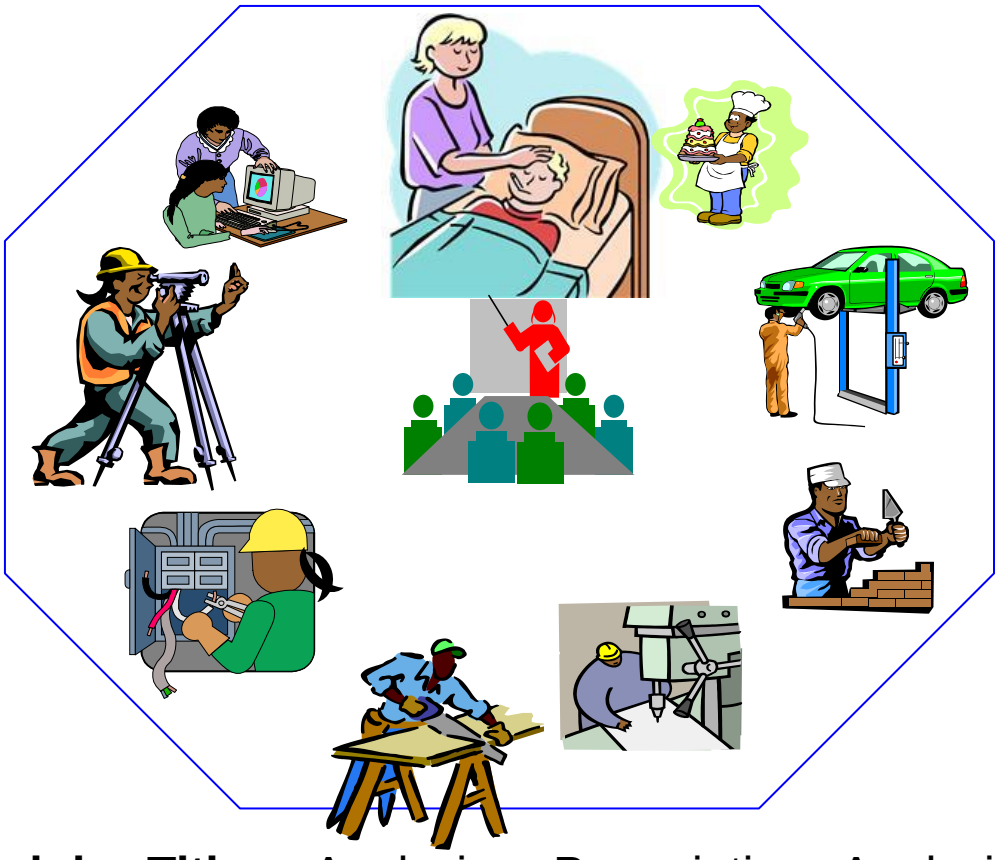
Pharmacy Level-IV

Based on Feb 2018 Version 2 OS and Jun, 2018 Version 1

Curriculum



Module Title: -Analyzing Prescription Analysis and Apply Good Dispensing Principles

LG Code:- HLT PHS4 M02 (LO1-LO7) (LG06-12)

TTLM Code:- HLT PHS4 TTLM 0221V1

February 2021

Bishoftu, Ethiopia

Table of Contents

LG #6	LO #1- Accepting prescription for dispensing

Instruction sheet

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

- Prescription and types of prescription
- Steps in dispensing of prescribed medications
    - Receive and validate prescription or verbal request
    - Understanding and Interpreting prescription
    - Prepare Items for issue
    - Labeling and packaging of medicines.
    - Issuing drugs to patients
    - Documentation and Reporting
- Validating a Prescription
    - Legality of a prescription
    - Legibility of a prescription
    - Completeness of a prescription
    - Correctness of the prescription

This guide 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:

- Collect prescription and confirm client details.
- Identify the prescriber and area initiating the order for the purpose of costing and computer entry.
- Confirm the legality, validity and completeness of the prescription.
- Report discrepancies to pharmacist.
- Determine cost of medication and provide appropriate information to client.
- Advise client of any foreseen difficulty in filling the prescription.
- Advise client of approximate waiting time and collection arrangements.
- Check payment and issue receipt

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information sheet.1 Overview of Prescription and types of prescription

1.1. Introduction

1.2. Definition of prescription

Prescription: is any order for medicines written by a fittingly licensed medical practitioner issued to a patient in order to collect medicine from dispensing unit.

The prescription is one of the **most important therapeutic transactions** between physician and patient.

A prescription is a written order from Registered Medical Practitioner or a Physician to a Pharmacist to compound and dispense a specific medication for the patient.

To avoid undesirable and/or serious effects on the patient, both physician and pharmacist must provide the highest of professional services.

- Accurate diagnosis;
- proper selection of medication, dosage form and route of administration;
- proper size and timing of dose;
- precise dispensing;
- accurate labeling; and
- Correct packaging; all must be provided.

1.3. Types of drugs

- Legend Drugs: These drugs may not be dispensed by a pharmacist without a prescription from a physician.
  - Prescription only drugs (prescription drugs)
- Controlled Drugs: In addition to requiring a prescription, these drugs require additional safeguards for storage.
  - Refills are also limited**.**
- Over-the-Counter (OTC) Drugs: These drugs do not require a prescription.

– Nonprescription drugs

1.1.3 Types of prescription

- Special prescriptions
  - ✓ Prescriptions for controlled drugs (narcotic and psychotropic substances)
  - ✓ Potential for abuse,
  - ✓ May cause addiction, tolerance.
  - ✓ Narcotic drugs- sleep inducing or pain removing substances.
  - ✓ Psychotropic substances- substances that affect behavior.
- Ordinary prescriptions
  - ✓ Prescriptions for drugs free of addiction, tolerance…
  - ✓ Special prescription and Ordinary prescriptions differ in color

Self check 1	**Written test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Choose the best answer for the following questions.

1. Which types of drug may not be dispensed by pharmacist without prescription
   A. Controlled drug
   B. Over the counter drug
   C. Legend drug
2. Drug do not require prescription is____
   A. Legend
   B. Controlled drug
   C. Over the counter drug
3. Which types of prescription used for controlled substances?
   A. Special prescription
   B. Ordinary prescription
4. Narcotic drug need-
   A. Special prescription
   B. Ordinary prescription

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1. _____
2. _____
3. _____

4. ____

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2 Steps in dispensing of prescribed medications

2.1. Receive and validate prescription or verbal request

Upon receiving a prescription, the staff member responsibility should confirm the name of the patient. This action is particularly important when the clinic is dealing with a large crowd of people and when there is any risk that staff or patient may mix up prescription. Cross –checking the name identity of the patient must also be done when issuing the medicine. [The use of matching numbers or symbol –one attached to the prescription and one given to the patient –Can also contribute to making sure the right patient gets the right medicines and is especially helpful in situation where many people share the same surname.]

2.2. Understanding and Interpreting prescription

Interpreting a prescription must be done by a staff member who can ---

- Read the prescription
- Correctly interpret any abbreviation used by the prescriber
- Confirm that the doses prescribed are in the normal range for the patient [noting age and sex]
- Correctly perform any calculation of dose and issue quantity
- Identity any common drug- drug interaction

It is assumed that the prescription will be in written form. Verbal orders for medications should be given only in exceptional and emergency situations. In such cases, the order should be repeated back to ensure accurate prescriber an agree upon period. Computerized prescribing and dispensing system are becoming more widespread, especially in large hospital. If the person dispensing the medicine has any doubt about what is required by the prescriber. Illegible writing by prescribers has serious implication when many product names are confusingly similar. Checking a prescription may save a life.

All calculation should be double checked by the dispenser or counter –checked by another staff member.

The pharmacy professionals should confirm

- Legality
- Legibility
- Identifying the patient's condition
- Completeness of the prescription
- Correctness of the prescription
- Therapeutic aspects
- Appropriateness of the individual

2.3. Prepare Items for issue

This includes:

A. Select stock container of pre-pack reading the label and cross matchingthe medicine name and strength against the prescription.
B. Read the container label at least twice during the dispensing process.
C. Do not select the prescribed medicine according to the color or location ofcontainer.
D. Do not open many stock containers at the same time. This trend willlead to errors and/or expose the medicines to air and eventually leads todeterioration in quality.
E. Open and close containers once at a time.
F. While counting, pouring or measuring, the following points should benoted:
    - Short and/or over counting should be avoided
    - Clean counting tray and/or spoon used
    - Graduated measuring cylinder and/or flask must be used for measuringliquid reduction. If small volume is to be measured, small measuringcylinder/flask has to be used (if compounding is performed in thepharmacy).
G. Appropriate balance should be used (if compounding is performed in the pharmacy
H. In dispensing liquids (if compounding is performed in the pharmacy):

- Must be measured in a clean vessel and should be poured from thestock bottle with the label kept up ward. This avoids damage to the labelby any spilled or dripping liquid.
- Pour the measured liquid preparation into the container/bottle andlabel it.
- Provide appropriate bottles with caps for repackaging liquid preparations
- Dispense liquid preparations in suitable containers
- Do not use patient's own bottle
- Dispense each medicine in a different bottle

I. In dispensing tablets and capsules:
   - Do not use fingers to count tablets as this can lead to contamination of medicines
   - Use a spoon to put tablets and capsules onto a counting tray
   - Count and put them in a labeled medicine container or pack
   - Close stock containers tightly after dispensing
   - Keep the spoon clean at all times
   - Do not keep the spoon inside the container

J. Labeling of dispensed medicines should be clear and legible.Use separate plastic boxes for different patient's requirements of medicines. To avoid mix-ups of medicines of different patients, it is a good practice to assemble medicines of different patients in separate/different boxes, till they are billed and packed.

2.4. Labeling and packaging of medicines.

The containers used for dispensing must be appropriate for the product dispensed. All containers intended for medicinal products must be protected and kept free from contamination.

A Packaging of medicines

- Medicines must be suitably contained, protected and labeled from the time of manufacture until they are used by the patient. The container

must maintainthe quality, safety and stability of the medicine throughout this period.

- The selection of packaging for medicines depends on:
  - ✓ Nature of the medicine
  - ✓ Type of patient
  - ✓ Dosage form
  - ✓ Method of administering the medicine
  - ✓ Required shelf-life
  - ✓ Use, such as for dispensing.

Original containers used by manufacturers are expected to protect medicines for their specified shelf-life. Because original containers may contain large amount of medicines, repackaging of medicines into another container maybe necessary in order to dispense medicines for patients. Such repackaging procedure can be done at-the –spot or in advance.
Prepackaging is the process by which the pharmacy professional transfers a medication manually from a manufacturer's original commercial container to another type of container in advance (before clients come to medicine retail out lets).
The following guidelines are recommended in prepackaging of medicines:

- ✓ Prepackaging procedures must comply with laws and regulations
- ✓ The prepackaging operations and area must be clean and separate fromother pharmacy activities.
- ✓ Only one medicine product at a time should be prepackaged in a specific work area.
- ✓ Before beginning a prepackaging run, a physical evaluation (color, odor, appearance, and markings) of the medicine product being prepackage should be made to assure product integrity. The bulk container should also be examined for evidence of damage, contamination, and other deleterious effects.
- ✓ All prepackaging equipment and systems should be operated and used.

In accordance with the manufacturers or other established instructions .There should be valid justification and authorization by the supervisor for any deviation from those instructions on the part of the operator.

The pharmacy professional must use available data on the characteristics of all packaging material used to protect the integrity of the medicine product. This information should include data on the chemical composition, light transmission, moisture permeability, size, thickness (alone or in laminate), recommended sealing temperature, and storage requirements.

Upon completion of prepackaging, all unused medicine stock, unused labels and finished packages should be removed from the prepackaging area. The packaging equipment should then be completely emptied, cleaned, and inspected before commencing the next prepackaging operation.Allprepackaged medicines should be stored in a temperature and humidity controlled environment.

Prepackaging materials should be stored and used in accordance with the manufacturer's instructions. The main advantages of prepackage in medicines is that it allows enough time for patient counseling and minimizes dispensing errors resulting from hectic operation due to heavy patient load. Unfortunately, the materials commonlyused for repackaging in many medicine retail outlets of Ethiopia are ordinary papers and the labeling is incomplete. In such cases, repackaging of medicinesis likely to have many disadvantages than advantages.

A. Packaging aids and materials

- The materials used for repackaging include: glass bottles, plastic bottles, collapsible tubes, paper envelops, plastic envelops, etc. Paper has the least value as the primary packaging material in terms of maintaining the quality, safety and stability of packaged medicine.

A. Labeling of medicines

The main functions of a label on a dispensed medicine are to uniquely identify the contents of the container and to ensure that patients have clear and concise information about the use of the

Medicine. Each dispensed medicine must be appropriately labeled to comply with legal and professional requirements. All medicines to be dispensed should be labeled and the labels should be unambiguous, clear, and legible and indelible. If possible lettering should be printed.
Minimum drug label information should include the following:

- ✓ Patient name
- ✓ Generic name, strength and dosage form of the medicine
- ✓ Dose, Frequency and Duration of use of the medicines
- ✓ Quantity of the medicine dispensed
- ✓ How to take or administer the medicine?
- ✓ Storage condition

If the medicine has been prepared extemporaneously, a batch number may be included. All labels must be unambiguous, legible, accurate and comprehensible.
The labeling of medicines in drug retail outlets of Ethiopia is very disappointing. It is common to see the dispensed medicines without a label, incomplete label,or illegible label. The size of the commonly used paper envelops may not even allow to write the required information on it.

Case study 2.1.

Ato Kebede went to a pharmacy with a prescription for nitroglycerin sublingual tablets. The pharmacy worker repackaged the prescribed number of tablets in paper envelops and dispensed with appropriate instructions for use. Some other day, Ato Kebede consulted the pharmacy professional about decreasing efficacy of the medicine dispensed. Comment.
Discussion: Nitroglycerin is volatile medicine. It should be packaged in tightly closed containers (bottles). The use of paper envelops for repackaging leads to a reduced efficacy of nitroglycerin, a possible reason for the complaint of Ato Kebede.

Case study 2.2.

The pharmacy professional received a prescription with the following information:

Tabs Ibuprofen 400mg

Mitte 60

One t.i.d.

The pharmacy professional dispensed 60 tablets of ibuprofen 400mg.andwrote a label that the patient should take three tablets daily with or after food. Comment on dosage.

Discussion**:** The prescription was to take one tablet three times a day. The information on the label is not clear. Accordingly, the patient may take three tablets at a time, which may lead to an occurrence of adverse effects or loss of efficacy. Understanding the meaning of Latin abbreviations that may appear on the prescription papers is important. Issuing drugs to patients

All medicines should be dispensed with adequate and appropriate information and counseling. Information must be structured to meet the needs of individual patients and questions and answers should be used to check the patient understands. Written information should be provided to supplement verbal communication as appropriate. Counseling should ensure that the patient hasan unequivocal understanding of the instructions for use, and any distinct characteristics or requirements of the medicine. Counseling should cover matters that will enhance or optimize medicine therapy.

2.5 Issue medicines to patient with clear information and advice

The prepared, packaged and labeled medicine is handed over to the right patient or care provider with appropriate medicine information. The information in the form of verbal and/or written instructions should include the following:

- ✓ How much and how often to take the medicine
- ✓ When to take the medicine (e.g., before or after meals)

- ✓ How long the treatment is to last (e.g., why the entire course of an antibiotic treatment must be taken)
- ✓ How to take the medicine (e.g., with water, chewing or swallowing)
- ✓ How to store the medicine (e.g., avoid heat, light and dampness)
- ✓ Not to share medicines with other persons
- ✓ Which types of foods and beverages should avoid while taking the medicine

To keep medicines out of reach of children

One has to demonstrate to the patient on how to administer the dispensed medications in case of inhaled administration and suppository application

- Patients should also be informed not to stop treatment when side effects occur or in the absence of response without consulting the prescriber or dispenser.
- Finally, check whether patients have understood the information provided

2.6. Documentation and Reporting

- The receipts for requisition, receiving as well as the prescription registration book should be kept properly.
- Blank prescription should be kept carefully, only prescribers have access to them.
- Filled prescription should be kept as a receipt. Prescriptions for narcotic and psychotropic Substances should be kept for 5 years and other prescriptions for 2 years. Thereafter, they should be disposed carefully in the presence of appropriate body.

- Regular reports on medicine consumption and prescribing pattern from patient prescription registration book should be prepared and report to the appropriate body timely.
- Information obtained from prescription registration book could be used for further planning and efficient utilization of resource.
- The report on physical inventory shall be documented

Self check 2	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Choose the best answer for the following questions.

1. Which one is the first step for dispensing of prescribed medication?
   A. Understanding and interpreting prescription
   B. Receive and validate prescription
   C. Prepare items for issue
   D. Labeling and packaging of medicine
2. Prepare items for issue include
   A. Legality
   B. Completeness
   C. Read container label at least twice during the dispensing process
   D. Correctness
3. Which one is not used in dispensing tablet and capsule
   A. Keep spoon clean
   B. Close stock container
   C. Use finger to count tablet
   D. Do not keep spoon inside the container
4. The container must maintain
   A. Quality
   B. Un safety
   C. In purity
   D. Instability

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Operation sheet 1	Steps in dispensing of prescribed medications

1. Receive and validate prescription or verbal request
2. Understanding and Interpreting prescription
3. . Prepare Items for issue
4. Labeling and packaging medicine
5. Issuing drugs to paitient
6. Documentation and reporting

Laptest	**Practical demonsteration**

Instruction

You are expected to perform the following activities within a given time per activity

Tools**:** Glass, bottle, plastic bottles, collabsible, tubes, papers, envelope

Task-1 Perform dispensing of prescribed medications

Task 2 Validate prescription

Name _____ Date _____

Started time _____ finished time _____

Information-sheet 3-Validating a Prescription

3.1. Legality of a prescription

A prescription is legal when:

- It is written (can also be typed) and signed by an authorized prescriber
- NPS prescription(Narcotic and psychotropic prescription) for Controlled drugs
- The medicines are written on the right prescription such as normal, NPS and ART
- Date of issue not exceeding 15 days for narcotic drugs and psychotropic substances and 30 days for other medicines
- Has all the information required to be contained with respect to parts of prescription

3.1.1 Legibility of a prescription

A brief examination of each prescription should be made immediately upon receiving it from the patient to ascertain the legibility of various parts of the prescription .Pharmacy professional must examine the prescription only behind the dispensing counter, and must not allow them to be distracted while doing so. Any doubt regarding the reading of the prescription (i.e. name of the medicines or directions, or if it appears that an error has been made by the prescriber), should be examined closely and, if necessary discussed/consulted with other pharmacists or the prescriber himself/herself without arousing doubts or fears in the patient.

a) Handwritten names of patients and medicines are often difficult to read. In case of illegibility of name, age, etc., ask the patient for the correct spelling tactfully. For example the pharmacy professional may ask “Excuse me. Is the first name Meseret or Mahelet?”

Always use ‘please’, ‘excuse me’ etc. and be polite

Every prescription should be read and understood thoroughly before at temptingto dispense it. Every word, abbreviation, has a meaning.To assume that anillegible or confusing word is unimportant inviting a costly mistake. In case of doubt, consult another pharmacy professional or the prescriber.

‘NEVER DISPENSE GUESS WORK’

Legibility is a problem requiring alertness and critical judgment on the part of the pharmacy professional. Careless handwriting and similarity in spelling of names of different medicines add to the difficulty.

Example of a Reading error:
Medoprazole and Mebendazole - Due to illegible handwriting of prescribers, Medoprazole could be read as Mebendazole. Medoprazole is a brand containing omeprazole whereas mebendazole is an anthelmintic two different medicines used for two different conditions. When handwriting is illegible, the best thing to do is to contact the prescriber over the phone and confirm.
Remember, you are dealing with medicines and thus, the lives of patients. So be sure of what you are dispensing. Imagine the disastrous consequences of dispensing the wrong medicine

b) The dosage form, the dosage and the quantity to be dispensed have to be legible so that dispensing becomes easier for the pharmacy professional. The instructions written for administration should state clearly what the prescriber expects from the patient so that the pharmacy professionals can counsel the patients efficiently.
   All terminology, including units of measures and Latin abbreviations shouldbe properly interpreted and checked

3.2 Completeness of a prescription

the prescription serves as a vehicle for communication from the licensed medical practitioner to the pharmacy professionals about the pharmaceutical care of the patient.

Details to be checked for completeness of the prescription

A. Seal of the health institution or header
B. Prescriber’s details (Name of prescriber’s, Qualification, Signature and Date)

C. Patient's details (Patient Name, Patient Address, Sex, Age, Weight and Diagnosis)

D. Medicine details

Checking the medicine details will include checking:

- ✓ Name of the medicine
- ✓ Dosage form
- ✓ Strength/ potency of the medicine
- ✓ Total amount to be dispensed and its availability
- ✓ Dosage and directions for use
- ✓ Frequency of administration and duration of the treatment

A. *Name of the medicine*

The name of medicine must be legible and correct without a doubt. Since many brands sound alike, brand confusion is quite common especially if the handwriting is illegible and the pharmacy professional's proceeds on the basis of guesswork. The prescriber should ideally write the generic name in parentheses against the brand name or write the generic name alone. This makes it easier if the pharmacy professional is not familiar with the brand prescribed. It would also aid in avoiding brand confusion.

Example: The prescription could state – Diclofenac 50mg rather Voltaren 50

If the prescriber writes the generic name alone, the pharmacy professional can give a brand of his choice. It is, however, the pharmacy professional's responsibility to ensure that the brand is of a standard company and registered by EFMHACA, and is cost effective at the same time. The pharmacy professional has to proceed ethically and morally, and in the best interest of the patient.

B. **Dosage form**

Some medicines are available in many different formulations. It is essential to check that the product on the prescription is available in the correct formulation, and to correctly choose the formulation. Confusion and mistakes can be made if the name of the formulation is similar to another formulation. For example, tablet formulations

of a medicine are available as tablets of 25mg and 50mg, dispersible/effervescent tablets, and100mg sustained release tablets

The same medicine could be available as tablets, capsules, and even injections. It is important to check the prescriber's prescription for the dosage form. If the dosage form is not specified, it is advisable to call up the prescriber and findout, especially if the medicine is available as different formulations. **Examples –** diclofenac available 50mg tab., 100mg tab., 100mg suppository and 75m/3ml inj.

Dermatological preparations: Creams, ointments, gels and lotions are not necessarily interchangeable; in fact wrong use can cause problems. The same medicine could be available as cream, gel, lotion and ointment and the prescriber may decide the exact dosage form to be dispensed to a particular condition. However, in Ethiopia, prescribers may also write without specifyingthe dosage form;

Example — dermovate 25 gram # one tube, apply nocte

Retinoic acid (Tretinoin 0.5%) # one tube; apply once a day, it may be available as gel and lotionFucidin (fucidic acid) # one tube; apply bid, it may be available as cream andointment forms.In such cases, the pharmacy professional has to choose the dosage form: thedecision to use an ointment, paste, cream, or lotion depends on

a) The degree of skin penetration of the medication
b) The characteristics of the skin to which the product is being applied.

For ointments (oleaginous bases) are generally used on dry scaly lesions astheir emollient properties will aid in re-hydrating the skin and they stay onlonger. Pastes are generally applied to an area that is intended to be protected

C.Strength/potency of the medicine

The pharmacy professionals should check that the strength is mentioned. Theremay be cases for prescribers to prescribe the medicine without the strength. Forexample:

Amlodipine 5mg……..Correct way
Amlodipine……...Incorrect way

If no strength is mentioned, it cannot be assumed that the lowest or highheststrength has to be dispensed. This is because many times the lower strengthmay not be sufficient to treat the condition or higher strength may lead totoxicity. E.g. combination of amoxicillinand clavulanate (Augmentin) isavailable as 1gm, 625mg, 412mg, 375mg, and so on. If a lower dose is given for an adult it may not be sufficient to killthe microbial load and cure the infection.

For example**,**
The prescriber prescribes a combination of amoxicillin and clavulanate and mentions the dose as take 5ml twice a day.
It is available as Amoxicillin 125mg+ Clavulanic acid 31.25mg and Amoxicillin 200mg+ Clavulanic acid 28.5mg.
Which one to dispense?
In this case the pharmacy professional has to be sure about which preparation to dispense.

The best option would be to consult the prescriber

Quantity to be dispensed

The prescription should lead to arrive at the exact number of the total quantityto be supplied to the patient. The pharmacy professional should check thisquantity to confirm that it is appropriate for the patient, and that the productcan be supplied in such quantity.For any product with a short expiry period, ensure that the quantity dispensedwill not last longer than the expiry date.

For example, if the prescription reads ‘Glibenclamide 5mg tablets p.o per dayfor 3 months’ for a chronic patient who has been taking the medicine since 3years ago, on May 15, 2011, and the stock available of Glibenclamide in the pharmacy has an expiry date of July2011, and no fresh stock is available,what to do? Is there a way to dispense for him all stocks? Here the patientshould be politely asked to show which stock he has been taking? There after,he can be advised to take 30 or 60 tablets according to the stock he has,andthen to collect the balance tablets later when the pharmacy can arrange forfresh stock.
Remember if the expiry date of a product is labeled as July 2011, then the product

can be used until the end of July 31st 2011.
In case the duration of therapy or total quantity to be dispensed is not mentioned, it will be necessary to contact the prescriber

C. **Dosage and directions for use**

A knowledgeable and an alert pharmacy professional can be a great asset and a lifesaver especially if the prescriber makes mistakes (at times major ones) while prescribing.

D. Contraindications
The age, sex, disease(s) conditions, or other characteristics of a patient may cause certain prescribed medicines to be contraindicated. The pharmacy professional should look out for such contraindications. The dose should always be checked taking into account the patient's age, and weight (especially for a child or for the elderly and pregnant woman).

E. Frequency of administration

Check if the frequency recommended by the prescriber is as per the standard dosing patterns. Doses more frequent than standard, proven doses May causetoxic manifestations. At the same time, doses lesser than standard, required doses may result in failure to treat the condition properly.In addition to frequency of administration, adherence to the time schedule is also important. For instance, patients taking medicines for hypertension have to take the medicine at the same time to maintain blood levels of the medicine.

3.3. Correctness of the prescription

A. Double medication **:**(same medicine or different medicine with same pharmaco therapeutic effect) concurrently prescribed by the same or different prescribers to the same patient undergoing treatment.

Example –

If a patient has been prescribed diclofenac for fever, and if the dentist has prescribed other NSAIDs for the same patient, it could lead to overdosing of NSAIDs, and result in the risk of GI bleeding and may aggravate hypertension.

B. **Interactions:**

- ✓ Many medicines are known to interact with other prescribed or OTCmedicines, food, diseases, herbal medicines, and laboratory results.
- ✓ Ideally, all multiple item prescriptions should be checked for medicineinteractions. (Unfortunately, checking for medicine interactions is amajor problem in Ethiopia because of the large number of medicines prescribed by prescribers.
- ✓ If a prescribed item is known to interact with many medicines or to interact with OTC medicines then it is imperative that the pharmacy professionals check with the patient which other medicines ortraditional/complementary medicines the patient is taking, in order to eliminate possible medicines interactions
- ✓ Any medicine interactions likely to render the therapy ineffective or cause undesirable effects to the patient, or affect the treatment in any way, should be brought to the notice of the prescribing prescriber(without unduly alarming the patient).

C. **History of overuse**, under use or misuse of medicines by the patient.

D. **Check for over writing:** Overwriting can be done by the patient, to buy extra medicines (especially habit forming medicines or medicines of abuse).

E. **Fake/false prescription:**

Pharmacy professionals should be alert to detect misuse of prescription blanks by clients (obtained by stealing from private practitioners or from Government hospital OPDs, where blanks are often left lying around).Pharmacy professionals should also be alert to fake prescriptions written/printed by the patient or client coming to the pharmacy. If the handwritingis not the usual handwriting of the prescriber or you notice it to be unusual otherwise, confirm with a senior colleague or call the prescriber to confirm.Do not dispense such prescriptions, and be sure to alert the prescriber about the misuse.

F. **For potent medicines, and medicines with a Narrow Therapeutic Index**:

Special care has to be taken with such medicines, as slight changes in systemic concentration lead to marked changes in pharmacodynamics responses.

Examples of narrow therapeutic index medicines

1. Digoxin
2. Lithium
3. Phenytoin
4. Warfarin

G. **Special care has to be taken in case of:**

a) **Medicines with similar names:**

Certain medicines have names that may appear similar when carelessly written or when not read carefully. Others may lead to confusion for other reasons. Problems are particularly likely if the strengths and doses of the two preparations are similar. Doubts should always be resolved by checking withthe prescriber. Sadly, in most cases where mistakes have occurred, it has been because the item was dispensed without a second thought.

Example of similar names that illustrate the pit falls are:

.Folic acid versus Folinic acid

.Dexamethasone versus Desoximetasone

b) **Abbreviations**

Although widely used in prescription writing, abbreviations can kill!! This is because in health care there are no recognized standards for abbreviations, and most of the time, prescribers invent their own. Secondly, different individuals/pharmacy professionals may assume or interpret abbreviations differently.

Examples

'HCT' 25mg was intended to mean Hydrocortisone 25mg, but Hydrochlorothiazide was dispensed.

'CPZ' may refer to Chlorpromazine, an antipsychotic or to Carbamazepine, which is an anticonvulsant. 'CPM' can mean Chlorpromazine or Chlorpheniramine

NEVER HINT ON ABBREVIATIONS. BE SURE TO CONFIRM WITH THE

PRESCRIBER.

H. Changes to the prescription

Before a pharmacy professional attempts to dispense a prescription, he/shemust read and understand it thoroughly. If any portion of the prescription isnot understood, or if he/she has detected an incompatibility, he/she shouldconsult the prescriber who wrote the prescription.

Any changes made to the prescription over the telephone by the prescriber,should be recorded on the prescription, with the words “changes made overthe telephone, in consultation with the prescriber at (time) on (date)” andshould be signed and stamped by the pharmacy professional. This exercisefacilitates a trust based professional relationship with the prescriber, besidesdocumenting the changes made to the legal document - the prescription, by the pharmacy professional. Many pharmacy professionals hesitate to call the prescriber about these matters, but, if the calls are executed tactfully, there is no reason why they should not create a better understanding between the persons of both professions

Self-cheek.3	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Choose the best answer for the following questions.

1. A prescription is legal when
   A. Signed by authorized person
   B. Clear hand writing
   C. Careless hand writing
   D. Illegibility
2. Which one is checked for completeness of the prescription
   A. Date of issue
   B. Types of prescription
   C. Prescriber detail
   D. Illegibility
3. One is not identify correctness of prescription
   A. Double medication
   B. Interacton
   C. Checking for over writing
   D. All
   E. None

Matching

Column A	Column B
1. Legality	A. frequency of administration
2. Correctness	B. checking for over writing
3. Completeness	C. clear writing
4. legibility	D. correct type of prescription

LG 7	**LO2 Ensuring clinical evaluation of prescriptions**

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Refer prescription to pharmacist for clinical evaluation • Confirm pharmacist's clinical evaluation before filling the prescription • Complete any special documentation This guide 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: • Refer prescription to pharmacist for clinical evaluation • Confirm pharmacist's clinical evaluation before filling the prescription • Complete any special documentation
Learning Instructions:
1. Read the specific objectives of this Learning Guide. **2.** Follow the instructions described below. **3.** Read the information written in the "Information Sheets". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them. **4.** Accomplish the "Self-checks" which are placed following all information sheets. **5.** Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks). **6.** If you earned a satisfactory evaluation proceed to "Operation sheets **7.** Perform "the Learning activity performance test" which is placed following "Operation sheets" , **8.** If your performance is satisfactory proceed to the next learning guide, **9.** If your performance is unsatisfactory, see your trainer for further instructions or go back to "Operation sheets".

Information Sheet-1 Checking for drug interactions and incompatibilities

1.1. Definition of drug interactions

Any medicine interactions likely to render the therapy ineffective or cause undesirable effects to the patient, or affect the treatment in any way, should be brought to the notice of the prescribing prescriber (without unduly alarming the patient) .Incompatibilities in parenteral admixtures

Intravenous admixture incompatibilities are the undesirable reactions that can occur when two or more drugs are administered through single IV line or given in a single solution. A safe admixture is one that is free from micro-organisms, free from particulate matter, un decomposed and clinically compatible.

2.2. Types of Incompatibilities in parenteral admixtures

- Physical Incompatibilities
- Chemical Incompatibilities
- Therapeutic Incompatibilities
- Drug -IV Container Incompatibilities

Physical Incompatibility: results from Incompatibility that is mainly on solubility changes and container interactions.

Various types of physical incompatibilities may occur as:

- ✓ Visible color change or darkening
- ✓ Formation of precipitate

Examples: Insolubility, sorption, gas formation, change of pH of solution.

Prevention: Do not administer a precipitate forming drug. Avoid mixing drugs prepared in special diluents with other drugs. In administration of multiple intravenous medications, prepare each drug in a separate syringe. **Chemical Incompatibility:** results from the molecular changes or rearrangement and leads to

chemical decomposition. Various types of chemical incompatibility occur as complexion, oxidation, reduction and photolysis. Therapeutic Incompatibility**:** is a result of antagonistic pharmacological effects of several drugs in one patient. For example: Heparin with antibiotics Intervention: It is best to avoid mixing heparin with antibacterial preparations because Heparin can affect the stability of certain antibiotics.

Drug-IV Container Incompatibility: arise from the chemical reaction of the drug and the Intravenous container.

ADSORPTION: - The property of a solid/liquid to attract and hold to its surface.

ABSORPTION: - The act of taking up liquids or other substances through a surface of the body into body fluids and tissues

Self-check-1	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Matching

A	B
1. Physical Incompatibility	A. Antagonistic pharmacological
2. Therapeutic Incompatibility	B. Molecular changes
3. Chemical Incompatibility	C. Container interactions
4. Drug-IV Container Incompatibility	D. Chemical reaction of the drug and the Intravenous container

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1. _____
2. _____
3. _____
4. _____

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2 Checking for contraindications

2.1. Checking for contraindications

Definition of Contraindications**:**

The age, sex, disease(s) conditions, or other characteristics of a patient may cause certain prescribed medicines to be contraindicated. The pharmacy professional should look out for such contraindications.

- The dose should always be checked taking into account the patient's age, and weight (especially for a child or for the elderly and pregnant woman).
- For pregnant woman all categories, A, B, C, D and X should be checked; i.e. Medicines under category '**A'** adequate well controlled studies in pregnant woman do not show risk to the fetus example vitamins like B complex, minerals like iron,

Medicines under category '**B** 'either animal findings show risk and human findings do not, or ,if no adequate human studies have been done ,animal findings do not show risk. Example like ceftriaxone sodium injection, chlorpheniramine maleate

Medicines under category **'C'** human studies are lacking, and animal studies either show risk or lacking as well. However, potential benefits may out way the potential risks. Example: albendazole, aspirin with codeine phosphate.

Medicines under category '**D** investigational or post marketing data show risk to the fetus nevertheless, the potential benefits may sometimes outweigh the risk. Example: Atenolol, captopril, Phenobarbitals

Medicines under category '**X'**= studies in animals or humans or investigational or post marketing surveillance reports show fetal risk that clearly outweighs any possible benefits gained from the drug to the patient. Example ethinyl estradiol and norethindrone, lovastatin, simvastatin, thalidomide, vitamin A, warfarin sodium.

More Examples

- Aspirin is not recommended for children below 12 years of age; so caution should be taken.

- Atenolol is contraindicated in asthma.
- Tretinoin contraindicated in pregnancy
- The pharmacy professional should always check that the dose, dosage regimen and any directions for use are appropriate for the patient and the medicine.
- Any suspected medicine under dose/overdoses or inappropriate dosing should always be referred to the prescriber.
- The dose should be carefully checked in case of children, and for all categories of potent medicines. Confirm the units written on the prescription,i.e. milligrams, micrograms, decimal points, etc. for medicines like digoxin.

Example –

You need to check carefully whether the prescription states:

- ✓ 0.25 mg or 0.025 mg.
- ✓ 0.5mg or 50mg
- ✓ 0.125mg or 125mcg (microgram)

Self-check-2	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: Matching

Column A	Column B
1. Category A	A. Animal studies indicate no risk
2. Category B	B. Potential risk
3. Category C	C. Adequate studies in human demonstrate no risk
4. Category D	D. Studies in animal or human show adverse reaction report or both have fatal abnormality
5. Category x	E. Evidence of human fatal risk

Note: **Satisfactory rating – 5 points** **Unsatisfactory - below 5 points**

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

Answer sheet

1. _____

2. _____

3. _____

4. _____

5. _____

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-3 *Identifying* and reporting

3.1. Identifying and reporting ADRs

3.1.1. Key Definitions:

Adverse drug reaction (ADR): Any response to a drug which is noxious and unintended, and which occurs at doses normally used in human for prophylaxis, diagnosis, or therapy of disease, or for the modification of physiological function." In other words, an ADR is harm directly caused by the medicine at normal doses, during normal use.

Side Effect**:** Any unintended effect of a pharmaceutical product occurring at doses normally used in humans which is related to the pharmacological properties of the medicine. Such effect may be either positive or negative. Such effects may be well-known and even expected and may require little or no change in patient management

3.1.2. Classification of ADRs

- ✓ Alphabetical classification of ADRs

Alphabetically ADRs can be classified into six types

Type A reaction (dose-related) these reactions are an exaggerated, but otherwise normal pharmacological responses to the effects of the medicines given in therapeutic dose, cause significant morbidity but are rarely severe.

- ✓ Examples of such reactions include
- ✓ Pharmacodynamics (e.g., bronchospasm from beta-blocker administration)
- ✓ Toxic (e.g., deafness from overdosing of amino glycosides)

Type B reactions **(non-dose related) these reactions**are bizarre and unpredictable with no relation to dose or pharmacological action of the medicine and are often allergic in nature. They are uncommon but are often severe and cause high mortality. Examples of such reactions include

Medicine-induced diseases (e.g., antibiotic-associated colitis)

Type C reactions (dose-related and time-related) these reactionsare chronic (long Term) and related to cumulative dose. The reaction is treated by reducing the dose or with holding the medicine; this may have to be withheld for a long time. Examples of such a reaction include—

- ✓ Osteoporosis with oral steroids
- ✓ Hypothalamic-pituitary-adrenal axis suppression by corticosteroids

Type D reactions **(**time related) these reactions are delayed (i.e., have a lag time**)**after the use of a drug. They are uncommon but their treatment is often intractable. Examples of such reactions include:

- ✓ Teratogenic effects with anticonvulsants or lisinopril

Type E reaction (withdrawal) these reactions occur soon after the end of use (i.e. withdrawal) and are uncommon. The reaction is treated by reintroducing the medicine and then withdrawing it slowly. Examples of this reaction include:

- ✓ Withdrawal syndrome with benzodiazepines

Type F reactions (unexpected failure of efficacy) these reactions occur when there is a failure of efficacy. Such reactions are common, may be dose-related and are often caused by drug interactions

3.2. Major Causes of adverse drug reactions

- ✓ There are various causes of known and unknown ADRs, some of these are mentioned below.
- ✓ Drug allergy/hypersensitivity
- ✓ Genetically – determined ADRs
- ✓ ADR following Drug withdrawal
- ✓ ADRs due to Disturbance of the Gut Flora by Broad – Spectrum Antibiotics
- ✓ Drug interactions
- ✓ Extrinsic Factors (Nutritional Deficiency State, Alcohol consumption, Cigarette smoking, Environmental pollutants)

3.3. Adverse drug event (ADEs) reporting

- In general, ADR-Reporting is an instrument that provides information on safety of products, detection of counterfeit or substandard drugs, resulting in improved quality of patient care and decreasing the financial impact on health care resources.

What to report?

Suspected adverse reaction to any therapeutic agent including prescription and over the counter drugs, vaccines, dental and surgical supplies, etc. should be reported.

Some of the ADRs categories, as per the aims of pharmacovigilance, that can be recognized and need to be reported are:

- All suspected reactions to new drugs
- Unknown or unexpected ADRS
- Serious adverse drug reactions
- Unexpected therapeutic effects
- All suspected drug interactions
- Product quality defects
- The above lists of categories are not exhaustive

When to report?

Any suspected ADR should be reported to the ADR monitoring division (FMHACA) as soon as possible (as soon as it is detected). Delay in reporting will make reporting inaccurate and unreliable. Reporting while the patient is still in the health

institution will give chance to the reporter to clear any ambiguity by re-questioning or examining the patient.

How to report?

When there is an adverse reaction to drugs the reporting form should be completed by the concerned health professional and sent to the ADR monitoring division at FMHACA.

3.2.Steps for completing Adverse Drug Event formats

Steps	Activity	Note
1	**Patient background information-** write the patient background information starting from Patient name; Card no, Age Sex, Weight, Height, Ethnic group and Substance abuse.	It's not necessary to write the full name of patient's, write initials only. Substance abuse: refers to the harmful or hazardous use of psychoactive substances, including alcohol, chat, cigarettes and illicit drugs.
2	**Drug name:** Write all information including brand name and manufacturer(Drugs include conventional drugs, herbal drugs, traditional medicines, biological, medical supplies, medicated cosmetics)	Avoid Non – Standard Abbreviations
3	**S/C:** Fill all Suspected and concomitantly used drugs	Write 'S' for suspected drugs and 'C' for concomitantly used drugs
4	**Product Dosage and Frequency:** write dose/dosage form, route and frequency of the drug	
5	**Date:** write the date of drug taking started, reaction started and taking stopped	In European calendar (dd/mm/yy) If the medicine hasn't been discontinued at the time of reporting, write 'continuing'
6	**Indication:** write reason for drug use	
7	**Adverse Drug Event Description**	Clear description about the nature of adverse event, the date of onset, duration, time course and laboratory test results including '-ve' and normal results of any relevant test performed should be reported. The severity of the reaction i.e whether it has necessitated prolonged hospitalization or not, discontinuation of the medicine or not, etc has to be reported.

8	**Reaction necessitated:** **Discontinuation of drugs:** tick yes or no **Hospitalization:** tick yes or no	
9	**Reaction subsides after discontinuation of suspected drug:** tick yes or no **Reaction reappear after restart of suspected drug:** tick yes or no	
10	**Treatment Reaction:** write any treatment given at the facility for the identified ADE (Reaction).	
11	**Outcome:** tick the outcome of the ADE	**Example:** died, not recovered with or with out

The ADEs report is completed when:

- ADE focal person send the completed ADE reporting format to FMHACA and summary report to the facility DTC
- When the focal person routinely follows and communicates to the responsible body.
- When the focal person receive confirmation from the nearest FMHACA or regulatory authority.

Self-check-3	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: Choose the best answer for the following questions.

1. ___ any response to drug a which is noxious and unintended
   A. Interaction
   B. Contraindication
   C. Adverse drug reaction
   D. Side effect
2. ____ any intended effect occurring related to pharmacological properties
   A. Contraindication
   B. Adverse drug reaction
   C. Interaction
   D. Side effect

Matching

Column A	**Column B**
1. Type A reaction	A. Uncommon ,intractable
2. Type B reaction	B. Uncommon, withdrawal
3. Type C reaction	C. Uncommon ,cause high mortality
4. Type D reaction	D. Cause significant morbidity rarely severe
5. Type E reaction	E. Failure efficacy
6. Type F reaction	F. Time related

Note: **Satisfactory rating - 8points** **Unsatisfactory - below 8points**

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

Answer sheet

MCQ

1. _____
2. _____

Matching

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-4 Sources of information for clinical evaluation of prescriptions

4.1. Primary and Secondary Sources of information

Primary literature contains the first written accounts of original research. It is the original information presented by the author without any evaluation by the second party consists of controlled clinical trials, cohort studies, case series, and case reports both published and unpublished

Secondary source

- Refers to references that either index or abstract the primary literature with the goal of directing the user to the primary literature
- A door for selective screening of the primary sources
- Indexing consists of providing bibliographic citation information (e.g., title, author, and citation of the article)
- abstracting includes a brief description (or abstract) of the information provided by the article or resource cited

4.2. Using software for drug interaction, contraindication, etc.

4.3. Drug formulary,

Is the publication that brings all the important summary information on medicines in the formulary list together in a manual.

–Is drug centered

–Handy reference that contains selected information relevant to prescriber, dispenser, nurse or other health worker

Drug information included in a comprehensive formulary

Introductory information

- Acknowledgment, List of approved abbreviation
- Introduction (development of manual, intended user)

- Formulary policies and procedures

Basic information about each medicine

- Generic name
- Dosage and strengths
- Indications, CI and precautions
- Side-effects
- Dosage schedule
- Instructions and warnings
- Drug, food, laboratory interactions

- **<u>Supplementary information for medicines</u>**
  - Price
  - Regulatory category
  - Storage guidelines
  - Patient counseling information
  - Labeling information
  - Brand names and synonyms

Prescribing and dispensing guidelines

- Rational prescribing techniques
- Principles of prescription writing
- Guidelines for quantities to be dispensed
- Controlled drug requirements
- Adverse drug reaction reporting requirements
- Dispensing guidelines
- List of precautionary labels
- Common drug interaction tables

4.4. Standard Treatment Guidelines (STG)

STG:

- Is also called Treatment Protocol or Clinical Guideline

- Systematically developed statements that help practitioner or prescriber in deciding on appropriate treatments for specific clinical conditions.
- It reflect consensus on the optimal treatment option within health facility or health system
  - ✓ It is disease centered
  - ✓ common disease and complaints, treatment alternatives
  - ✓ STG exist for various level of health care

  E.g. Hospital, health center, region, nation

Information on STG

- Diagnostic criteria
- Treatment of first choice
- Cost of treatment
- Important CI, SE
- Important drug information, warnings and precautions
- Referral criteria
- index

4.5. Consulting the pharmacist

A consultant pharmacist is a pharmacist who has developed and demonstrated high level expertise in their area of practice and across the four pillars outlined in the 2005guidance, namely clinical practice, leadership, education and research. They have been credentialed as such and have been appointed to an approved consultant post.

While the consultant pharmacist is not required to undertake a direct patient facing role, the role is expected to be one that impacts directly on patients or the populatione.g. a consultant pharmacist in medication safety. Examples of activities that may beconsidered to have a direct impact on patients and the population are given in theclinical practice section

As leaders in their field and the profession, consultant pharmacists provide expert care to patients with the most complex needs as well as providing advice to the

teams caring for patients. Their influence spreads across organizational and professional boundaries to support the health of those accessing services in their area of practice as well as the wider population

- While the principles of the 2005 guidance are at the heart of this document the

  additional aims of the guidance are to:-
- Highlight the benefit of consultant pharmacists in contributing to better patient and population outcomes, through delivering care as well as research and innovation across the healthcare system.
- Improve access to high level clinical expertise for patients, the public, the pharmacy profession and other healthcare professionals.
- Outline the expectation of consultant pharmacist posts, defining expert practice and supporting best practice in job planning.
- Support the strategic creation of posts to meet the needs of local populations.
- Suggest a robust credentialing mechanism to provide assurance as to the ability and expertise of individuals working at the highest level.
- Support a sustainable consultant pharmacist workforce, through planning, training and succession planning.
- To develop guidance that supports continuity and transferability across the four nations.

Consultant Pharmacist Practice

What is Expert Practice for a consultant pharmacist?

A consultant pharmacist's expert practice depends on a large number of factors including area of practice, level of experience as well as national and organizational priorities. It comprises direct clinical care and/or indirect clinical activities (guideline development, formulary/governance leadership and clinical supervision), research,including quality improvement and evaluation, education, training and mentoring. In,some cases it may include the management of individuals or services

and above allin includes leadership, which is expected to span all of the activities they undertake.

Self check 4	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: Choose the best answer for the following questions.

1. Which source of information consists of providing bibliography citation information?
   A. Primary source
   B. Formulary
   C. Indexing
   D. Abstracting
2. _____ include a brief description of the information by the article
   A. Indexing
   B. Abstracting
   C. Primary source
   D. Formulary
3. One is not basic information about each medication from drug information
   A. Generic name
   B. Brand name
   C. Side effect
   D. Warning
4. All are supplementary information for medicine except one
   A. Price
   B. Regulatory category
   C. Laboratory interaction
   D. Storage guideline
5. Prescribing and dispensing guideline contain all except one.
   A. Rational prescribing technique
   B. Dispensing guideline
   C. List of precaution label
   D. Formulary policies
6. Which information is not found in STG
   A. Regulatory category
   B. Diagnostic criteria
   C. Important CI,SE,
   D. Cost of treatment treatment

Note: **Satisfactory rating - 6points** **Unsatisfactory - below 6points**

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

Answer sheet

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Score = _____

Rating: _____

Name: _____ Date: _____

LG#8	LO#3 Calculating prescription quantity

instruction sheet

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

- Dilution concentration
- Relationship between strength and total quantity
    - Dilution and concentration of liquids Stock solutions
    - Dilution of alcohol
    - Dilution of acids
    - Dilution and concentration of solids
    - Trituration
    - Allegation
    - Allegation alternate
    - Specific gravity of mixtures
- Reducing and enlarging formulas
    - Formulas that specify amounts of ingredients
    - Formulas that specify proportional parts
- Calculating oral doses
- Powders and granules
- Tablets and capsules
- Oral liquids
- Calculating parenteral doses
    - Injectable liquids
    - Injectable powder forms (reconstitution)
    - IV admixtures
    - Insulin doses
- Calculating pediatric doses
    - Based on age
    - Based on weight
    - Based on body surface area

This guide 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

- . Calculate quantities of each item according to the prescription
- Annotate the prescription

- Refer prescription to pharmacist if uncertain about prescription details or

Learning Instructions:

10. Read the specific objectives of this Learning Guide.
11. Follow the instructions described below.
12. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
13. Accomplish the “Self-checks” which are placed following all information sheets.
14. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
15. If you earned a satisfactory evaluation proceed to “Operation sheets
16. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
17. If your performance is satisfactory proceed to the next learning guide,
18. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet-1 Dilution concentration

1.1. Dilution concentration

The strength of a pharmaceutical preparation may be increased or decreased by changing the proportion of active ingredient to the whole. A preparation may be ***strengthened or made more concentrated by the addition of active ingredient, by admixture with a like preparation of greater*** strength, or through the evaporation of its vehicle, if liquid. The strength of a preparation may be **decreased or *diluted*** *by the addition of* ***diluent*** *or* ***by admixture with a like preparation of*** **lesser strength**.

- The ***dilution of a liquid dosage form, as a solution or suspension, may be desired to provide*** product strength more suitable for use by a particular patient (e.g., **pediatric, elderly, those in disease states**).
- The diluent is selected based on its compatibility with the vehicle of the original product; that is, aqueous, alcoholic, hydro alcoholic, or other.
- The dilution of a solid dosage form (as a powder or the contents of a capsule) or a semisolid dosage form (as an ointment or cream) also may be performed to alter the dose or strength of a product. Again, the diluent is selected based on its compatibility with the original formulation.

Relationship between strength and total quantity

If a mixture of a given percentage or ratio strength is diluted to twice its original quantity, its active ingredient will be contained in twice as many parts of the whole, and its strength therefore will be reduced by one half. By contrast, if a mixture is concentrated by evaporation to one-halfits original quantity, the active ingredient (assuming that none was lost by evaporation) will be contained in one half as many parts of the whole, and the strength will be doubled**.**

Example

So, if 50 mLof a solution containing 10 g of active ingredient with a strength of 20%or1:5 w/vare diluted to 100 mL, the original volume is doubled, but the original strength is now reduced by one half to 10% or 1:10 w/v.

If, by evaporation of the solvent, the volume of the solution is reduced to 25 mL or one half the original quantities, the 10 g of the active ingredient will indicate strength of 40% or 1:2.5 w/v.

If, then, the amount of active ingredient remains constant, any change in the quantity of a solution or mixture of solids is inversely proportional to the percentage or ratio strength; that is, the percentage or ratio strength decreases as the quantity increases, and conversely.

Problems in this section generally may be solved by any of the following methods:

1. Inverse proportion.
2. The equation: (1st quantity) x (1st concentration)

=

(2nd quantity) x (2nd concentration),

Or Q1 x C1 = Q2 x C2.

3. By determining the quantity of active ingredient (solute) present or required and relating that quantity to the known or desired quantity of the preparation.

Example Calculations of the Dilution and Concentration of Liquids If 500 mL of a 15% v/v solution are diluted to 1500 mL, what will be the percentage strength (v/v)?

$$\frac{1500\ (\text{mL})}{500\ (\text{mL})} = \frac{15\ (\%)}{x\ (\%)}$$

$$x = 5\%, \textit{answer.}$$

Or,

$$Q1\ (\text{quantity}) \times C1\ (\text{concentration}) = Q2\ (\text{quantity}) \times C2\ (\text{concentration})$$

$$500\ (\text{mL}) \times 15\ (\%) = 1500\ (\text{mL}) \times x\ (\%)$$

$$x = 5\%, \textit{answer.}$$

Or,

500 mL of 15% v/v solution contains 75 mL of solute

$$\frac{1500\ (\text{mL})}{75\ (\text{mL})} = \frac{100\ (\%)}{x\ (\%)}$$

$$x = 5\%, \textit{answer.}$$

If a syrup containing 65% w/v of sucrose is evaporated to 85% of its volume, what percentage (w/v) of sucrose will it contain?

Any convenient amount of the syrup, for example, 100 mL, may be used in the calculation. If we evaporate 100 mL of the syrup to 85% of its volume, we will have 85 mL.

$$\frac{85\ (\text{mL})}{100\ (\text{mL})} = \frac{65\ (\%)}{x\ (\%)}$$

$$x = 76.47\% \text{ or } 76\%, \textit{answer.}$$

Strengthening of a Pharmaceutical Product

Example:

If a cough syrup contains in each teaspoonful, 1 mg of chlorpheniramine maleate and if a pharmacist desired to double the strength, how many milligrams of that ingredient

would need to be added to a 60-mL container of the syrup? Assume no increase in volume.

$$\frac{1 \text{ mg}}{5 \text{ mL}} \times 60 \text{ mL} = 12 \text{ mg chlorpheniramine maleate in original syrup}$$

To double the strength, 12 mg of additional chlorpheniramine maleate would be required, *answer*.

1.2. Stock solutions

1.2.1. Stock Solutions

Stock solutions are concentrated solutions of active (e.g., drug) or inactive (e.g., colorant) substance sand are used by pharmacists as a convenience to prepare solutions of lesser concentration.

Example 1. Calculations of Stock Solutions

How many milliliters of a 1:400 w/v stock solution should be used to make 4 liters of a 1:2000 w/v solution?

4000 mL of a 1:2000 w/v solution requires 2 g of active constituent (solute); thus:

$$\frac{1 \text{ (g)}}{2 \text{ (g)}} = \frac{400 \text{ (mL)}}{x \text{ (mL)}}$$

$$x = 800 \text{ mL, } \textit{answer}.$$

Or,

$$Q1 \times C1 = Q2 \times C2$$

$$4000 \text{ (mL)} \times 0.25 \text{ (\%)} = x \times 0.05 \text{ (\%)}$$

$$x = 800 \text{ mL, } \textit{answer}.$$

Example 2

How many milliliters of a 1% stock solution of a certified red dye should be used in preparing 4000 mL of a mouthwash that is to contain 1:20,000 w/v of the certified red dye as a coloring agent?

$$1:20{,}000 = 0.005\%$$
$$\frac{1\ (\%)}{0.005\ (\%)} = \frac{4000\ (\text{mL})}{x\ (\text{mL})}$$
$$x = 20\ \text{mL},\ \textit{answer.}$$

Check:

1% stock solution contains $20\ (\text{mL}) \times 0.01 \rightarrow$ 0.2 g certified red dye $\leftarrow 4000\ (\text{mL}) \times 0.00005$ 1:20,000 solution contains

Some interesting calculations are used in pharmacy practice in which the strength of a diluted portion of a solution is defined, but the strength of the concentrated stock solution used to prepare it must be determined. The relevance to pharmacy practice may be explained, for example, by the need of a pharmacist to prepare and dispense a concentrated solution of a drug and direct the patient to use a specific household measure of a solution (e.g., 1 teaspoonful) in a specified volume of water (e.g., a pint) to make of solution of the desired concentration (e.g., for irrigation or soaking). This permits the dispensing of a relatively small volume of liquid, enabling a patient to prepare relatively large volumes as needed, rather than carrying home gallons of a diluted solution from a pharmacy.

For example-

How much drug should be used in preparing 50 mL of a solution such that 5 mL diluted to 500 mL will yield a 1:1000 solution?

1 : 1000 means 1 g of drug in 1000 mL of solution

$$\frac{1000\ (\text{mL})}{500\ (\text{mL})} = \frac{1\ (\text{g})}{x\ (\text{g})}$$

x = 0.5 g of drug in 500 mL of *diluted* solution (1 : 1000), which is *also* the amount in 5 mL of the *stronger* (stock) solution

And,

$$\frac{5\ (\text{mL})}{50\ (\text{mL})} = \frac{0.5\ (\text{g})}{y\ (\text{g})}$$

y = 5 g, *answer*.

1.2.2 Dilution of alcohol

Example Calculations of Alcohol Dilutions

When water and alcohol are mixed, there is a physical contraction such that the resultant volume is less than the total of the individual volumes of the two liquids.

Thus, to prepare a volume-in volume strength of an alcohol dilution, the alcohol ‘‘solute’’ may be determined and water used to ‘‘q.s.’’ to the appropriate volume.

Because the contraction of the liquids does not affect the weights of the components, the weight of water (and from this, the volume) needed to dilute alcohol to a desired weight-in-weight strength may be calculated.

Example

How much water should be mixed with 5000 mL of 85% v/v alcohol to make 50% v/v alcohol?

- Answer = 8500 ml

How many milliliters of 95% v/v alcohol and how much water should be used in compounding the following prescription?

℞ Xcaine 1 g
Alcohol 70% 30 mL
Sig. Ear drops.

$$\frac{95\ (\%)}{70\ (\%)} = \frac{30\ (\text{mL})}{x\ (\text{mL})}$$
$$x = 22.1\ \text{mL}$$

Therefore, use 22.1 mL of 95% v/v alcohol and enough water to make 30 mL, *answer*

1.2.3. Dilution of acids

The strength of an official undiluted (concentrated) acid is expressed as percentage weight-in weight. For example, Hydrochloric Acid, NF, contains not less than 36.5% and not more than 38.0%, by weight, of HCl. However, the strength of an official diluted acid is expressed *as* percentage weight-in-volume. For example, Diluted Hydrochloric Acid, NF, contains, in each 100 mL, not less than 9.5 g and not more than 10.5 g of HCl.1.

It is necessary, therefore, to consider the specific gravity of concentrated acids in calculating the volume to be used in preparing a desired quantity of a diluted acid.

❖ Example Calculations of Acid Dilutions

- How many milliliters of 37% w/w hydrochloric acid having a specific gravity of 1.20 are required to make 1000 mL of diluted hydrochloric acid 10% w/v?

$$1000\ \text{g} \times 0.10 = 100\ \text{g of HCl (100\%) in 1000 mL of 10\% w/v aci}$$

$$\frac{37\ (\%)}{100\ (\%)} = \frac{100\ (\text{g})}{x\ (\text{g})}$$
$$x = 270\ \text{g of 37\% acid}$$

270 g of water measure 270 mL

$$270\ (\text{mL}) \div 1.20 = 225\ \text{mL}, \textit{answer}.$$

1.2.4. Dilution and concentration of solids

Reducing or enhancing the strengths of creams and ointments is a usual part of a compounding pharmacist's practice to meet the special needs of patients. The dilution of semisolids is a usual part of a compounding pharmacist's practice in reducing the strengths of creams and ointments to meet the special needs of patients.

Example Calculations of Solid and Semisolid Dilutions

If 30 g of a 1% hydrocortisone ointment were diluted with 12 g of Vaseline, what would be the concentration of hydrocortisone in the mixture?

$$30\ \text{g} \times 1\% = 0.3\ \text{g hydrocortisone}$$
$$30\ \text{g} + 12\ \text{g} = 42\ \text{g, weight of mixture}$$
$$\frac{0.3\ \text{g}}{42\ \text{g}} \times 100 = 0.71\%\ \text{(w/w), } \textit{answer.}$$

- How many grams of zinc oxide should be added to 3200 g of 5% zinc oxide ointment to prepare an ointment containing 20% of zinc oxide?

$$3200\ \text{g} \times 0.05 = 160\ \text{g of zinc oxide in 3200 g of 5\% ointment}$$
$$3200\ \text{g} - 160\ \text{g} = 3040\ \text{g of base (diluent) in 3200 g of 5\% ointment}$$

In the 20% ointment, the diluent will represent 80% of the total weight

$$\frac{80\ (\%)}{20\ (\%)} = \frac{3040\ (\text{g})}{x\ (\text{g})}$$
$$x = 760\ \text{g of zinc oxide in the 20\% ointment}$$

Because the 5% ointment already contains 160 g of zinc oxide,

$760\ \text{g} - 160\ \text{g} = 600\ \text{g, } \textit{answer.}$

2. Trituration

Triturations are dilutions of potent medicinal substances. They were at one time official and were prepared by *diluting one part by weight of the drug with nine parts of finely powdered lactose.*

They are, therefore, *10% or 110 w/w mixtures.* These dilutions offer a means of obtaining conveniently and accurately small quantities of potent drugs for compounding purposes.

Example Calculations of Triturations

- How many grams of a 1:10 trituration are required to obtain 25 mg of drug?

$$10 \text{ g of trituration contain } 1 \text{ g of drug}$$

$$25 \text{ mg} = 0.025 \text{ g}$$

$$\frac{1 \text{ (g)}}{0.025 \text{ (g)}} = \frac{10 \text{ (g)}}{x \text{ (g)}}$$

$$x = 0.25 \text{ g, } \textit{answer.}$$

2.1. Allegation

Alligation is an arithmetical method of solving problems that involves the mixing of solutions or mixtures of solids possessing different percentage strengths.

Alligation Medial. ***Alligation medial is a method by which the "weighted average" percentage*** strength of a mixture of two or more substances of known quantity and concentration may be easily calculated. By this method, the percentage strength of each component, expressed as a decimal fraction, is multiplied by its corresponding quantity; then the sum of the products is divided by the total quantity of the mixture; and

the resultant decimal fraction is multiplied by 100 to give the percentage strength of the mixture.

Example Calculations Using Alligation Medial

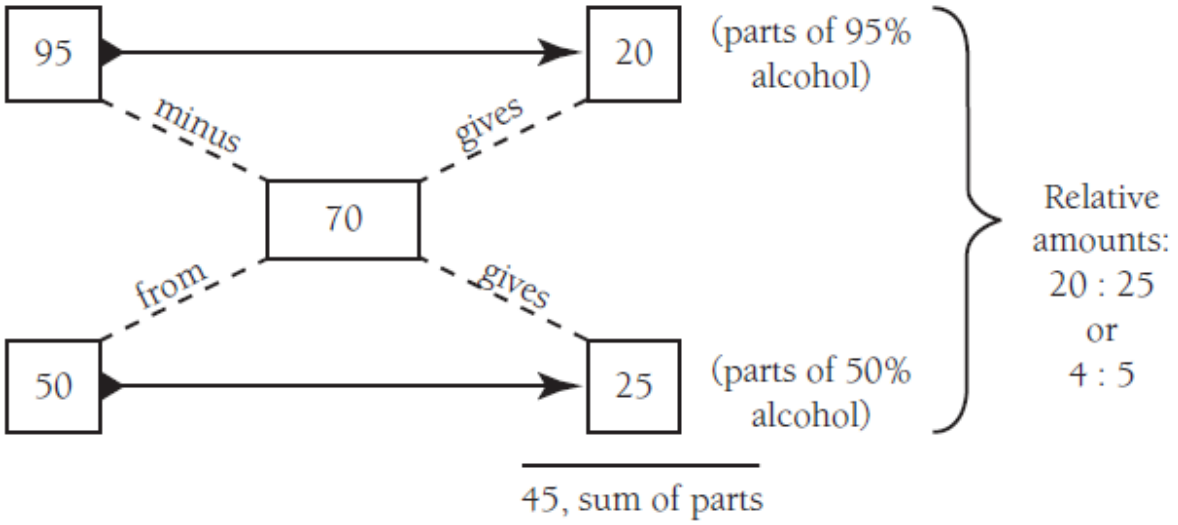
What is the percentage strength (v/v) of alcohol in a mixture of 3000 mL of 40% v/v alcohol, 1000 mL of 60% v/v alcohol, and 1000 mL of 70% v/v alcohol? Assume no contraction of volume after mixing.

$$
\begin{aligned}
0.40 \times 3000\ \text{mL} &= 1200\ \text{mL} \\
0.60 \times 1000\ \text{mL} &= 600\ \text{mL} \\
0.70 \times 1000\ \text{mL} &= 700\ \text{mL} \\
\text{Totals:}\quad 5000\ \text{mL} &\quad 2500\ \text{mL} \\
2500\ (\text{mL}) \div 5000\ (\text{mL}) &= 0.50 \times 100 = 50\%, \textit{answer.}
\end{aligned}
$$

In some problems, the addition of a solvent or vehicle must be considered. It is generally best to consider the diluent as of zero percentage strength, as in the following problem.What is the percentage strength of alcohol in a mixture of 500 mL of a solution containing 40% v/v alcohol, 400 mL of a second solution containing 21% v/v alcohol, and a sufficient quantity of a nonalcoholic third solution to make a total of 1000 mL?

$$
\begin{aligned}
0.40 \times 500\ \text{mL} &= 200\ \text{mL} \\
0.21 \times 400\ \text{mL} &= 84\ \text{mL} \\
0 \times 100\ \text{mL} &= 0\ \text{mL} \\
\text{Totals:}\quad 1000\ \text{mL} &\quad 284\ \text{mL} \\
284\ (\text{mL}) \div 1000\ (\text{mL}) &= 0.284 \times 100 = 28.4\%, \textit{answer.}
\end{aligned}
$$

- In what proportion should alcohols of 95% and 50% strengths be mixed to make 70% alcohol?



Given a = 95%, b = 50%, and c = 70%, we may therefore solve the problems as follows:

$$0.95x + 0.50y = 0.70(x + y)$$

Or,

$$\begin{aligned} 95x + 50y &= 70x + 70y \\ 95x - 70x &= 70y - 50y \\ x(95 - 70) &= y(70 - 50) \end{aligned}$$

$$\frac{x}{y} = \frac{70 - 50}{95 - 70} = \frac{20}{25} = \frac{4\text{ (parts)}}{5\text{ (parts)}},\ \textit{answer.}$$

The result can be shown to be correct by *alligation medial*:

$$\begin{aligned} 95 \times 4 &= 380 \\ 50 \times 5 &= 250 \\ \text{Totals: } 9 \quad & \quad 630 \end{aligned}$$

$$630 \div 9 = 70\%$$

In what proportion should 20% benzocaine ointment be mixed with an ointment base to produce a 2.5% benzocaine ointment?

20%	2.5%	2.5 parts of 20% ointment
0%		17.5 parts of ointment base

Relative amounts: 2.5:17.5, or 1:7, *answer.*

Check: $20 \times 1 = 20$

$0 \times 7 = 0$

Totals: 8 20

$20 \div 8 = 2.5\%$

1.25	1.10	0.10 parts of glycerin
1.00		0.15 parts of water

Relative amounts: 0.10:0.15, or 2:3, *answer.*

Self-check-1	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Calculate of dilution and concentration of liquid if 400ml of 20%v/v solution are diluted of 1000ml, what will be the parenteral strength v/v?
   A. 5%
   B. 8%
   C. 11%
   D. 14%

2. Calculate the amount cotrimoxazole if antibiotic suspension contain in each teaspoonful 240mg of cotrimoxazole and if pharmacist desired to double the strength , how many milligram of that ingredient would need to be added to 120ml contain of suspension
   A. 5760mg
   B. 10mg
   C. 2.5mg
   D. 4760mg
3. How many milliliter of 1:300 w/v stock solution should be used to make 3 liter of 1litre of 1:1500 w/v solution
   A. 404ml
   B. 505ml
   C. 606ml
   D. 707ml
4. How much water should be mixed with 1500ml of 98% v/v alcohol to make 70% alcohol?
   A. 1100ml
   B. 2100ml
   C. 1900ml
   D. none

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1. _____
2. _____
3. _____
4. _____

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2 Reducing and enlarging formulas

2.1. Reducing and enlarging formulas

Pharmacists may have to reduce or enlarge formulas for pharmaceutical preparations in the course of their professional practice or manufacturing activities. Official (United States Pharmacopeia— National Formulary) formulas generally are based on the preparation of 1000 mL or 1000 g. In this instances, a pharmacist may calculate the quantities of each ingredient required for a smaller or greater quantity by *reducing or enlarging the specified formula,* while maintaining the correct proportion of one ingredient to the other.

- Calculations to reduce or enlarge formulas may be performed by a *two-step process:*

Step 1*. Using the following equation, determine the factor that defines the multiple or the* decimal fraction of the amount of formula to be prepared:

$$\frac{\text{Quantity of formula desired}}{\text{Quantity of formula given}} = \text{Factor}$$

A factor greater than 1 represents the multiple of the formula, and a factor less than 1 indicates the fraction of the formula to be prepared.

Step 2. Multiply the quantity of each ingredient in the formula by the factor to determine the amount of each ingredient required in the reduced or enlarged formula

2.1.2.Formulas that specify amounts of ingredients

Example Calculations of Reducing and Enlarging Formulas

- From the following formula, calculate the quantity of each ingredient required to make 240 mL of calamine lotion

Calamine	80	g
Zinc Oxide	80	g
Glycerin	20	g
Bentonite Magma	250	mL
Calcium Hydroxide Topical Solution, to make	1000	mL

$$\frac{240 \text{ mL}}{1000 \text{ mL}} = 0.24 \text{ (factor)}$$

Using the factor 0.24, the quantity of each ingredient is calculated as follows:

$$\begin{aligned} \text{Calamine} &= 80 \text{ g} \times 0.24 = 19.2 \text{ g} \\ \text{Zinc Oxide} &= 80 \text{ g} \times 0.24 = 19.2 \text{ g} \\ \text{Glycerin} &= 20 \text{ g} \times 0.24 = 4.8 \text{ mL} \\ \text{Bentonite Magma} &= 250 \text{ g} \times 0.24 = 60 \text{ mL} \end{aligned}$$

Calcium Hydroxide Topical Solution, to make 240 mL, *answers.*

2.1.3.Formulas that specify proportional parts

On a rare occasion, a pharmacist may encounter an old formula that indicates the ingredients in ‘‘parts’’ rather than in measures of weight or volume. The parts indicate the relative proportion of each of the ingredients in the formula by *either weight or volume, but not both. A formula* for solid or semisolid ingredients, therefore, may be considered in terms of *grams, whereas a* formula of liquids may be considered in terms of *milliliters.*

Example Calculation of a Formula Expressed in Parts

- From the following formula, calculate the quantity of each ingredient required to make 1000 g of the ointment.

Coal Tar	5 parts
Zinc Oxide	10 parts
Hydrophilic Ointment	50 parts

Total number of parts (by weight) = 65
1000 g will contain 65 parts

$$\frac{65\ (\text{parts})}{5\ (\text{parts})} = \frac{1000\ (\text{g})}{x\ (\text{g})}$$

$$x = 76.92\ \text{g of Coal Tar,}$$

Information Sheet-3 Calculating oral doses

3.1. Calculating oral doses

The dose of a drug is the quantitative ***amount*** administered or taken by a patient for the intended medicinal effect. The dose may be expressed as a single dose, the amount taken at one time; a daily dose; or a total dose, the amount taken during the course of therapy. A daily dose may be subdivided and taken in divided doses, two or more times per day depending on the characteristics of the drug and the illness. The schedule of dosing (e.g., ***four times per day for 10 days***) is referred to as the dosage regimen

Quantitatively, drug doses vary greatly among drug substances; some drugs have small doses, other drugs have relatively large doses. The dose of a drug is based on its biochemical and pharmacologic activity, its physical and chemical properties, the dosage form used, the route of administration, and various patient factors. The dose of a drug for a particular patient may be determined in part on the basis of the patient's age, weight, body surface area, general physical health, liver and kidney function (for drug metabolism and elimination), and the severity of the illness being treated.

General dose calculation

If the dose of a drug is 200 mg, how many doses are contained in 10 g?

10 g =10,000 mg

Number of doses = 10000[mg]/200[mg] =50 doses, ***answer***

Or, solving by dimensional analysis:

3.1.1. Powders and granules

A pharmacist often needs to calculate the size of a dose, the number of doses, or the total quantityof medication to dispense. For these calculations the following equation is useful with the termsrearranged depending on the answer required.In using the equation, the units of weight or volumemust be the same for the total quantity and size of the dose.

3.1.2. Tablets and capsules

CALCULATIONS CAPSULE

Doses

Given two factors in the following equation, by rearrangement, the third may be calculated:

Number of doses =Total quantity/Size of dose

In using the equation, the total quantity and the size of dose must be in the same unit of measure.

3.1.3.Oral liquids

In the home setting, the adult patient or a child's parent generally measures and administers

medication. Exceptions occur when home health care personnel are involved in a patient's care.

Liquid dosage is usually measured in ''household'' terms, most commonly by the teaspoonful

and tablespoonful. An oral dispenser finds use in administering calibrated quantities of liquid medication to children.

Teaspoon and Tablespoon

In calculating *doses, pharmacists and physicians accept a capacity of 5 mL for the teaspoonful*
and 15 mL for the tablespoonful. It should be noted that the capacities of household teaspoons
may vary from 3 to 7 mL and those of tablespoons may vary from 15 to 22 mL. Such factors

USEFUL APPROXIMATE EQUIVALENTOF HOUSEHOLD MEASURE*HOUSEHOLD MEASURE(ABBREVIATION) OUNCE METRIC MEASURE*
1 teaspoonful (tsp.) *1⁄6* **fluidounce** *5* **mL**
1 tablespoonful (tbsp.) *1⁄2* **fluidounce** *15* **mL**

TheDropasaUnitofMeasure
Occasionally, the drop *(abbreviated* gtt*) is used as a measure for small volumes of liquid medications. A drop does not represent a definite quantity, because drops of different liquids varygreatly. In an attempt to standardize the drop as a unit of volume, the* United States Pharmacopeia *defines the official medicine dropper as being constricted at the delivery end to a round opening*
with an external diameter of about 3 mm.7 The dropper, when held vertically, delivers waterin drops, each of which weighs between 45 and 55 mg. Accordingly, the official dropper is calibrated to deliver approximately 20 drops of water per milliliter (i.e., 1 mL of water 1 gram or 1000 mg 50 mg [ave.]/drop 20 drops).
It should be kept in mind that few medicinal liquids have the same surface and flow characteristics as water, and therefore the size of drops varies materially from one liquid

to another. The drop should not be used as a measure for a specific liquid medication until the volume that the drop represents has been determined for that liquid. This determination is made by calibrating *the dispensing dropper. The calibrated dropper is the only one that should be used for themeasurement of medicine. Most manufacturers include a specially calibrated dropper along withtheir prepackaged medications for use by patients in measuring dosage. Examples of speciallycalibrated droppers'a dropper may be calibrated by counting the drops of a liquid as they fall into a graduateuntil a measurable volume is obtained. The number of drops per unit volume is then established (e.g., 20 drops/mL).*

If a pharmacist counted 40 drops of a medication in filling a graduate cylinder to the 2.5-mL mark,how many drops per milliliter did the dropper deliver?

40 (drops)

x (drops)

2.5 (mL)

1 (mL)

x 16 drops mL, ***answer***

Self-check-3	Work out

Direction:- answer the following questions

Case in Point.*A physician asks a pharmacist to calculate the dose of a cough syrupso that it may be safely administered drop wise to a child. The cough syrup containsthe active ingredient dextromethorphan HBr, 30 mg/15 mL, in a 120-mL bottle.Based on the child's weight and literature references, the pharmacist determinesthe dose of dextromethorphan HBr to be 1.5 mg for the child.The medicine dropper to be dispensed with the medication is calibrated by thepharmacist and shown to deliver 20 drops of the cough syrup per 1 mL.Calculate the dose, in drops, for the child*

Information sheet 4 calculating parentral doses

4.1.Calculating parenteral doses

4.1.1. Injectable liquids and Injectable powder forms (reconstitution)

Injections

Injections are sterile pharmaceutical solutions or suspensions of a drug substance in an aqueous or non-aqueous vehicle. They are administered by needle into almost any part of the body, including the joints (**intra-articular**), joint fluid (**intrasynovial**), spinal column (**intraspinal**), spinal fluid (**intrathecal**), arteries (**intra-arterial**), and in an emergency, even the heart (**intracardiac**).

However, most injections are administered into a vein (intravenous, I.V., IV), muscle (intramuscular, I.M., IM), skin (intradermal, I.D., ID, intracutaneous), or under the skin (subcutaneous, sub- Q, SQ, hypodermic).

Some injections are available as prepared solutions or suspensions with their drug content labeled as, for example, ‘‘10 mg/mL.’’ Others contain dry powder for

reconstitution to form a solution or suspension by adding a specified volume of diluent prior to use and are labeled as, for example, ‘‘10 mg/vial

4.1.2. IV admixtures

Intravenous Admixtures

The preparation of intravenous admixtures involves the addition of one or more drugs to large volume sterile fluids such as sodium chloride injection, dextrose injection, lactated Ringer’s injection, and others. The additives are generally in the form of small-volume sterile solutions packaged in ampules, vials, small-volume mini-bags for use as piggybacks, or sterile solids, some requiring constitution with a sterile solvent before transfer.

Example Calculations of Additives to Intravenous Infusion Solutions

A medication order for a patient weighing 154 lb. calls for 0.25 mg of amphotericin B per kilogram of body weight to be added to 500 mL of 5% dextrose injection. If the amphotericin B is to be obtained from a constituted injection that contains 50 mg/10 mL, how many milliliters should be added to the dextrose injection?

$$1\ \text{kg} = 2.2\ \text{lb.}$$
$$\frac{154\ (\text{lb.})}{2.2\ (\text{lb.})} = 70\ \text{kg}$$
$$0.25\ \text{mg} \times 70 = 17.5\ \text{mg}$$

Constituted solution contains 50 mg/10 mL:

$$\frac{50\ (\text{mg})}{17.5\ (\text{mg})} = \frac{10\ (\text{mL})}{x\ (\text{mL})}$$
$$x = 3.5\ \text{mL},\ \textit{answer.}$$

4.2.2. Insulin doses

Total Daily Insulin Requirements:

Weight in pounds divided by 4 OR Wt in kilograms multiplied by 0.55 Ex) 160lb divided by 4 = 40 units OR 72.7kg x 0.55 = 40 units

Then for basal bolus calculate what percentage you want. Typically 40% basal and 60% bolus.

Ex) 40% of 40 units = 16 u basal & 60% of 40 units = 24u bolus total then divide by 3= 8units per meal (for 3 meals per day)

Calculating Insulin Sensitivity Factor

1500 divided by Total Daily Dose of insulin (TDD) if patient uses rapid acting insulin OR 1800 divided by TDD if patient uses regular insulin

Ex) TDD = 40 units so 1500/40 = 37.5

If current premeal BG is 160 and the target BG is 90 you would take the current BG subtract the target BG then multiply by the correction factor.

Ex) (160-90)/37.5 = 1.9 units

Information Sheet-5 Calculating pediatric doses

5.1.1. Calculating pediatric doses

5.1.2. Based on age

Drug Dosage Based on Age

The age of the patient is a consideration in the determination of drug dosage.Neonates has immature hepatic and renal functions that affect drug response. The elderly, in addition to diminished organ function, frequently have issues of concomitant pathologies and increased sensitivities to drugs.

Currently, when age is considered in determining dosage of a potent therapeutic agent, it is used generally in conjunction with another factor, such as weight. This is exemplified, in which the dose of the drug digoxin is determined by a combination of the patient's age and weight.

Example Calculations of Dose Based on Age

An over-the-counter cough remedy contains 120 mg of dextromethorphan in a 60-mL bottle of product. The label states the dose as 1⁄2 teaspoonful for a child 6 years of age. How many milligrams of dextromethorphan are contained in the child's dose?

$$1\tfrac{1}{2} \text{ teaspoonfuls} = 7.5 \text{ mL}$$

$$\frac{60 \text{ mL}}{120 \text{ mg}} = \frac{7.5 \text{ ml}}{x \text{ mg}}$$

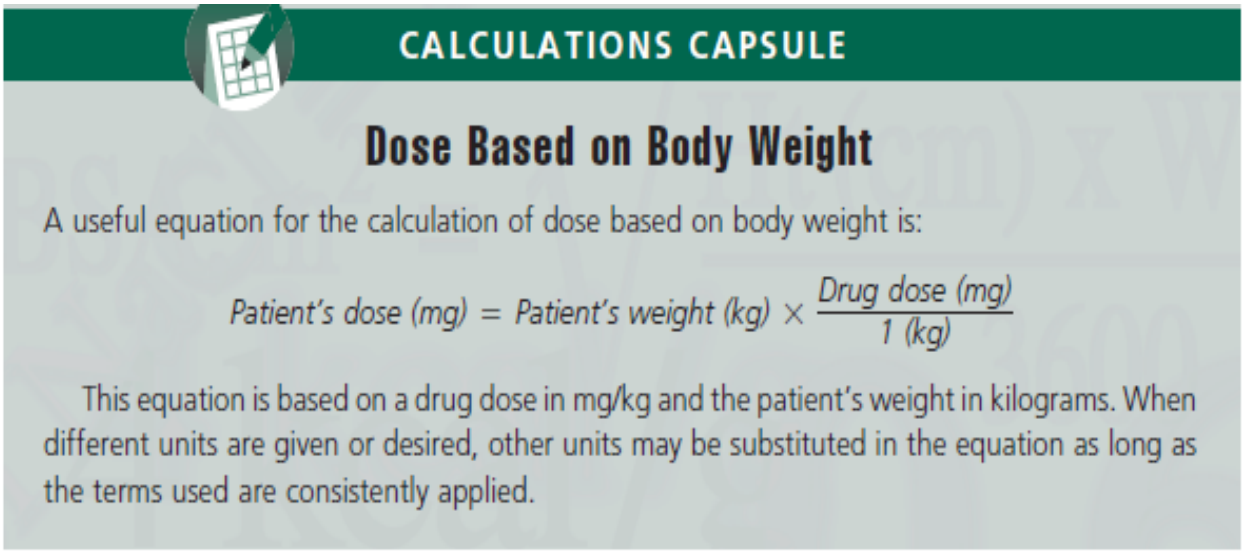
$$x = 15 \text{ mg dextromethorphan, } \textit{answer.}$$

***Note**:* The value of 150 in Fried's rule was an estimate of the age (12.5 years or 150 months) of an individual who would normallyreceive an adult dose, and the number 150 in Clark's rule was an estimate of the weight of an individual who likewise would receive an adult dose.

5.2.2. Based on weight

Drug Dosage Based on Body Weight

The usual doses of drugs are considered generally suitable for the majority of individuals likely to take the medication. In some cases, the usual dose is expressed as a specific quantity of drug per unit of patient weight, such as milligrams of drug per kilogram of body weight (abbreviated mg/kg). Dosing in this manner makes the quantity of drug administered specific to the weight of the patient being treated.



The patient's weight is an important factor in dosing since the size of the body influence the drug's concentration in the body fluids and at its site of action. Dose calculations based on body weight have become standard for certain drugs in dosing both adult and pediatric patients

Example Calculations of Dose Based on Body Weight

The doses of the majority of drugs based on body weight are conveniently expressed in terms of *mg/kg, since the doses of most drugs are administered in milligram amounts. However, this* is not always the case. Depending on the drug, dosage form, and/or route of administration, the doses of some drugs are expressed in other units of measure, such as micrograms or milliliters per pound or kilogram of body weight.

A useful equation for the calculation of dose based on body weight is:

$$\text{Patient's dose (mg)} = \text{Patient's weight (kg)} \times \frac{\text{Drug dose (mg)}}{1\ \text{(kg)}}$$

Example

The usual initial dose of chlorambucil is 150 mcg/kg of body weight. How many milligrams should be administered to a person weighing 154 lb.?

Solving by the equation:

150 mcg = 0.15 mg

$$\text{Patient's dose (mg)} = 154 \text{ lb.} \times \frac{0.15 \text{ mg}}{2.2 \text{ lb.}} = 10.5 \text{ mg chlorambucil, } \textit{answer.}$$

5.2.3. Based on body surface area

The body surface area (BSA) method of calculating drug doses is widely used for two types of patient groups: cancer patients receiving chemotherapy and pediatric patients, with the general exception of neonates, who are usually dosed on a weight basis with consideration of age and a variety of biochemical, physiologic, functional, pathologic, and immunologic factors.

Example Calculations of Dose Based on Body Surface Area

- A useful equation for the calculation of dose based on BSA is:

$$\text{Patient's dose} = \frac{\text{Patient's BSA } (m^2)}{1.73 \text{ m}^2} \times \text{Drug dose (mg)}$$

If the adult dose of a drug is 100 mg, calculate the approximate dose for a child with a BSA of 0.83 m2, using (a) the equation and (b) Table

cS

(a) $\text{Child's dose} = \frac{0.83 \text{ m}^2}{1.73 \text{ m}^2} \times 100 \text{ mg} = 47.97 \text{ or } 48 \text{ mg, } \textit{answer.}$

(b) According to Table 8.3, a BSA of 0.83 m^2 represents 48% of the average adult BSA of 1.73 m^2; thus, the child dose would be 48% of the usual adult dose:

100 mg × 0.48 = 48-mg dose for child, *answer.*

Shelf check-5	Work out

Direction: - Answer the following questions

1. Calculate child dose for cotrimoxazole if adult dose is 960mg ,the age of child is 5years,how many the dose of cotrimoxazole give to child

LG9	**LO4.Assembling prescription items according to good dispensing practice**

Instruction sheet

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

- Selecting and collecting prescribed products
- Physical inspection of items
- Re-packaging of prescribed items

This guide 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:

- Select prescribed products in the desired form in line with FMHACA guidelines for good dispensing practice
- Package correct quantity into a suitable container
- Attach correct label (and ancillary label if applicable) to container
- Check packed item for accuracy
- Check visibility of expiry date

Learning Instructions:

19. Read the specific objectives of this Learning Guide.
20. Follow the instructions described below.
21. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
22. Accomplish the “Self-checks” which are placed following all information sheets.
23. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
24. If you earned a satisfactory evaluation proceed to “Operation sheets
25. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
26. If your performance is satisfactory proceed to the next learning guide,
27. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet-1 Selecting and collecting prescribed products

1.1. Selecting and collecting prescribed products

1.1.1. Selection and Manipulation

This includes: -

A. Select stock container of pre-pack reading the label and cross matching the medicine name and strength against the prescription.

B. Read the container label at least twice during the dispensing process.

C. Do not select the prescribed medicine according to the color or location of container.

D. Do not open many stock containers at the same time. This trend willlead to errors and/or expose the medicines to air and eventually leads to deterioration in quality.

E. Open and close containers once at a time.

F. While counting, pouring or measuring,
the following points should be noted:

- ✓ short and/or over counting should be avoided
- ✓ Clean counting tray and/or spoon used
- ✓ Graduated measuring cylinder and/or flask must be used for measuring liquid reduction. If small volume is to be measured, small measuring cylinder/flask has to be used (if compounding is performed in the pharmacy).

1. Appropriate balance should be used (if compounding is performed in the pharmacy)
2. In dispensing liquids (if compounding is performed in the pharmacy):
   - ✓ Must be measured in a clean vessel and should be poured from the stock bottle with the label kept up ward. This avoids damage to the label by any spilled or dripping liquid.
   - ✓ Pour the measured liquid preparation into the container/bottle and label it Provide appropriate bottles with caps for repackaging liquid preparations
   - ✓ Dispense liquid preparations in suitable containers
   - ✓ Do not use patient's own bottle
   - ✓ Dispense each medicine in a different bottle
3. In dispensing tablets and capsules:

- ✓ Do not use fingers to count tablets as this can lead to contamination of medicines?
- ✓ Use a spoon to put tablets and capsules onto a counting tray
- ✓ Count and put them in a labeled medicine container or pack
- ✓ Close stock containers tightly after dispensing
- ✓ Keep the spoon clean always
- ✓ Do not keep the spoon inside the container

.10. Labelling of dispensed medicines should be clear and legible.

- ✓ Use separate plastic boxes for different patient's requirements of medicines. To avoid mix-ups of medicines of different patients, it is a good practice to assemble medicines of different patients in separate/different boxes, till they are billed and packed

Self-check-1	Written test

Say true if the statement is correct say false if the statement is incorrect

1. Select the prescribed medicine according to according to color is major in dispensing
2. When issue drug to the patient open and close container once at time
3. Digital balance not used at small compounding
4. Dispensing medicine the same bottle

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1. _____
2. _____
3. _____
4. _____

Score = _____

Rating: _____

Name: _____ Date: _____

2.1.Physical inspection of items

Pharmaceuticals are received into the dispensing unit and shelved at assigned bins after a thorough physical inspection. Physical inspection involves carrying out physical checkups on the products to identify quality defects and discrepancies in quantity. The process of physical inspection includes:

- Comparing list of names of medicines with their names on Model 22/ጤጤ
- Checking whether the correct number of containers /package are delivered
- Making sure quantity in each package is correct
- Confirming dosage form (tablet, capsule, suspension, etc.) and strength is correct
- Ensuring products do not have quality problems. Examples include:
  - ✓ Color changes for tablets and capsules
  - ✓ Cracking/chipping for tablets
  - ✓ Caking for suspensions
  - ✓ Not easily dispersible emulsions (broken phases)
  - ✓ Quickly settling suspensions/emulsions (enough time for measuring)
  - ✓ Odor changes
  - ✓ Damaged packaging, wrong or illegible labelling on the package
  - ✓ Spills and cracks on bottles
  - ✓ Documentation of the amounts received for each item on respective bin cards

Self-check-2	Written test

Direction: - Answer the following questions

1. Write at least three the process of physical inspection

Note*:* Satisfactory rating - 3points **Unsatisfactory - below 3points**

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

Answer sheet

1. _____
2. _____
3. _____

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-3 Re-packaging of prescribed items

Medicines must be suitably contained, protected and labeled from the time of manufacture until they are used by the patient. The container must maintain the quality, safety and stability of the medicine throughout this period

- The selection of packaging for medicines depends on:

- Nature of the medicine
- Type of patient
- Dosage form
- Method of administering the medicine
- Required shelf-life
- Use, such as for dispensing

Original containers used by manufacturers are expected to protect medicines for their specified shelf-life. Because original containers may contain large amount of medicines, repackaging of medicines into another container may be necessary in order to dispense medicines for patients. Such repackaging procedure can be done at-the –spot or in advance.

Packaging aids and materials

The materials used for repackaging include:

- glass bottles,
- plastic bottles,
- collapsible tubes,
- paperenveloppes,
- plasticenvelops, etc.

Self-check-3	Written test

Direction: - Answer the following questions.

1. Write at least 4 materials used for repacking of pharmaceutical produce

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1. _____
2. _____
3. _____
4. _____

Score = _____

Rating: _____

Name: _____ Date: _____

LG 10	**LO5. Preparing labels according to legal requirement**

Instruction sheet

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

- Legal requirements regarding labeling
- Types of labels
- Components of labels

This guide 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

- Prepare prescription labels to meet legal and regulatory requirements
- Identify procedures to deal with contraventions of law
- Check information on labels for accuracy, according to the prescription requirements
- Check that information on labels is neat, clear, easily understood and in line with legal requirements
- Add appropriate cautionary and advisory labels (either incorporated into label or attached separately)

Learning Instructions:

28. Read the specific objectives of this Learning Guide.
29. Follow the instructions described below.
30. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
31. Accomplish the “Self-checks” which are placed following all information sheets.
32. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
33. If you earned a satisfactory evaluation proceed to “Operation sheets
34. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
35. If your performance is satisfactory proceed to the next learning guide,
36. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet-1 Legal requirements regarding labeling

Legal requirements regarding labeling

The then FMHACA , today's EFDA defined ‘label’ as any material which is printed or affixed to a packing material which provides the necessary information about a food or medicine, and includes an insert.

Labellingincludes any legend, word, or mark attached to, included in, belonging to, or accompanying any drug including: 1) the immediate container label; 2) cartons, wrappers, and similar items; 3) information materials, such as instructional brochures and package inserts. All drugs should be put in suitable and appropriately labelled containers to ensure correct use and maintain potency and quality during the period of use

- Labeling of dispensed products
  - Label all containers in which drugs are dispensed
  - Use pictorial labels when a patient is not literate
  - Where envelopes are used, label them before drugs are packed
  - For liquid preparations, label the container(s) after putting in the liquid preparation

❖ The label on the container of dispensed drugs should contain

- Drug name (use generic name)
- Strength (usually in mg)
- Quantity dispensed
- Clear instructions for use in a familiar language
- Cautionary label (e.g. “Keep out of reach of children”)
- Name of the patient,
- Name of the health facility,

- Date of dispensing

Self-check-1	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the legal requirements of label of containers?

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

5. _____
6. _____
7. _____
8. _____

Score = _____

Rating: _____

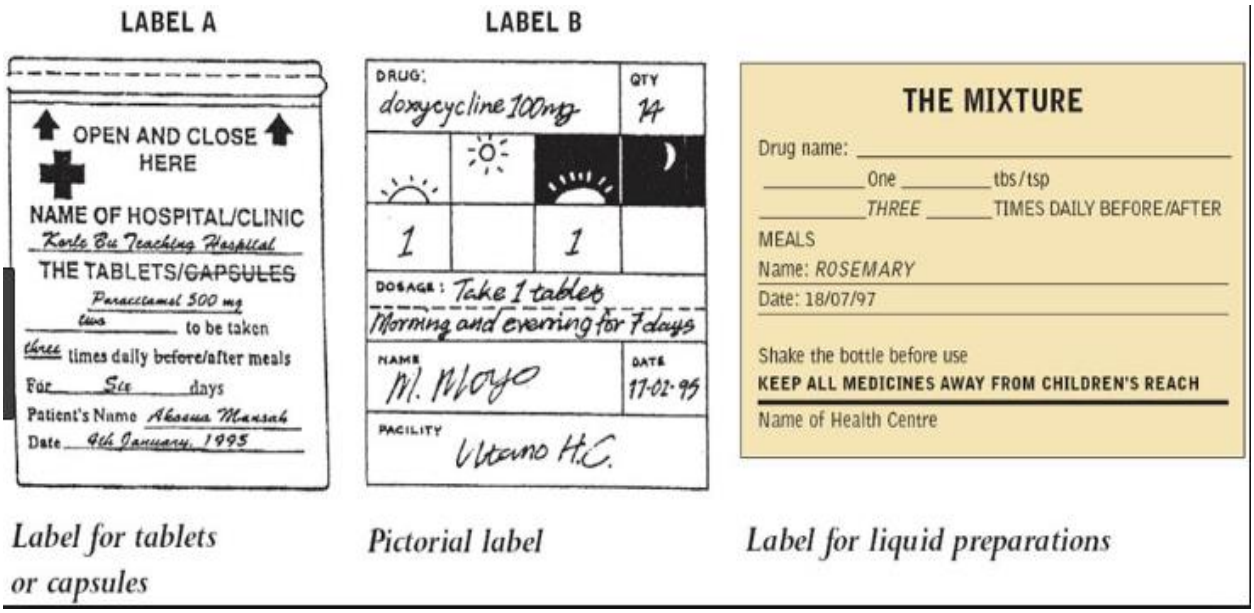
Name: _____ Date: _____

Information Sheet-2 Types of labels

Types of labels

A. Manufacture label

B. Dispensing label



Requirements for labeling compounded medicines

All labels must be type written or computer generated. The details, which must appear on the label of a dispensed medicine, are:

- The name and address of the pharmacy
- The patient's name
- Name of the preparation
- Quantity of the preparation
- Formula of the preparation (for unofficial preparations only)
- The strength of the preparation
- Use of the preparation
- Instructions for the patient
- The date of compounding
- Beyond used date (shelf life)

- Storage conditions
- Additional label
- Precautions
- Advise

Self-check-2	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the two types of labels?

Note: **Satisfactory rating - 2points** **Unsatisfactory - below 2points**

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

Answer sheet

1. _____
2. _____

Score = _____

Rating: _____

Name: _____ Date: _____

Information 3 Components of labels

Components of labels

- Drug name (use generic name)
- Strength (usually in mg)
- Quantity of drug
- Clear instructions
- Cautionary label (e.g. “Keep out of reach of children”)
- Name of the patient,
- Name of the health facility,
- Manufacture date
- Expiry date

Self-check-3	Written test

Direction: -Answer the following questions.

1. What are components of labelling?

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1. _____
2. _____
3. _____
4. _____

Score = _____

Rating: _____

Name: _____ Date: _____

LG 11	**LO6. Enter data in to the dispensing computer**

Instruction sheet

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

- Computerized dispensing system
- Entering data in to a computer system
- Barcode technology for the dispensing process
- Checking accuracy of data

This guide 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

- Enter dispensing data accurately into pharmacy computer System
- Use barcode technology for the dispensing process in line with local Pharmacy guidelines
- Check accuracy of data entered against information from prescription and labels
- Annotate prescription with the quantity supplied, signature and date
  Assemble items for an easy and complete check by the Pharmacist

Learning Instructions:

37. Read the specific objectives of this Learning Guide.
38. Follow the instructions described below.
39. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
40. Accomplish the “Self-checks” which are placed following all information sheets.
41. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
42. If you earned a satisfactory evaluation proceed to “Operation sheets
43. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
44. If your performance is satisfactory proceed to the next learning guide,
45. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information sheet-1 Computerized dispensing system

Although only a machine capable of producing a typed label is technically required, all dispensaries now have at least one computer. On it will be a programmed designed specifically to assist in the dispensing process. This software will identify interactions with other medicines the patient is known to take or have taken. In addition to generating dispensing labels, the computer will also hold the patient medication records and it will often been used to order and manage stock. Therefore, the information held must be regularly backed-up to ensure it would not be lost in the event of a technical failure Pharmacy computer systems may assist efficient dispensing by 'filling in' template details from the prescription message. Pharmacists are reminded that the system is pre-populating information for inspection and verification by the pharmacist and the usual professional dispensing vigilance is still required. Pharmacy computer systems maintain a prescribing and dispensing history for each patient, and also have decision support tools to support the pharmacist's professional check (drug interactions, drug disease interactions etc). The decision support warnings produced by pharmacy computer systems should inform, not replace, the pharmacist's clinical judgments.

Electronic data processing equipment, when used to store prescription information, must:-

A. is structured in such a manner that all prescription drug orders, communicated to a pharmacy by way of electronic transmission, will be transmitted with no intervening person having access to the information contained in the prescription drug order;

B. not infringe on a patient's freedom of choice of pharmacy provider;

C. guarantees the confidentiality of the information contained in the system's storage devices and databases;

D. produce a hard copy daily summary of controlled substance transactions and be capable of producing a hard copy printout of legend drug transactions going back two years, except that if this information is already available in hard copy form it is not necessary to duplicate the data through a computer-generated hard copy;

E. be capable of recording and carrying in the record all dates of refills of any Prescription drug order and the unique identifier of the pharmacist;

F. is capable of producing a patient profile indicating all drugs being taken and the dates and quantities of fills or refills of prescription drug orders dispensed for the patient and:-

(1) in the case of hospital or long-term care inpatients, these records shall be kept in the computer system or on hard copy and be immediately retrievable for two years; and

(2) In all other cases the data shall be kept in the computer system and be immediately retrievable for at least two years;

G. is capable of producing a printout providing a refill-by-refill audit trail for any specified strength and dosage form of any controlled substance. The audit trail must include the name of prescribing practitioner, the name and location of patient, the quantity dispensed on each refill, the date of dispensing of each refill, the name or unique identifier of the dispensing pharmacist, and the prescription number;

H. be capable of identifying any authorized changes in drug, quantity, or directions for use of any prescription drug order including the date of change, the identity or unique identifier of the individual making the change, and what the original information was; alternatively a new prescription drug order may be created for each authorized change; and

I. is capable of preventing unauthorized access, modification, or manipulation of patient prescription data

Self-check-1	Written test

Direction: -Answer the following questions.

Electronic data processing equipment, when used to store prescription information, must contain at least describe four

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1._____
2._____
3._____
4_____

Score = _____

Rating: _____

Name: _____ Date: _____

Information sheet-2 Entering data

When electronic data processing equipment is employed by any pharmacy, input of drug information may be performed by a prescriber or a pharmacist.

If prescription drug orders are entered by other personnel, the pharmacist or the prescriber must certify the accuracy of the information entered and verify the prescription drug order prior to the dispensing of the medication. The unique identifier of the person entering the prescription drug order must be retained in the computer record. And by using this computer system we can access data easily, communicate with the prescriber and used for calculation purpose

Self-check-2	Written test

Direction: -Answer the following questions.

1. If prescirber made an error of the drug who is responsible to correct him/her

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1._____
2._____
3._____
4_____

Score = _____

Rating: _____

Name: _____ Date: _____

Information sheet-3 Barcode technology for the dispensing process

When a patient is to receive a medication the pharmacist would scan his/her bar-coded employee identifier, the patient's wristband to confirm retrospective analysis of aggregate data to monitor trends (e.g., p0.0 bvxercent of doses administered late and errors of omission.

The principles behind bar coding suggest that errors leading to patient harm could be significantly reduced through the effective use of this technology.
In essence, barcode technology is a replacement for traditional keyboard data entry.

It requires conversion of an identifier to a symbolic representation—**the barcode**—that can then be printed on, or affixed to, an item, subsequently read by a light source and fed into a computer. Standard barcodes usually do not contain descriptive data.

Instead, like the license plate on your car, the data in a barcode is a reference number the computer uses to look up associated descriptive data and other pertinent information.

3.1. Calculating prescription quantities

3.1.1. Mathematics Review

- A number is total quantity, or amount of unit.
- A numeral is a word or sign or group of words or signs expressing a number.

E.g.5, 10, 18 are Arabic numerals expressing numbers that are, respectively,5 times, 10 times, 18 times the unit one.

3.1.2. Arabic and Roman numerals

- Arabic system of notation is properly called a decimal system with only 10 figures A zero and nine digits(1,2,3,4,5,6,7,8,9).
- The total value of any number expressed in the Arabic (Decimal) system is the sum of the values of its digits as determined by their position.
- The roman numbering system expresses large range of numbers by the use of a few letters of the alphabet in a simple positional notations indicating adding or subtracting from a succession of bases extending from 1 through 5, 10, 50,100,500 to 1000.
- To express quantities in the roman system, eight letters of fixed values are used (there is no letter for the value zero).

Ss = ½
I or I = 1
V or v = 5
X or x = 10
L or l =50
C or c =100
D or d =500
M or m =1000

- other quantities are expressed by combining these letters.
- There are **four** general rules for reading roman numerals.
  1. A letter repeated once or more repeats its value.
  E.g. - XX = 20, XXX = 30
  2. One or more letters placed after a letter of greater values increases the value of the greater letter.
  E.g.VI = 6, Xii = 12, LX = 60
  3. A letter placed before a letter of greater value decreases the value of the greater letter.
  E.g. IV = 4, XL = 40, CM = 900
  4. A bar placed above a letter or letters increases the value by 1000 times.
  E.g. XV = 15, but XV = 15000

3.1.3. Fractions, Decimals and significant figures

- **Fractions**-is a number in the form 1/8,1/2 etc
- It has numerator and denominator.
- A fraction with denominator of 10 or any power of 10 is called a **decimal.**
- The denominator of a decimal fraction is never written, because the decimal point indicates the place value of the numerals.
- **Significant figures** are consecutive figures that express the value of a denominate number accurately enough for a given purpose.
- Any zero b/n digits is significant.
- Initial zeros to the left of the first digit are never significant.
- One or more final zeros to the right of the decimal point may be taken to be significant.
  - **E.g.** 12.56 - Four significant figures.
  - 0.5 – One significant figure.
  - 0.06050 – Four significant figures.
- **Specific gravity** often becomes a part of the solution to a pharmaceutical calculation. Hence, the main use of specific gravity is to solve for a liquid's volume when the weight of the liquid is known. Because of the difficulty which

may be countered in trying to weigh a liquid, it is often advantageous to calculate the liquid's volume and measure it in a graduate as opposed to weighing it.

Specific gravity is the ratio of the weight of a substance to the weight of an equal volume of distilled water at **25ºC**.

- At ***25ºC*** and ***1 atmosphere*** of pressure, one milliliter of distilled water weighs one gram. Therefore, the specific gravity of water is established as **one**.

$$\text{Specific gravity} = \frac{\text{Weight of the substance}}{\text{Weight of an equal volume of water}}$$

- Because one milliliter of water weighs one gram:

$$\text{Specific gravity} = \frac{\text{Number of grams of the substance}}{\text{Number of milliliters of the substance}}$$

- Specific gravity has **no** units. Because specific gravity has no units, only the numbers must be placed in the formula providing the units of weight and volume are grams and milliliters. If units are other than grams and milliliters, using the conversion factors as discussed in the metric system and common systems of measure should change them.

Self-check-3	**Written test**

Direction: -Answer the following questions.

1. Which method is best for calculating prescription quantities

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1._____
2._____
3._____
4_____

Score = _____

Rating: _____

Name: _____ Date: _____

Information sheet-4 Checking accuracy of data

Purpose

To ensure that dispensed prescriptions have been assembled and labelled accurately before being transferred to the patient.

Scope

The procedure covers the way in which prescriptions that have been dispensed (assembled and labelled) are checked for accuracy. It covers all prescriptions except those which have to be dispensed into monitored dosage systems. For MDS, please refer to the Dispensary SOP: MDS: Initiation and Supply

The following members of staff are authorised to check prescriptions before transfer to the patient:

Dispensers

Procedure / process

P1. Check the prescription

- Keep distractions and interruptions to a minimum
- Read the prescription through once, including details of patient name as well as drug name, strength, and quantity
- Check each item individually in the order it appears on the prescription before moving on to the next.

P2. Check the product:

- Read the drug name on either the bulk stock pack or the patient pack and check that this matches what is written on the prescription
- Check that the product strength correlates with that on the prescription. Be careful with units, eg mg (milligrams) and mcg (micrograms)
- If using multiple patient packs, check that *all* packs are the same medication and the same strength
- Check that the correct form has been dispensed (cream vs. ointment etc.)
- If using bulk packs, carry out a quick visual check on the contents of the bulk pack and the contents of the container to ensure they match
- If using patient/calendar packs, open all unsealed packs checking that the contents are correct, the number of strips present in each pack is correct, and that there are no loose blisters or tablets
- Check that the pack contains the relevant PIL or, for medicines dispensed from bulk packs, that a leaflet is supplied; these can be downloaded from the internet

P3. Check the label**:**

- Check the label against the prescription (not against what has been dispensed) to ensure that it contains the correct patient name, correct medication name, correct strength, quantity, and dosage form
- Check that the dose and usage instructions on the label correspond with the prescription.

P4. Complete the checks:

- When the accuracy check is complete, initial the dispensing label
- If any of the above steps reveals that an error has been made, this must be brought to the attention of the dispenser concerned. Errors should be recorded, and any trends should be brought to the attention of the [insert name of responsible person]
- Count the number of items on the prescription and then count the corresponding number of dispensed items (not packs) into an appropriately sized bag
- Check that you have not included any stock containers in the bag
- If the dispensed items have special storage requirements, eg items needing refrigeration or controlled drugs, ensure that the prescription form is annotated accordingly
- Ensure that 5ml spoons, oral syringes, etc. are included if necessary
- Attach any owing notes if necessary
- Attach the prescription to the bag

- Hand the dispensed items to the patient in accordance with the SOP: Transferring dispensed items to patients OR
- If the patient is collecting the prescription at a later time, store the dispensed items in the [insert details of designated location], ensuring that any items which have special storage conditions are stored in an appropriate area.

Review procedure

This procedure will be reviewed following:

- Changes in the law affecting dispensing
- Changes in DDA or other guidelines affecting the dispensing process
- Change of staff
- Any adverse dispensing incident

Self-check-4	Written test

Direction: -Answer the following questions.

Which staffs are authorized to check prescriptions before transfer to the patient:

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1.___
2._____
3._____
4___

Score = _____

Rating: _____

Name: _____ Date: _____

L#12	**LO#7 Finalizing and documentation of prescription**

Instruction sheet

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

- Complete recording of prescribed medications
  - Completing prescription record book
  - Completing patient medication record for chronic illnesses
  - Record keeping for controlled drugs
- Prescription filing

This guide 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:

- Verify that prescription is checked and signed by the pharmacist
- Complete documentation in accordance with organization policies and procedures
- Record relevant information and statistics according to organization policies and procedures

Learning Instructions:

46. Read the specific objectives of this Learning Guide.
47. Follow the instructions described below.
48. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
49. Accomplish the “Self-checks” which are placed following all information sheets.
50. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
51. If you earned a satisfactory evaluation proceed to “Operation sheets
52. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
53. If your performance is satisfactory proceed to the next learning guide,
54. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information sheet #1 Complete recording of prescribed medications

1.1. Recording the Transaction

Prescriptions should be recorded and documented as proof of transaction between the patient and the dispenser. Prescriptions can therefore be traced back if any need arises. All dispensing units should have a standardized Prescription Registration Book (PRB) for recording every pharmaceutical issued to a patient

- A computerized dispensing and registration system may also be used, but should always be supported by paper backup. The registration book should be completed at the time of dispensing or at the close of the working day.
- The prescription registration book should be used both when prescriptions are retained in the pharmacy and when they are returned to the patient.
- For a prescription, which is returned to a patient because all the items in the original prescription could not be filled, the medicines that have been dispensed from the pharmacy should be copied on a blank prescription and the prescription should be filed appropriately. On the original prescription, which is retained by the patient, the word “dispensed” should be stamped an adjacent to those items which have been dispensed.

For prescriptions, which are to be refilled on a later date, the dispensing information should be interred the registration book before returning the prescription to the patient. The official seals of the pharmacy/Health institution, name and signature of the dispenser, the date of dispensing and then extra fill date should be written on the back of the prescription.

1.2. Completing prescription record book

Prescriptions should be recorded and documented as proof of transaction between the patient and the dispenser. Prescriptions can therefore be tracedback if any need arises. All dispensing units should have a standardizedPrescription Registration Book (PRB) for recording every pharmaceuticalissued to a patient. A computerized dispensing and registrationsystem may also be used, but should always be supported by paper back up.The registration book should be

Completed at the time of dispensing or at the close of the working day. The prescription registration book should be used both when prescriptions are retained in the pharmacy and when they are returned to the patient.For a prescription which is returned to a patient because all the items inthe original prescription could not be filled, the medicines that have beendispensed from the pharmacy should be copied on a blank prescription and the prescription should be fled appropriately. On the original prescription, which is retained by the patient, the word “dispensed” should be stamped adjacent to those items which have been dispensed. For prescriptions which are to be refilled on a later date, the dispensing information should be entered into theregistration book before returning the prescription to the patient. The officialseal of the pharmacy/Health institution, name and signature of the dispenser,the date of dispensing and the next refill date should be written on the back ofthe prescription

Self-check-1.	Written test

Direction: -Answer the following questions.

1. At what time The prescription registration book should be used

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1._____
2._____
3._____
4_____

Score = _____

Rating: _____

Name: _____ Date: _____

Information sheet-2 Prescription filing

Each prescription should be signed and accountability accepted by the dispenser or other authorized person for the correctness of the dispensing of the medicine and confirming that the medicine was supplied.

At the close of each day all dispensed prescriptions should be organized

- Prescriptions should be filed sequentially by day in a single container/ carton for each month. The container should be labelled with the month and year.
- Containers should be arranged **monthly**.
- Normal prescriptions should be filed securely for two years and special prescriptions **for 5 years**.
- Prescriptions, patient and medication related records and information should be documented and kept in a secure place that is easily accessible only to the authorized personnel.

Self-check-2	Written test

Direction: -Answer the following questions.

1. Normal prescriptions should be filed securely for_____yrs.

2. Special prescriptions should be filed securely for_____yrs

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4points**

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

Answer sheet

1._____
2._____
3._____
4_____

Score = _____

Rating: _____

Name: _____ Date: _____

Reference

1. Manual for Medicines Good Dispensing Practice 2nd edition, 2012
2. National drug formulary, Guideline for prescription papers FMHACA, latest edition
3. Manual for Medicines Good Dispensing Practice 2nd edition, 2012
4. National drug formulary, Guideline for prescription papers FMHACA, latest edition
5. Introduction to Pharmaceutical calculation Rees Judith A, Smith Jan, Watson Jennie 4th edition.
6. Manual for Medicines Good Dispensing Practice 2nd edition, 2012
7. National drug formulary, Guideline for prescription papers FMHACA, latest edition
8. ***Drug Facts and Comparisons.*** St. Louis, MO: Wolters Kluwer, 2008
9. ***Physicians' Desk Reference.*** Montvale, NJ: Medical Economics, 2008.
10. Taketomo CK, Hodding JH, Kraus DM. ***Pediatric Dosage Handbook.*** 14th Ed. Hudson, OH: Lexi-Comp, 2007.
11. Semla TP, Beizer JL, Higbee MD. ***Geriatric Dosage Handbook.*** 13th Ed. Hudson, OH: Lexi-Comp, 2008.
12. Lacy CF, Armstrong LL, Goldman MP, Lance LL. ***Drug Information Handbook.*** 15th Ed. Hudson, OH: Lexi-Comp, 2007.
13. United States Pharmacopeia 31st Rev. National Formulary 26. Rockville, MD: United States Pharmacopeial Convention, 2008 ;(1221)1:678

The trainers who developed the learning guide

No	Name	Qualification	Educational background	Region	E-mail
1	Feysal Mohammed	A	Nurse	Somali	Feysalm28@gmail.com
2	Nigatu wayesa	A	Nurse	Benishangul	nigatuwey@gmail.com
3	Farhan Abubeker	A	MPH in RH	Harari	Feru_ab@yahoo.com
4	Tesgera Begize	A	Nurse	Benishangul Gumuze	Tesgera125@gmail.com
5	Bekuma Tadesse	A	Nurse	Oromiya	BekumaTadesse@gmail.com
6	Shu'ayb Ahmed	B	Nurse	Somali	Shucayba5@gmail.com