Nursing Level III
NTQF Level III

Learning guide -16

Unit of Competence	**Providing Basic First aid and Emergency Care**
Module Title:	**Providing Basic First aid and Emergency Care**
LG Code:	**HLT NUR3 LO 2 LG 14**
Module Code	**HLT NUR3 M04 00919**
TTLM Code:	**HLT NUR3 M LO2 TTLM, 09 2019 V1**

LO 2: Apply pharmacology in the field of nursing practice

Instruction Sheet	Learning Guide #

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

Basic pharmacology

Drug calculations

Route of administration

Side effects

Mechanism of action

Toxicity of drugs

Monitoring drug before, during and after administration

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

Describe basic pharmacological knowledge

Explain Basic pharmacology is applied

Describe about drug calculations, correct route of administration, side effects, mechanism of action, toxicity is given

Perform drug cheeking/ maintaining before, during and after administration

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information "Sheet 1 in page 3
4. Accomplish the "Self-check 1, **in page 14**
5. Submit your accomplished Self-check. This will form part of your training portfolio. Your trainer will give you feedback and the evaluation will be either satisfactory or unsatisfactory. If unsatisfactory, your trainer shall advice you on additional work. But if satisfactory you can proceed to Learning Guide # 3.

Information Sheet-1	Basic pharmacology

2.1 Basic Pharmacology

2.1.1 Definitions: Pharmacology can be defined as 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.

2.1.2 Pharmacokinetics: Study of the metabolism and action of drugs Particularly emphasizes the following: Absorption, Distribution , Biotransformation , Excretion

2.1.3 Pharmacodynamics: study of how a drug works and how we can expect the body to respond to the administration of a drug

2.1.4 The Physical Nature of Drugs

Drugs may be solid at room temperature (eg, aspirin, atropine), liquid (eg, nicotine, ethanol), or gaseous (eg, nitrous oxide). These factors often determine the best route of administration. For example, some liquid drugs are easily vaporized and can be inhaled in that form, eg, halothane, amyl nitrite.

2.1.4 Classification of Drug

Classifications of Medications

- Anticoagulants
- Anticonvulsants
- Antidiabetics
- Antidysrhythmics
- Antihypertensives
- Anti-infectives
- Antipsychotics
- Cardiac Glycosides
- Corticosteroids
- Drotrecogin
- GI Agents
- IV fluids
- Narcotics
- Parenteral Nutrition
- Platelet Aggregation Inhibitors
- Respiratory Medications
- Sedatives
- Vasoactive agents

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)

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

Cowlings Equation

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

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

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

Determination of drug dosage

There are different rules to determine the dose in children.

1. **Fried's rule** -(for infants under 2 years)
   Infant dose = age in month x adult dose
   150
2. **Clark's rule** -(for children over 2years)
   Child dose = weigh in 1b x adult dose
   150
   Or
   =weigh in Kg(0.45)(adult dose)
   150

NB- 1 lb=0.45kg

3. **Young's rule**
   Child dose=Age in years x adult dose
   Age in years + 12
4. **Surface area** -is the most accurate method.

   Child dose =Surface area in sqm x adult dose
   1.75
   Note -surface area in sqm= 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 and apply the 6 rights (the previous five rights and the right of the parent and child to know).

2.3 Route of administration

- **Enteral Route**

Enterally- through the gastrointestinal tract

The enteral routes are:

- Oral
- Rectal
- Directly in to the stomach by means of gastric tubes.

- Parenteraly - through other than gastro intestinal tract.
  - Topically (in to the eyes, ears, nose or on the skin)
  - Intradermaly: in to dermis.
  - Subcutaneously: in to cutanuese.
  - Intravenously: in to venous.
  - Intramuscularly: in to muscle.

- Intrathecaly: in to subarachnoid space.
- Intraosseous: in to bone.
- Intra-articular: in to joint

2.3.1 Oral Administration

Definition: - Oral medication is drugs administered by mouth.

Advantage, Disadvantages& contra-indications

- Most drugs are administered by the oral route because it is the safest, most convenient, and least expensive method.
- The disadvantage of the oral route is that it is slower acting than the other routes, such as injectables.
- Drugs may not be given orally to clients with gastrointestinal intolerance or those on NPO (nothing by mouth) status.
- Oral drugs should be given with caution to clients who have difficulty swallowing, such as a patient who has had a cerebro vascular accident (stroke).
- Oral administration is also precluded by unconsciousness.
- When small amounts of drugs are required, the **buccal** (cheek) or sublingual route is used.
- Drugs administered through these routes act quickly because of the oral mucosa's thin epithelium and large vascular system, which allows the drug to quickly be absorbed by the blood.
- Certain oral drugs are prepared for sublingual or buccaladministration to prevent their destruction or transformationin the stomach or small intestines.
- Buccal drugsare designed to be placed in the buccal pocket (superior-posterioraspect of the internal cheek next to the molars)for absorption by the mucous membrane of the mouth.
- Sublingual medications are designed to dissolve quicklywhen placed under the tongue. For exampleerythrityltetra nitrate (anti-angina) can be given either sublinguallyor buccally as prescribed, whereas isoproterenolhydrochloride (a bronchodilator) and

nitroglycerin (ananti-angina) are given sublingually, and methyltesterone(an androgen) is given only buccally.

- When digestive juices inactivate the effect of the drug, we do not give.
- Alsowhen there is inadequate absorption of the drug, which leads to inaccurate determination of the drug absorbed.
- When the drug is irritating to the mucus membrane of the elementary canal.

Types of oral medications:

1. Lozenges (troches)
2. Tablets
3. Capsules
4. Syrups
5. Tinctures
6. Suspensions
7. Pills & gargle
8. Effervescent
9. Power
10. Oily medication

2.3.2 Suppositories:

Purpose:

a. To produce a laxative effect.(Bowel movement). Suppository is use frequently instead of enema since it is inexpensive.
b. To check diarrhea
c. To produce local sedative in the treatment of hemorrhoids or rectal abscess.
d. To produce general sedative effects when dedications cannot be taken by mouth.
e. To check rectal bleeding

Kinds of suppositories used:

a. Bisacodyl (Dulucolax) is commonly ordered for its laxative action. It stimulates the rectum and lubricates its contents. Normally15 minutes are needed to produce bowel movement.
b. Glycerin or soap for bringing about bowel movement. If soap suppository is use, cut a split of soap 2-6cm and wash it on hot water to smooth the rough edges before administration.
c. Bismuth – toreduce symptoms of vomiting and diarrhea.

d. Opium, sodium barbital etc. for sedation.

2.3.4 Intradermal injection:

Definition: It is an injection given into the outer layer of the skin. (corneum:most outer layer of the dermis)

Purpose: For diagnostic purpose

A) Tine test (mantoux test) : to test for the presence of tuberculosis infection.

B) Allergic reaction

Intradermal injection may also be given for therapeutic purpose,

2.3.5 Sub-cuteness injection(SC,SQ)

Definition: Injection of drug under the skin in the sub-cuteness tissue

Purpose:-

1. To obtain quick absorption than oral administration.
2. When it is impossible to give medicines orally.

2.3.6 I.V. Injections:

Definition: It is the introduction of a drug in solution form into a vein. Often the amount is not more than 10ml. at a time.

Purpose:

1. When the giving drug is irritating to the body tissue if given through other routes.
2. When quick action is desired.
3. When it is particularly desirable to eliminate the variability of absorption. (to make absorption uniform)
4. When blood drawing is needed (exsanguinations).

2.3.7 Intra-muscular injection:

Definition: It is an introduction of a drug into a body's system via the muscles.

Purpose:

1. To obtain quick action next to the intra-venous route
2. To avoid an irritation from the drug if given through other route.

2.3.8 Blood Transfusion

Definition:- It is the giving of blood to a patient through a vein .

Purpose

1. To counteract severe hemorrhage and replace the blood loss.
2. To prevent circulatory failure in operation.Where blood loss is considerable, such as in rectal resection,hysterectomy and arterial surgery.
3. In severe burns to make up for blood lost by burning but only after plasma and electrolytes have been replaced.
4. For severe anemia from cancer, marrow aphasia and similar conditions.
5. To provide clotting factors normally present in blood which may be absent as a result of disease.

Table 1: Routes of Administration, Bioavailability, and General Characteristics.

Route	Bioavailability (%)	Characteristics
Intravenous (IV)	100 (by definition)	Most rapid onset
Intramuscular (IM)	75 to ≤100	Large volumes often feasible; may be painful
Subcutaneous (SC)	75 to ≤100	Smaller volumes than IM; may be painful
Oral (PO)	5 to <100	Most convenient; first-pass effect may be significant
Rectal (PR)	30 to <100	Less first-pass effect than oral
Inhalation	5 to <100	Often very rapid onset
Transdermal	80 to ≤100	Usually very slow absorption; used for lack of first-pass effect; prolonged duration of action

2.4 Side effects: Adverse drug reactions (ADR)

- 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 some times it is predictable, e.g. Hypotension following antihypertensive drugs.
    - Hypoglycaemia following insulin.
- ADR Is 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.

2.4.1 **Side effects:**

- Side effects are infact 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 preanaesthetic medication.

2.4.2 **Untoward effects:**

- 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**.

2.5 Teratogenic effect:

- Some drugs given in the first three months of pregnancy may cause congenital abnormalities and are said to be teratogenic.

- The best known example is thalidomide which results in early easily recognizable abnormalities such as absent or grossly abnormal limbs.
- Other drugs with teratogenic potential are androgens, steroids, anti convulsants, anti neoplastic drugs, cortisone, lithium, pencillamine, tricyclic antidepressants and warfarin

2.6 Mechanism of Drug action

The fundamental mechanism 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 reacts according to simple chemical equation
   E.g. Antiacids ($AIOH_3$ and other) neutralize gastric HCl
3. **Through enzymes**:- Almost al biological reaction are carried out under catalytic influences of enzymes are a very important target of drug actions.

Drugs can either increase or decrease the rate of enzymatically imediated reactions; which can be

Stimulation: - by increasing the affinity of an enzyme for substrates

- Enzyme induction i.e. synthesis of more enzyme proteins

Inhibition

- May drugs inhibit a particular enzyme with out affecting others. This inhibition is either competitive or non-competitive
  i. Competitive
- The drug competetes with the normal substrate or co-enzyme
  ii. Non-competitive
- The drug reacts an adjacent sit and not with catalytic site, but alters the enzyme catalytic property

4. **Through receptors**:-

- A Drug receptor is a specialized target macro molecule, present on the cell surface or intracellularly, that binds a drug and mediates its pharmacological action

2.7 Toxicology is that branch of pharmacology which deals with the undesirable effects of chemicals on living systems, from individual cells to complex ecosystems.

2.8 Monitoring drug before, during and after administration

- A critical element of drug administration is documentation.
- The standard is "if it was not documented it was not done."
- Many drug errors can be avoided with appropriate documentation.
- The nurse responsible for administering the medication must initial the medication on the MAR near the time the drug is scheduled.
- Usually there is a space available for a full signature on the record.
- The nurse should document that a drug has been given after the client has taken the drug.

2.9 Guidelines for Safe Administration of Medications

- ✓ Never administer medications that are prepared by another nurse.
- ✓ You are responsible for a medication error if you administer a medication that was inaccurately prepared by another nurse.
- Nurses should listen carefully to the client who questions the addition or deletion of a medication.
- Most clients are aware of their prescribed medications. If a client questions the drug or dose you are preparing to administer, recheck the order.
- If a medication is withheld, indicate the exact reason why in the client's record.
- Legally you are accountable for giving ordered medications to the client; however, circumstances may prevent you from giving a medication as ordered.
- Medications may be held for some diagnostic tests, or the client receiving antihypertensive medications may have a blood pressure that is lower than normal. If you gave the antihypertensive, the blood pressure would decrease, causing further hypotension.
- *Do not leave medications at the client's bedside for any reason.*
- The client may forget to take themedication, medications can accumulate, andthe client could take two or more of the samemedication, causing an overdose, or anotherclient who is confused could take themedicine.

- Initial the MAR only for those medications you actually have administered. This practice ensures accurate charting by clearly indicating which actions you have performed.
- Advise clients not to take medications belonging to others and not to offer their medications to others.
- Medications are ordered for each client on the basis of the history, physical examination, and effectiveness of the medication.
- If the client refuses to take a medication once it has been prepared, the nurse must indicate that a dose was missed. In some hospitals, a circle is placed around the time the medication was scheduled to be given.
- The nurse should write in the record why the dose was missed and notify the health care practitioner.
- The client may have refused because the tablet was too large.
- The medication may be supplied as a liquid so an alternate form of the medication can be given; the nurse must request that the health care practitioner change the order to a liquid.
- Clients do have the right to refuse medications. However, if clients understand the actions of the medication, they may be willing to take the medication.
- Clients who are scheduled for various diagnostic tests or treatments at the time the medication is to be administered will need to have the medication times rescheduled.

Self-Check 1	Written Test

1. Define pharmacology
2. What is pharmacokinetics
3. Mention the deference between loading and maintenance dose
4. List route of medication of administration
5. List general guide line for Safe Administration of Medications

Note: **Satisfactory rating - 12 points Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers

Answer Sheet

Score = _____
Rating: _____
Name: _____ Date: _____

Short Answer Questions

1. _____

_____

_____

_____

_____

2. _____

_____

_____

_____

_____

3. _____

_____

_____

_____

_____

4. _____

_____

_____

_____

5. _____

_____

List of Reference

1. Bertan G, Katzung – Basic and clinical Pharmacology 9th edition

2. Patient Safety and Quality: An Evidence-Based Handbook for Nurses, Ronda G. Hughes,2018

Pripared By

No	Name	Educational Back grund	LEVEL	Region	College	Email	Phaone Number
1	Middega Jbril	Nursing	B	oromia	Nagelle HSC	midhagadhangago@gmail.com	0091318425
2	Biratu Ebessa	Nursing	A	BGRS	Pawi HSC	biratuebs004@gmail.com	0915926607
3	Ali Adan Mohamed	Nursing	A	Somali	Jigjiga HSC	alishide120@gmail.com	0912866022
4	Tariku Abebe	Nursing	A	oromia	Mettu HSC	gessessetariku@gmail.com	0917831032
5	Birhanu Tessisa	Nursing	B	oromia	Nekemte HSC	birhanutessisa3@gmail.com	0913327601
6	Eskender Birhanu	Nursing	B	Harari	Harar HSC	amenaesender@gmail.com	0933259187
7	Ferhan Abubeker	Nursing	A	Harari	Harar HSC	Feru_ab@yahoo.com	0915742083