain can be challenging in some people.

Soft Tissue Pain: This is pain or discomfort that results from damage or inflammation of the muscles, tissues, or ligaments. It may be associated with swelling or bruising and common causes include:

Back or neck pain, bursitis, fibromyalgia, rotator cuff injury, sciatic pain, sports injuries, such as sprains or strains, temporo-mandibular joint (TMJ) syndrome.

Referred pain: This is pain that feels like it is coming from one particular location, but is the result of an injury or inflammation in another structure or organ. For example, during a heart attack, pain is often felt in the neck, left shoulder, and down the right arm. An injury or inflammation of the pancreas is often felt as constant pain in the upper stomach area that radiates to the back. A ruptured spleen can cause pain in the shoulder blade. Referred pain happens because there is a network of interconnecting sensory nerves, that supply many different tissues. An injury in one area of the network can be mistakenly interpreted by the brain as being in a different part of the network

How to respond to clients in pain

Once the person in pain knows that you are listening, you can choose from several specific categories of response to accompany the active listening described above. These include:

Offering support “How can I help you through this?” People in pain often know the help they need, but it may be hard for them to ask for it.

Asking for elaboration “Tell me more about it,” or “Then what happened?” Sometimes people in pain need to tell their story, and this telling itself can alleviate some of the pain.

Exploring fears or worst-case scenarios What are your fears?” “What is the worst that can come from this?” Clarification of the worst case can enable someone to focus on a more realistic possibility.

Reducing isolation: It helps to say “together we can get through this”. Often feelings of isolation accompany intense emotional or physical pain. Reducing that sense of isolation can facilitate a path to healing.

Encouraging problem solving “What might you do about it?” People can experience unsolicited advice as intrusive or infantilising. Encouraging problem solving stimulates their own abilities to determine what they need to do and is usually experienced as empowering.

Eliciting additional support It may help to say, “is there anyone else you could talk to about this? There is a direct relationship between social and emotional support and improved physical and emotional health. Helping people to think of other support in their lives can also reduce a sense of isolation.

Stimulating coping resources Ask “How have you coped with this in the past?”. Remembering a previous success can stimulate optimism and remind people of their coping strategies.

Remember if you are feeling upset or overwhelmed when working with a client seeks support for yourself from your manager or HR. You can’t help anyone else if you don’t first take care of yourself.

5.2. Reporting any irregular or abnormal findings

All incidents, events, irregular occurrences, and variances must be identified and reported according to the particular health care facility's policies and procedures. The purpose of this reporting is to give the health care facility and the health care professionals the opportunity to address the issue and prevent the occurrence of future incident.

Nurses must immediately report all client care issue, concern or problem to the supervising nurse, the charge nurse and/or the performance improvement or risk management department according to the reporting policies and procedures of the particular facility.

All incidents, accidents, adverse events, irregular occurrence and variances require the completion of a written report that will be sent to the risk management and/or performance improvement department as per the specific facility's established policies and procedures. Simply stated, incidents, accidents and events that must be reported and documented include occurrences that are not expected, not normal, irregular and potentially or actually harmful to the patient, staff, visitors and others.

Variances can be classified as a practitioner variance, a system/institutional variance, a patient variance, a random variance and a specific variance. A practitioner variance is an irregularity that is associated with the care and/or service provided by a health care provider. For example, an untimely medical assessment upon admission is considered a practitioner variance. A system/institutional variance is an irregularity that is associated with the care and/or service given by the facility. For example, the lack of necessary supplies and equipment to adequately and safely care for patients and the lack of staff education and competency validation are considered system /institutional variances.

A patient variance is an irregularity that is associated with the patient themselves and not the health care provider or the facility. For example, the development of a pressure ulcer secondary to the patient's immobility and poor nutritional status is an example of a patient related variance.

Information that is typically reported on a formal incident or accident report includes:

- The date, time and place of the incident or accident

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- Clear, concise and objective data about the occurrence and any surrounding factors, like a wet floor, that may have led to the incident or accident
- The name of the person or persons who was affected with the incident or accident
- The names of any witnesses
- Any injuries that were sustained as a result of the incident or accident
- All care and treatment s that were provided to the person who was adversely affected with an incident or accident
- The names of people, such as the client's doctor, that were contacted and notified about the incident or accident

These reports are forwarded to the correct person, as indicated in the facility's policies and procedures. They are not put in the client's medical record nor mentioned in the client's medical record. These legal documents are considered confidential.

5.3. Calming any fears or anxiety experienced by the client

Clients often experience anxiety as their body responds to danger – whether real or imagined. And for some of our clients, when anxiety revs up, slowing it back down can take on a sense of emergency. So what exactly is it that often keeps people from soothing anxiety once it begins to take hold?

There are two primary treatments for individuals with anxiety:

Cognitive behavioural therapy (CBT),-which involves learning how to lower anxiety and face distressing situations.

Medication management with anti-depressants works well on its own but even better when coupled with cognitive behavioural therapy.

During therapy, continue to show your support by:

- Asking them what you can do to help them.
- Asking if you can attend a therapy session to learn some skills to better support them.
- Making time for your own life and interests to sustain your energy.
- Encouraging them to try another therapist if the first one isn't a good fit.

“If you’re concerned about a one’s anxiety, early treatment is ideal. “The longer you let anxiety or any sort of mental or physical health condition go without intervention, the harder it can be to recover.”

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Self-Check-5

Test-5.1: Match items in column A with items in column B

A	B
A. Referred pain	1. This starts suddenly and only lasts for a short period
B. Chronic Pain	2. Pain that has persisted for longer than six months and is experienced most days.
C. Acute pain	3. Pain that feels like it is coming from a body part that is no longer there.
D. Phantom Pain	4. pain that feels like it is coming from one particular location, but is the result of an injury or inflammation in another structure or organ

Test-5.2: Select the correct choice for the following questions

- What do you recommend to clients in pain management in addition to administering anti pain
 - Reducing isolation
 - Encouraging problem solving
 - Eliciting additional support
 - All
- Information that is typically reported on a formal incident or accident report includes: more than one response is possible.
 - The date, time and place of the incident or accident
 - Clear, concise and objective data about the occurrence
 - The name of the person or persons who was affected
 - Any injuries that were sustained as a result of the incident or accident

3. Medication management with anti-depressants works well on its own but even better when coupled with cognitive behavioral therapy.

A. true
B. False

Test 5.3: answer the question below

I. Briefly describe how to reporting any incidents, events, irregular occurrences or abnormal findings are concerned body

Unit Six:- Monitor and report client's response to administer medication

Instruction sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Recording administered medications
- Evaluating client understanding on provided information
- Recognizing acute and delayed adverse reactions
- Implementing emergency actions to adverse reactions
- Recording and reporting the response to emergency strategies
- Monitoring client response experiencing pain and carry out appropriate management
- Recording and reporting Effectiveness of pain-relieving medication

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Record administration of medications in accordance with the relevant policy and procedures.
- Provide information and evaluate client understanding
- Recognize acute and delayed adverse reactions to medications and act upon within role responsibility.
- Implement emergency actions to address acute and delayed adverse reactions within the role responsibility.
- Record and report response to emergency strategies.
- Monitor and undertake appropriate medication and non-medication therapies in consultation/collaboration with concerned body to a client experiencing pain
- Recording and reporting effectiveness of pain-relieving medication

6.1. Recording administered medications

A medication record must be completed with the following information:

the name of the client, the authorisation to administer medication (including self-administration, if applicable, the name of the medication to be administered, the time and date the medication was last administered, the time and date or the circumstances under which the medication should be next administered, the dosage of the medication to be administered, the manner in which the medication is to be administered and the name and signature of the person who administered the medication.

6.2. Evaluate client understanding on provided information.

Because of the wide range of symptoms or problems clients present, it is crucial that interviewers have at least a general knowledge of psychopathology. Use the teach back method to evaluate their understanding by asking them to explain the concept in their own words while using open ended questions instead of close ended. During this time:

Avoid using jargon words when you explain to your client

Assess their understanding by asking them to explain the concept by their own word

Explain one concept of a diagnosis or treatment plan to the client

Assess the client's recall and understanding by asking the client to explain what you said Repeat the process until the client can demonstrate they have a satisfactory understanding of the information

Introduce the next concept

6.3. Recognizing acute and delayed adverse reactions

Antibiotics, especially penicillin and the sulphonamides, are among the most common causes of drug-induced hypersensitivity reactions. These reactions are caused by four different immunologic mechanisms: type I or immediate hypersensitivity reactions; type II or cytotoxic reactions; type III or delayed, immune complex allergic reactions; and type IV or cell-mediated hypersensitivity reactions.

Immediate reactions- allergic reactions to antibiotics can be sudden and life-threatening. Type I hypersensitivity reactions most often occur within an hour after exposure to an

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antibiotic, although in rare cases they may occur after a day or more.

The result of the interaction of an antigen with preformed IgE antibodies, these reactions cause the release of

histamines and other inflammatory mediators, leading to Urticarial, angioedema, and anaphylactic events. Urticarial manifests as blanching oedematous papules or plaques approximately 1 to 2 centimetres in diameter, which are usually very pruritic. The lesions are generalized, bilateral, and symmetrical. Angioedema appears as swelling of underlying skin structures, most often occurring on the palms, soles, or the per orbital or perioral region; it is not pruritic. Both conditions are caused by capillary vein leakage; Urticarial results from leakage in the superficial dermis and angioedema from leakage in the deep dermal tissue and sub cutis. Often, Urticarial and angioedema occur concomitantly.

Anaphylaxis accounts for approximately 500 deaths annually. It occurs when Urticarial and angioedema advance to a stage that causes dysphagia, bronchoconstriction, and upper airway obstruction. Hypotension and cardiovascular collapse are the hallmarks of true anaphylactic shock. Anaphylactic reactions are commonly reported after penicillin use, but they can also occur with cephalosporin, sulphonamides, and, more rarely, other antibiotics.

Cytotoxic reactions are triggered when IgG or IgM antibodies become attached to red blood cells (RBCs) or renal interstitial cells that have an antigen bound to their surface. Interstitial nephritis is a type II allergic reaction that is often associated with antibiotic use. Frequently, penicillin's or sulfa drugs are found to be the inciting agent. Onset of symptoms can be delayed from days to weeks after starting the offending drug. Symptoms include eosinophilia, eosinophilia, haematuria, and proteinuria. Patients may have declining renal function and a corresponding rise in serum blood urea nitrogen and creatinine. Rapid recovery will often occur after the drug is stopped. Thrombocytopenia and haemolytic anaemia are other examples of cytotoxic reactions.

Delayed, immune complex reactions- occurs when IgG or IgM antibodies form circulating complexes with antigens, which then induce complement fixation and become lodged in small blood vessels of the skin, kidneys, and joints, causing inflammation. Serum sickness is an example of a type III reaction. It most often occurs 7 to 10 days after exposure and causes Urticarial and angioedema, with fever, arthralgia, myalgia, and palpable purpura. Often,

erythema will first occur on the sides of the fingers, toes, and hands before becoming more widespread.

Penicillin, sulphonamides, and quinolones are most often the inciting agents in these reactions.

Cell-mediated reactions- are induced when T-lymphocytes interact with an antigen and cytokines are released. Additional immune cells are attracted by the cytokines, causing local tissue inflammation. This type of reaction occurs with topical application; contact dermatitis is an example of a type IV hypersensitivity reaction. Type IV reactions are so common with topically applied beta-lactam antibiotics that those drugs are never used that way

6.4. Implementing emergency actions to adverse reactions

Successful management of adverse drug reactions requires early identification and prompt treatment of anaphylaxis, whether due to immunoglobulin (Ig) E- or non-IgE-mediated mechanisms of mast cell mediator release. Acute therapy is directed toward enhancement of oxygenation and maintenance of norm tension. Requisite measures include the use of epinephrine, oxygen, and adequate fluid replacement; in some instances, vasopressors or corticosteroid drug therapy may be warranted. Emergency measures may be needed to maintain the airway.

Familiarity with the drug groups most commonly responsible for immunologic reactions is helpful, as is knowledge of satisfactory alternatives for these drugs in the presence of known hypersensitivity. An adverse reaction can often be minimized through use of established protocols for pre medication.

6.5. Recording and reporting the response

Timing, the pattern of illness, the results of investigations, and re-challenge can help attribute causality to a suspected adverse drug reaction. Management includes withdrawal of the drug if possible and specific treatment of its effects. Suspected adverse drug reactions should be documented as mentioned earlier and reported to the appropriate body.

6.6. Monitoring, recording and reporting client's pain response

There are many different types of pain-relieving medications and each class works in a slightly different way. Most medications can be grouped under one of the following:

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Non-opioids: a medicine that is not similar to morphine (an opioid)

but is not addictive (e.g., acetaminophen, aspirin, NSAIDs)

Weak opioids: a medicine that is similar to morphine (an opioid) but not considered as strong (e.g., codeine, tramadol)

Combination opioids: these contain a non-opioid and either a weak opioid or a strong opioid (e.g., acetaminophen and hydrocodone)

Strong opioids: a medicine such as morphine or similar to morphine that has the potential to cause addiction (e.g., fentanyl, morphine, oxycodone)

Other (e.g., ketamine)

Adjuvant treatments: a medicine that can help relieve pain by relieving inflammation or by improving the functioning of other systems (e.g., cannabidiol, capsaicin cream, gabapentin)

Non-pharmacological treatments (drug-free treatments), such as psychotherapy or counselling.

The choice of pain-relieving medication comes down to how effective it is for that type of pain and the likelihood of side effects in that particular person.

- Once a pain medication is started, it should be monitored for effectiveness and side effects and the dosage or choice of treatment modified if the pain changes or the choice is deemed unsuitable or ineffective.
- Some types of pain (such as cancer-related pain) have an unpredictable course that can vary dramatically in severity and duration, depending on the type of treatment and disease progression. Pain management needs to have some flexibility to account for this.
- Some people will have more than one type of pain.
- Changing the method of delivery of pain medication may improve its effectiveness; for example, changing from an oral treatment to a patch or a subcutaneous pain pump.

Traditionally, most experts have recommended a stepwise approach to pain management, starting with acetaminophen or NSAIDs, then progressing to a weak opioid (such as codeine, dihydrocodeine, or tramadol), before changing to a strong opioid (such as fentanyl, morphine, oxycodone).

Self-check-6

Test-6.1: Match items in column A with items in column B

A	B
A. Type I hypersensitivity reactions	1. most often occur within an hour after exposure to an antibiotic
B. Delayed, immune complex reaction	2. are induced when T-lymphocytes interact with an antigen
C. Non-opioids	3. most often occurs 7 to 10 days after exposure and causes urticarial and angioedema
D. Cell-mediated reactions	4. a medicine that is not similar to morphine

Test 6.2: Say true or false to the following statements

1. Successful management of adverse drug reactions requires early identification and prompt treatment of anaphylaxis
2. Changing the method of delivery of pain medication may improve its effectiveness
3. Acute adverse reaction measures include the use of epinephrine, oxygen, and adequate fluid replacement; and in some instances, vasopressors or corticosteroid drug therapy may be warranted.

Test-6.3: Select the correct response for the following MCQs

1. A medication record must be completed with the following information:
 - A. the name of the client,
 - B. the authorisation to administer medication
 - C. the time and date the medication was last administered,
 - D. All

2. What concepts one should follow to evaluate client understanding on provided information

- A. Using jargon words should be avoided when you explain to your client
- B. Assess their understanding by asking them to explain the concept by their own word
- C. Assess the client's recall and understanding by asking the client to explain what you said
- D. All

References

1. Bentley, M., Peerenboom, C. A., Hodge, F. W., Passano, E. B., Warren, H. C., & Washburn, M. F. (1929). Instructions in regard to preparation of manuscript. *Psychological Bulletin*, 26(2), 57–63.
<https://doi.org/10.1037>
2. <http://www.qualitygurus.com/courses/mod/forum/discuss.php?d=1557>
3. Good man & Gilman's Pharmacological basis of Therapeutics, 11th edition
4. Ethiopian medicines formulary, second edition 2013, FMHACA, Addis Ababa, Ethiopia
5. Consolidated guidelines on The use of Antiretroviral drugs For treating and Preventing hiv infection, WHO
6. FMHACA, Standard treatment guideline for Primary hospital: Third edition, 2014
7. Pharmacology lecture notes for health science students, Tefera Abula, UoG

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