Module 1 LESSON 1

PHARMACOLOGIC TERMS

Pharmacology – study of drugs, origin, nature properties and their effects upon living.

Drugs – chemical absorbed exhibit specific response and their action.

Medications – diagnosis, cure, treatment or relief of symptoms or prevent of disease.

Prescription – written direction for preparation& administration of drugs.

Pharmacy – science of preparing, compounding & dispensing medicine.

DRUG STANDARD

SOURCE OF DRUGS;

Natural

- PLANTS (Digitalis, Opium)
- ANIMALS (Insulin, Vaccines)
- MINERALS (Sodium Chloride, Iron)

Synthetic (Thyroid Supplement)

DRUG CLASSIFICATIONS

According to SPECIFIC NAMES

- **CHEMICAL NAME –** N – (-4-hydropheny)acetamide
- **GENERIC NAME –** paracetamol
- **BRAND (TRADE) NAME –** Biogesic

Generic VS Brand Name

Generic – non proprietary name of drugs active ingredients.

-not owned by any one company

-Usually cheaper

Brand – commercial name given to dryg by manufacturer.

According to GENERAL TERMS

- **CHEMICAL SIMILARITY -** Penicillin, Sulfonamides
- **THERAPEUTIC USE/ BIOLOGICAL EFFECT –** Analgesic, Antipyretics, Antihypertensive
- **PHYSIOLOGIC/ MECHANISM OF ACTION –** ACE Inhibitors, Beta Blockers

According to LEGAL CLASSIFICATION

- **OTC/NONPRESCRIPTION DRUGS**
- **PRESCRIPTION DRUGS**
- **ILLEGAL OR RECREATIONAL DRUGS**

DRUG APPROVAL PROCESS – testing process first begin animal studies, next step involves FDA to review obtained data.

Pharmacotherapy – use drugs to prevent , diagnose, or treat signs symptoms & disease process.

Pharmacodynamics - drug actions on target cells & resulting alterations in cellular biochemical reactions & functions. " *What the drug does to the body* " .

Pharmacokinetics – drug movement through the body to reach sites of action. " *What the body does to the drug*" .

Toxicology – study of harmful effects of drugs on living tissues

Posology - study of dosage or amount of drugs given in treatment disease.

PHASE 1 – determine safe dosage, scheduling, & toxicity

PHASE 2 – determine effectiveness with specific disease.

PHASE 3 – establish if new drug is more effective than standard drug.

PHASE 4 – drug marketed for general use. Continuous monitoring & further testing of drug.

DRUG MISSUE

Drug Abuse – inappropriate intake of substance

- Drug Dependence – reliance or need to take drug
- ► Physiological – tissues come to require the drug for normal functioning due to biochemical changes.
  - Emotional reliance on drug to maintain a sense of well-being, accompanied by feelings of cravings.
- Drug Habituation – habit taking a drug & feels better after taking it.

LESSON 2

DRUG ACTIONS & ADMINISTRATION

❖ **EFFECTS OF DRUGS**

- Desired (Therapeutic Effect) – Intended action of medication.

► THERAPEUTIC ACTIONS OF DRUGS

1. **PALLIATIVE –** relieves symptoms of disease.
2. **CURATIVE –** cures disease itself.
3. **SUPPORTIVE –** support body function until body can take over.

- Undesired Effect

► SIDE EFFECTS

- Secondary effect
- Usually predictable
- May be harmful or harmless

- ADVERSE EFFECTIVE – more sever side effects
- Drug Allergy – immune reaction to a drug
- ANAPHYLACTIC REACTION
  - Severe allergic reaction to drug
  - Can be fatal if not treated promptly
- Drug Toxicity – harmful effects of drug due overdose or buildup.

❖ **ALTERED DRUG RESPONSE**

- Drug Tolerance – decreased response requires higher dosage for same therapeutic effect.
- Cumulative Effect – increased response increased drug accumulation when drug administration exceeds rate of metabolism or excretion.
- Idiosyncratic Effect – drug reaction different from what expected.

❖ **DRUG INTERACTIONS –** effects of one drug are modified by prior or concurrent administration of another drug.

- Potentiation – increased drug action.
  - ADDITIVE - same types of drugs enhance each other.
    - Inhibiting Effect – decreased drug action.

ACTIONS OF DRUGS ON THE BODY

PHARMACODYNAMICS

- MECHANISM OF ACTION – understand how drug produces its effect.
- INDICATION – ensures the correct use of drug.
- CONTRAINDICATION – prevent harmful drug administration.
- MAINTENANCE DOSE – maintain therapeutic drug level.
- LOADING DOSE – provide rapid drug effect.
- POTENCY – determine the strength needed for desired response.
- RECEPTOR SITE – where drug binds on or inside cell.
- RECEPTOR THEORY – drugs work by binding to receptors.
- AGONISTS – activates receptor to produce response.
- ANTAGONIST – blocks receptor & prevent response.
- COMPETITIVE ANTAGONISM – agonist & antagonist compete for the same receptor.

ONSET, PEAK & DURATION

Onset – time until drug begins to work.

Peak – when drug reaches it highest concentration.

Duration – how long the drugs effect lasts.

DOSE RESPONSE & MAXIMAL EFFICACY

- Dose response is the relationship between the minimal versus the maximal amount of drug dose needed to produce the desired drug response
- Some patients respond to a lower drug dose, others need a high drug dose to elicit the desired response
- All drugs have maximum drug effects (maximal efficacy)

THERAPEUTIC INDEX

The drug' s safety margin between effective & toxic doses.

- **LD50 –** dose that lethal to 50% subjects.
- **ED50 –** dose effect in 50% subjects.

Therapeutic Ratio – formula : **LD50 ÷ ED50.**

Therapeutic Range/Window – safe blood concentration gives the desired effect without toxicity.

PHARMACOKINETICS

- ABSORPTION – drug enters bloodstream to circulated.
  - Types of absorption
    - Passive
    - Active
    - Pinocytosis
  - Different sites of absorption in GIT
    - Mouth or oral cavity
    - Stomach
    - Small intestine
- DISTRIBUTION – drug transported throughout body.
  - Factors affecting drug absorption
    - Blood flow
    - Route of administration
    - Dosage form
    - GI function
    - Pain & Stress
    - Presence of food or other drugs
  - Hepatic First Pass Effect
- METABOLISM/BIOTRANSFORMATION – drug broken down or inactivated.
  - Main Site – liver
  - Factors affecting metabolism – Age, nutrition, body hormones & liver disease.
- EXCRETION – drug eliminated from the body.
  - Inactivates Medication
  - Activate prodrugs
  - Decreases toxicity
  - May increase toxicity
  - Supports renal excretion
  - Can increase therapeutic effect

Excretion – primary process of eliminating drugs from the body

Route: kidneys(main), intestine, lungs, mammary glands, sweat glands, & salivary glands.

FACTORS AFFECTING MEDICATION ACTION

- **Developmental Factors**
  - Pregnancy: most drugs are avoided, esp. 1st trimester
  - Infants: immature liver & kidneys slow drug metabolism
  - Older Adults: reduced liver/kidney function slows drug clearance
- **Gender –** body fat & hormones can change drug effects
- **Cultural, Ethnic, & Genetic Factors**
  - Pharmacogenetics – genes influence drug metabolism & response.
  - Ethnopharmacology – drug effects may vary smong ethics groups.

I. **Diet**
II. **Environment**
III. **Psychological**
IV. **Illness & Disease**
V. **Time of Administration**

ROUTE OF ADMINISTRATION

I. **Oral**
II. **Sublingual**
III. **Buccal**
IV. **Parenteral (ID, IM, SQ, IV)**
V. **TOPICAL**

❖ FOOD, DRUG, & COSMETIC (1938) – drug labels must be accurate ; drugs tested for safety.
❖ DURHAM – HUMPHREY AMENDMENT (1952) – distinguishes prescription (Rx) & over the counter (OTC) drugs.
❖ KEFAUVER – HARRIS AMENDMENT (1962) – requires proof of drug safety & effectiveness.
❖ CONTROLLLED SUBSTANCES ACT (1970) – classification controlled drugs & regulated prescription refills.

PHILIPPINES

❖ **RA 9165 DANGEROUS DRUGS ACT (2002) –** punishes illegal sale, distribution, & transport of dangerous drugs.
❖ **RA 6675 GENERIC ACT (1988) –** requires medicines to be identified by their generics.
❖ **RA 9502 CHEAPER MEDICINES ACTS (2008) –** makes quality medicines more affordable & accessible.
❖ **SYSTEMS OF MEASUREMENT**
- Metric System – widely accepted & convenient system
- Apothecary System – less convenient & precise than the metric system
- Household System – least accurate

Lesson 3

SAFE MEDICATION PRACTICE

IMPORTANT THINGS TO REMEMBER

- OBSERVE THE 12 RIGHTS
- PRACTICE ASEPSIS
- NURSE WHO ADMINISTER MEDICATIONS ARE RESPONSIBLE FOR THEIR OWN ACTIONS
- BE KNOWLEDGEABLE ABOUT THE MEDICATION THAT YOU ADMINISTER
- USE MEDICATION THAT ARE IN CLEARLY LABELED CONTAINERS

12 Rights of Giving Medication

- RIGHT PATIENT
- RIGHT DRUG
- RIGHT DOSE
- RIGHT ROUTE
- RIGHT TIME
- RIGHT ASSESSMENT
- RIGHT DRUG PREPARATION
- RIGHT DOCUMENTATION
- RIGHT REASON
- RIGHT PATIENT EDUCATION
- RIGHT TO REFUSE
- RIGHT EVALUATION

LEGAL ASPECTS OF DRUG ADMISSION

USA

Ex. You are required to give morphine 6 mg. In your stock ampule, there is 15mg per 1 mL. How many cc will you give?

CALCULATING ADMINISTRATION RATES

2 components to remember before using the formulas drop factor of the IV administration rate amount of solution to be infused over one hour

MACRODRIP SET

10 drops = 1 ml

15 drops = 1 ml

20 drops = 1ml

MICRODRIP SET

60 microdrops = 1mL

BLOOD SET

10 drops = 1 ml

IV FLUID FLOW RATE

- gtts/min
- cc/hr
- no. of hrs

COMPUTE

- The physician ordered D5LR 1L to run for 8 hours using a macroseta IV tubing with a drop factor of 15 gtts/mL. Solve for the following:

cc/hr

gtts/min

- The physician ordered D5NM 1 pt to run for 10 hours, using a microset IVF tubing. Solve for:

cc/hr

mcgtts/min

Module 2 **REVIEW OF SYSTEM RESPIRATORY**

LESSON 1

ANTIHISTAMINES & ANTITUSSIVES

ANTIHISTAMINES

- ❖ H1 blockers
- ❖ Block H1 histamine receptor
- ❖ Treat colds & allergic rhinitis
- ❖ Reduces nasal secretions
- ❖ Act in about 15 minutes
- ❖ Not for anaphylaxis

► **1st Generation Antihistamine**
  - ■ Sedating (causes drowsiness)
  - ■ May cause dry mouth
  - ■ Ex: Diphenhydramine (benadryl)
► **2nd Generation Antihistamine**
  - ■ Nonsedating
  - ■ Fewer anticholinergic effects
  - ■ Avoid alcohol & NCS depressants
  - ■ Ex: Cetirizine, Fexofenadine, Loratadine, Azelastine
► **Pharmacokinetics**
  - ■ *Routes:* **PO, IM, IV**
  - ■ Well absorbed in the GIT
  - ■ Metabolized in the liver
  - ■ Excreted in urine
  - ■ Half life: 2-7hrs
► **Pharmacodynamics**
  - ■ Blocks H1 receptor (Antihistamine)
  - ■ Has **anticholinergic effects**
  - ■ *Onset:* **15 mi (PO), immediate (IM/IV)**
  - ■ *Duration:* **4-8hrs**
  - ■ Avoid with **alcohol** & **CNS depressants**
► **Side Effects**
  - ■ 1st Generation: drowsiness, dizziness, fatigue, & disturbed coordination anticholinergic effects (dry mouth, urine retention, blurred vision)

ANTITUSSIVES

- ❖ Suppress or inhibit coughing
- ❖ Act on the cough control center in the medulla to suppress the cough reflex
- ❖ Indicated if the cough is nonproductive and irritating.
  - o Major antitussives: benzonatate, codeine, dextromethorphan*, hydrobromide, hydrocodone bitartrate
  - o 3 types: nonnarcotic, narcotic or combination preparations

PHARMACOKINETICS

Dextromethorphan Pharmacokinetics

Forms: Syrup, liquid, chewable, and lozenges.
Absorption: Rapidly absorbed after oral administration.

Onset: 15– 30 minutes.

Metabolism: Liver.

Excretion: Kidneys. Half-life & protein binding: Unknown.

PHARMACODYNAMICS

Dextromethorphan Pharmacodynamics

Action: Suppresses the cough center in the medulla without depressing respiration.

Onset: Fast. Duration: 3– 6 hours.

Caution: Avoid alcohol and other CNS depressants.

PHARMACOTHERAPEUTICS

Benzonatate: Used to relieve nonproductive cough caused by pneumonia, bronchitis, the common cold, and COPD. It is also given during bronchoscopy to prevent coughing.

Codeine & Hydrocodone: Narcotic antitussives used to treat severe or intractable cough, especially in patients with lung cancer.

DRUG INTERACTIONS

Codeine & Hydrocodone: With MAO inhibitors, may cause excitation, fever, blood pressure changes, and coma.

Dextromethorphan: With MAO inhibitors, may cause excitation, fever, hypotension, and coma.

Codeine: Increases CNS depression when taken with alcohol, barbiturates, or sedative-hypnotics.

LESSON 2

ASTHMA DRUGS

METHYLXANTHINES – xanthine derivatives

- **Bronchodilators** used for asthma

- **Drugs:** Theophylline, Aminophylline, Theophylline sodium glycinate, Oxtriphylline
- **Actions;** stimulate CNS & respiration, dilate coronary and pulmonary vessels, & promote diuresis
  - ❖ **THEOPHYLLINE**
    Relaxes bronchi & bronchioles – **bronchodilation**
    MOA: inhibits phosphodiesterase - ↑ cAMP
    Therapeutic range: 10 – 20 mcg/mL
    Use: maintenance treatment for chronic asthma & COPF
    Avoid in: seizure, cardiac, renal, or liver disease
    - o **PHARMACOKINETICS**
      - **Absorption:** well absorbed orally
      - **Metabolism:** liver
      - **Excretion:** kidney (90%)
      - **Smoking:** ↑ metabolism - ↓ half life
      - **Half life:** 7-9hrs (adults), 4-5hrs (smoker/children), ~12hr (CHF, COPD, liver disease)
    - o **PHARMACODYNAMICS**
      - Increase **cAMP**, causing bronchodilation.
      - Relaxed bronchial smooth muscle to relieve bronchospasm & reduce airway reactivity.
      - Onset: **30min**(oral), **1-2hrs**(sustained release).
      - Duration: **~6hrs** (oral/IV), **8-24hrs** (sustained release).
    - o **PHARMACOTHERAPEUTICS**
      Used to manage **asthma** (2nd – 3rd line), **chronic bronchitis,** & **emphysema.**

Side effects

Anorexia, nausea, vomiting, gastric pain, nervousness, dizziness, headache, irritability, tachycardia, palpitations, hypotension, dysrhythmias, hyperreflexia, and seizures. Adverse effects are more severe in children, and other xanthines should be avoided while taking theophylline.

PIRBUTEROL

- aerosolized bronchodilator

- acts beta 2 adrenergic receptor agonist to relax smooth muscle of bronchi.

- may used alone or with theophylline or steroid therapy

Adverse reactions: nervousness, tremor, headache, palpitations, rapid heart rate, chest pain or tightness, nausea, diarrhea, & dry mouth.

CROMOLYN SODIUM

-Stabilizes mast cells to prevent histamine release and helps prevent bronchial asthma.

-It is not effective for acute asthma attacks and is given by inhalation.

Side effects include bronchospasm, cough, wheezing, sneezing, throat irritation, dizziness, nausea, headache, and skin rash.

LESSON 3

MUCOLYTICS & EXPECTORANTS

MUCOLYTICS – liquefy & loosen thick mucus by breaking down sticky secretions, making them easier to expectorate. Ex. Acetyl cysteine.

❖ Acetylcysteine (Mucomyst)

Administered nebulization

-A mucolytic given mainly by **nebulization** to loosen thick mucus. -It may be combined with a **bronchodilator** in asthma.

Side effects include nausea, vomiting, stomatitis, and runny nose. It is also an **antidote for acetaminophen overdose** if given within **12– 24 hours** and may be taken orally diluted in juice or water.

- o **PHARMACOKINETICS**
  Absorbed through the **lungs** (inhale) or **GIT** (oral), metabolized in the **liver**, and excretion is **unknown**.
- o **PHARMACODYNAMICS**
  Reduces the thickness of respiratory secretions by changing the molecular structure of mucus.

DORNASE ALFA

-An enzyme that breaks down DNA thick mucus of **cystic fibrosis (CF)** patients.

-It reduces respiratory infections & improves lung function, with effects seen in **3 – 7 days**.

Side effects: chest pain, sore throat, laryngitis, & hoarseness.

EXPECTORANTS

-Thin mucus, soothe the respiratory tract, & loosen bronchial secretions for easier coughing

-The most common ex. **Guaifenesin.**

-**Hydration** is the best natural expectorant.

-*Brands;* Robitussin, Anti-Tuss, Glycotuss.

- ► Indication – relieves cough due to bronchitis, sinusitis, influenza, asthma, emphysema, & other respiratory disorders.
- ► Adverse Reactions – Nausea, vomiting, diarrhea, drowsiness, & abdominal pain.
- ► Drug Interactions – may increase the risk of bleeding when take with **anticoagulants.**
    - o **PHARMACOKINETICS**

      Absorbed in **GIT tract,** metabolism by **liver**, & excreted mainly by the **kidneys.**

    - o **PHARMACODYNAMICS**

      Increase respiratory fluids to thin mucus, making it easier to clear from the airways. It also soothes the respiratory mucus membranes.