L1: Introduction to Pharmacology

Objectives: Upon completion of this lecture, student will be able to answer the following questions:

1. Why a nursing student should learn pharmacology?
2. Define: Pharmacology, Clinical Pharmacology, Drug, Therapeutics
3. What are the Clinical applications of drugs?
4. What are the nature and sources of drugs?
5. What are the different types of drug therapies?
6. What are the different names assigned to drugs?
7. Classify drugs and define a prototypical drug.
8. Describe the properties of an ideal drug.
9. Explain the therapeutic objective of drug therapy.
10. Describe the main categories of drugs.

Introduction to Pharmacology

? **Why should a nursing student learn pharmacology?**

Learning pharmacology will enhance nursing process and safeguard patient care. Nurses who are not knowledgeable about pharmacology can put patients at risk. The objectives of studying pharmacology include:

- Make a significant contribution to achieving the therapeutic goal of drug therapy.
- In order to administer medicines safely and accurately, and to monitor patients for the therapeutic and adverse effects of these medicines.
- To monitor the overall patient care plan to prevent or limit the medication errors and adverse drug events. Nurses can minimize any harm associated with medications by carrying out this task with few, if any, errors.
- To educate patients about medications, dosages and possible side effects… etc. .
- To evaluate the outcomes of the therapy delivered.

Four Basic terms in pharmacology

Pharmacology: The term **pharmacology** is derived from two Greek words: *pharmakon,* the Greek word for "*drugs, medicine* or *poison"*; and *logos*, the Greek word for "*study* or *science"*.

Thus, pharmacology is most simply defined as **"the Study of Drugs** or **the Science of Drugs"**.

Pharmacology "A branch of medical sciences that study drugs and their action on living organisms" by activating or inhibiting normal body processes (alter functions of living organisms).

Clinical Pharmacology is the study of drugs in human – includes patients as well as healthy volunteers (during new drug development).

Clinical pharmacology addresses two key concerns: the drug's effects on the body, and the body's response to the drug.

Drug − General term for any chemical substance or mixture of substances that can affect physiologic processes of a living organism.

In **pharmacology**, a drug is a chemical substance, typically of known structure, which, when administered to a living organism, produces a biological effect.

Drugs can stimulate or inhibit normal cellular functions and activities; Drugs cannot add functions and activities to the body.

Therapeutics: is the branch of medicine concerned with the proper selection and use of drugs → the use of drugs to diagnose, prevent, and treat illness or disease.

(Therapeutics also known as **Pharmacotherapy, Drug therapy)**

A **drug** used for therapeutic application also called a **medication** or **medicine.**

We will limit discussion to drugs that have therapeutic (medical or clinical) application rather than studying all drugs

Medical or Clinical application of drug (Therapeutic Application):

The use of the drugs to diagnose, prevent, and treat illness or disease or to prevent pregnancy.

1. Diagnosis of the disease (investigation)
2. Prevention of disease (as prophylaxis)
3. Treatment of disease: treat signs, symptoms, and disease processes.
   – **To cure disease:** that eliminates the disease, and the drug is withdrawn, e.g. as in bacterial and parasitic infection.
   – **Suppression of symptoms** to avoid the effects of disease without attaining cure e.g. hypertension, diabetes mellitus, and asthma, or to control symptoms (pain, cough).
4. Prevention of pregnancy (contraceptive pill)

The nature and sources of drugs:

– **Natural drug sources**

Plants
Minerals
Animals
Microorganisms

– **Synthetic drug source:**

What are Advantages of Synthetic drugs

– **Semi-synthetic drugs**

– **Biotechnology**

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

Types of drug therapies

1. **Acute therapy:**
2. **Maintenance therapy**
3. **Supplemental/replacement therapy**
4. **Palliative therapy**
5. **Supportive therapy**
6. **Prophylactic therapy**
7. **Empiric therapy**

Drug Names: There are three types of drug names:

1. The chemical name
2. The generic name
3. The trade name

Individual drugs may have several different names, but the two that are most commonly used are the generic name and the trade or brand name. To avoid confusion, it is best to use a drug's generic name because any one drug can have a number of trade names.

Example 1:

Chemical name: N-acetyl-paraaminophenol

Generic name, (nonproprietary): Acetaminophen or Paracetamol

Trade name, (proprietary): Tylenol$^®$ or Panadol$^®$

Example 2:

Chemical name: propionic acid

Generic name: ibuprofen

Trade name: Motrin$^®$, Profen$^®$

Drug Classification and prototypical drug:

Drugs classified according to

1. **Effects on particular body systems**.
2. **Therapeutic uses**
3. **Mechanism of action**

Drug prototypes: When classify drugs, it is common practice to select a single drug from a class and compare all other drugs with this representative drug.

Prototype: is the well-understood drug model with which other drugs in its representative class are compared.

Example, morphine is the prototype of opioid analgesics; penicillin is the prototype of antibacterial drugs.

By learning the characteristics of the prototype drug, you well predict the actions and adverse effects of other drugs in the same class.

For example, by knowing the effects of penicillin V, students can extend this knowledge to the other drugs in the penicillin class of antibiotics.

Properties of an ideal drug:

The most important characteristics that any drug can have are: **(No drug is ideal!)**

1. **Effectiveness**
2. **Safety**
3. **Selectivity**

Additional properties of an ideal drug

1. **Reversible action**
2. **Predictability**
3. **Ease of administration**
4. **Freedom of drug interactions**
5. **Low cost – easy to afford**
6. **Chemical stability**
7. **Possession of simple generic name**

Consequently, medications are not ideal. **(No drug is ideal!)**

No drug is safe, all drugs produce side effects. Drug responses may be difficult to predict and altered by drug interactions. Drug may be expensive, unstable, and hard to administer.

Because no drug is ideal … All members of the health care team must exercise care to promote therapeutic effects and minimize drug-induced harm … this to achieve the therapeutic objective.

Therapeutic objective of drug therapy:

The objective or a goal of drug therapy is to provide maximum benefit (beneficial effects) with minimum harm (adverse effects).

You, as a nurse have a critical responsibility in achieving the therapeutic objective.

Categories of drugs: Legal drugs are obtained either by a prescription or over the counter.

Prescription drugs

Nonprescription drugs

Self-assessment

- Why a nursing student should learn pharmacology?
- Define: Pharmacology, Clinical Pharmacology, Drug, Therapeutics
- What are the Clinical applications of drugs?
- What are the nature and sources of drugs and different types of drug therapies?
- What are the different names assigned to drugs?
- Classify drugs and define a prototypical drug.
- Describe the properties of an ideal drug.
- Explain the therapeutic objective of drug therapy

References

1. Anne Collins Abrams, Clinical Drug Therapy: Rationales for Nursing Practice, 9th ed., New York, Lippincott, 2009.

2. Richard A. Lehne, Pharmacology for Nursing Care, 8th ed., London, Saunders, 2009.