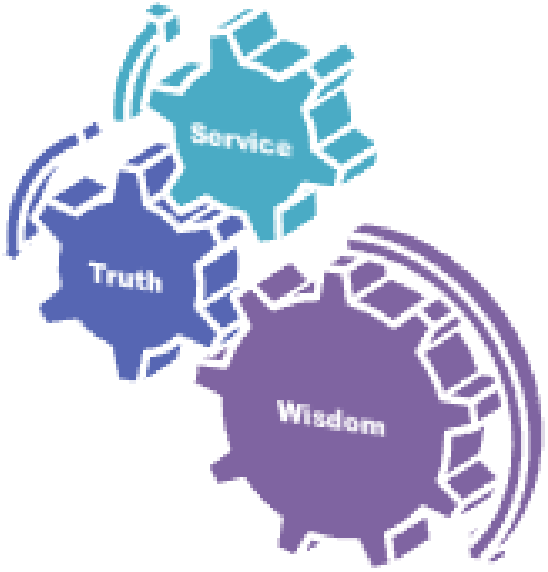

بسم الله الرحمن الرحيم

MOTTO AND VISION



- To impart evidence based research oriented medical education
- To provide best possible patient care
- To inculcate the values of mutual respect and ethical practice of medicine

FOUNDATION MODULE

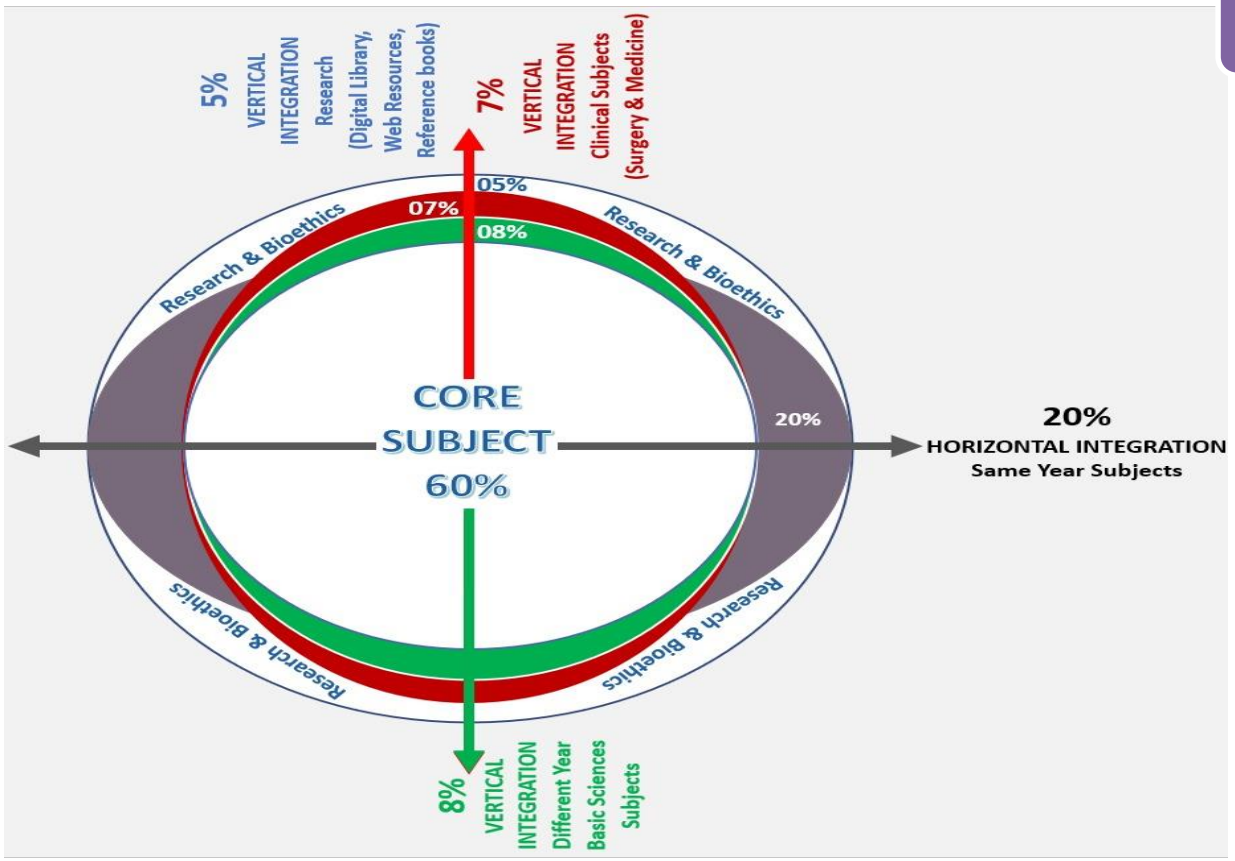
GENERAL PHARMACOLOGY

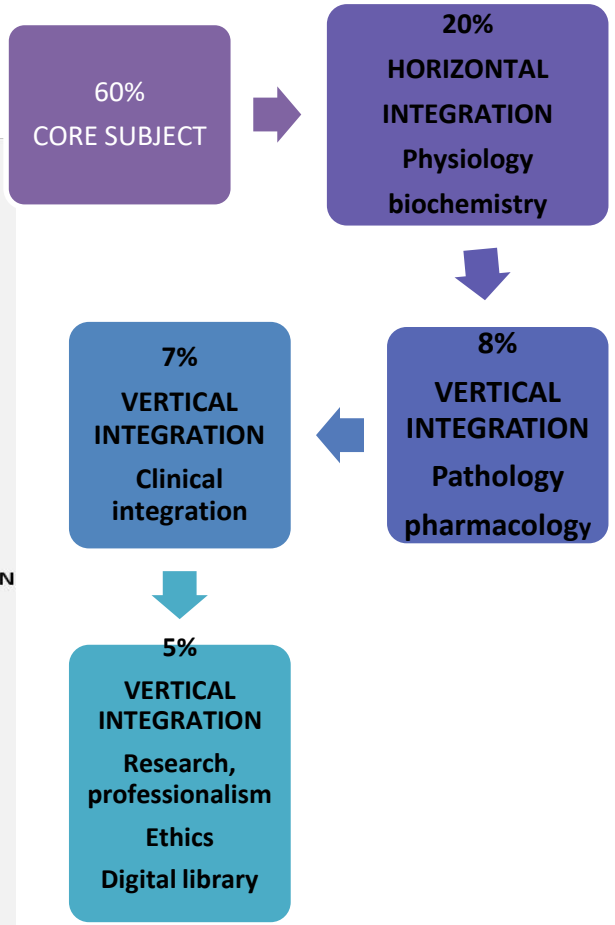
FACTORS AFFECTING ABSORPTION OF DRUGS

SOURCES:

1. BERTRAM G. KATZUNG BASIC & CLINICAL PHARMACOLOGY 16TH EDITION
2. GOODMAN AND GILMAN'S THE PHARMACOLOGICAL BASIS OF THERAPEUTICS 13TH EDITION

Professor Umar Model of Integrated Lecture



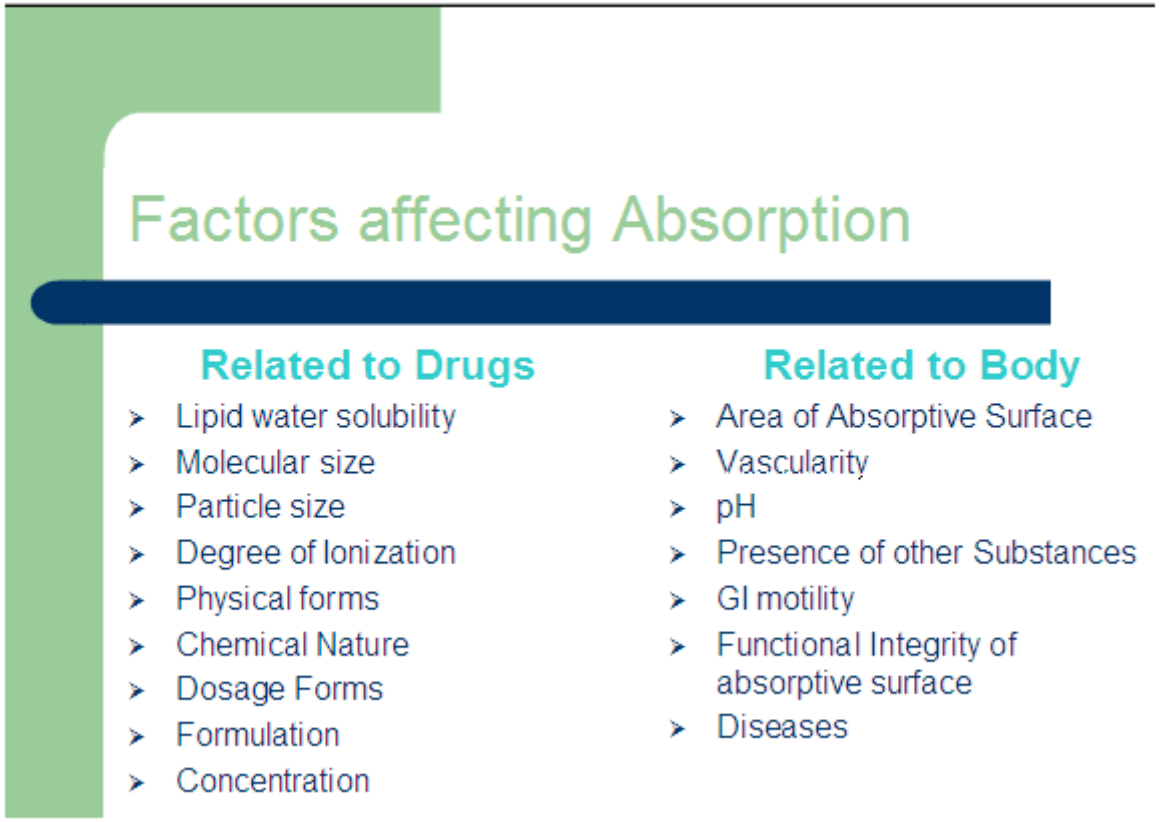


LEARNING OBJECTIVES

At the end of the session, the students should be able to

- ❑ Enlist drug and body related factors affecting drug absorption
- ❑ Briefly discuss different factors affecting absorption of drugs.

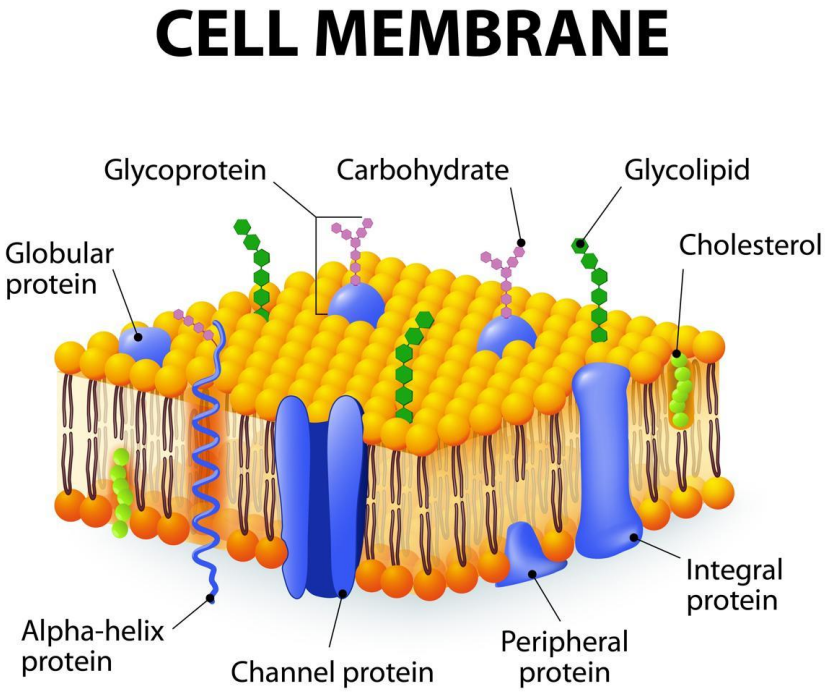
Factors Affecting Absorption



FACTORS RELATED TO DRUGS

LIPID WATER SOLUBILITY

- **Lipid water solubility coefficient** is the ratio of dissolution of drug in lipid as compared to water.
- Drugs with benzene ring, hydrocarbon chain, steroid nucleus and halogen groups in their structures are lipid soluble.



MOLECULAR SIZE

- Smaller the molecular size of the drug, rapid is the absorption.

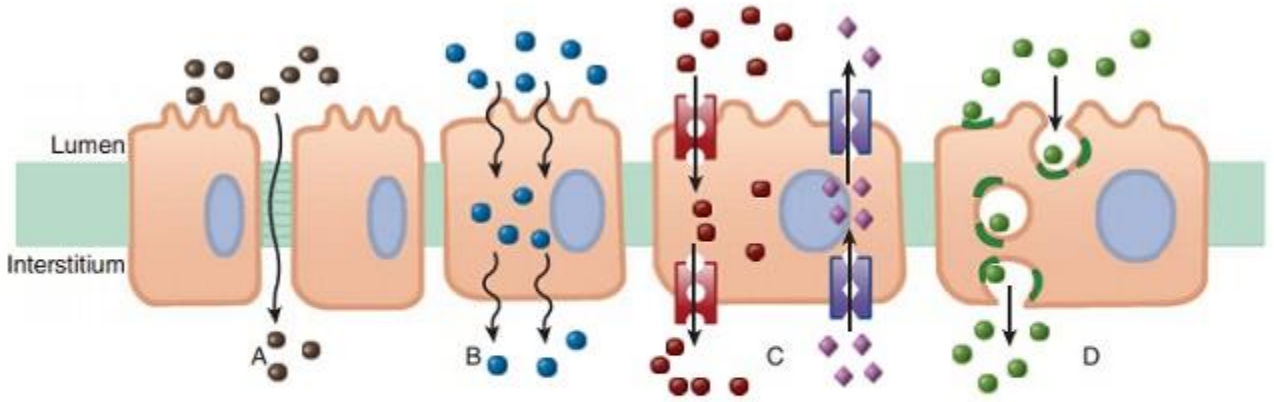


FIGURE 1–5 Mechanisms of drug permeation. Drugs may diffuse passively through aqueous channels in the intercellular junctions (eg, tight junctions, **A**), or through lipid cell membranes (**B**). Drugs with the appropriate characteristics may be transported by carriers into or out of cells (**C**). Very impermeant drugs may also bind to cell surface receptors (dark binding sites), be engulfed by the cell membrane (endocytosis), and then released inside the cell or expelled via the membrane-limited vesicles out of the cell into the extracellular space (exocytosis, **D**).

RECALL THE KNOWLEDGE OF PHYSIOLOGY

Those with smaller molecular sizes utilize aqueous diffusion or lipid channels

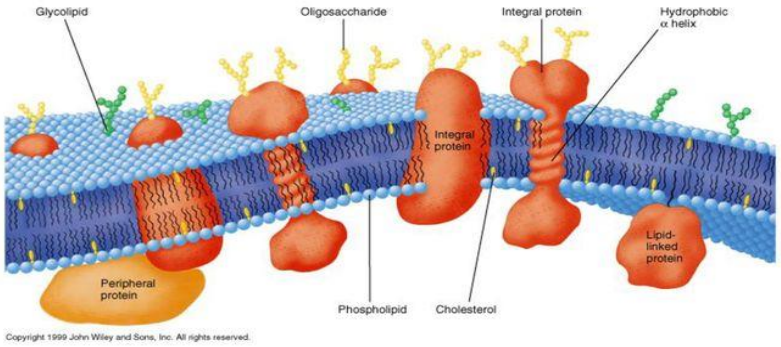
Passive diffusion

Aqueous diffusion

Drug passes through aqueous pores in biomembranes BUT these pores limited to molecular wts of <40

Lipid Diffusion

-drug if hydrophopic **and uncharged** dissolves in lipid (hydrophobic components) of biomembranes



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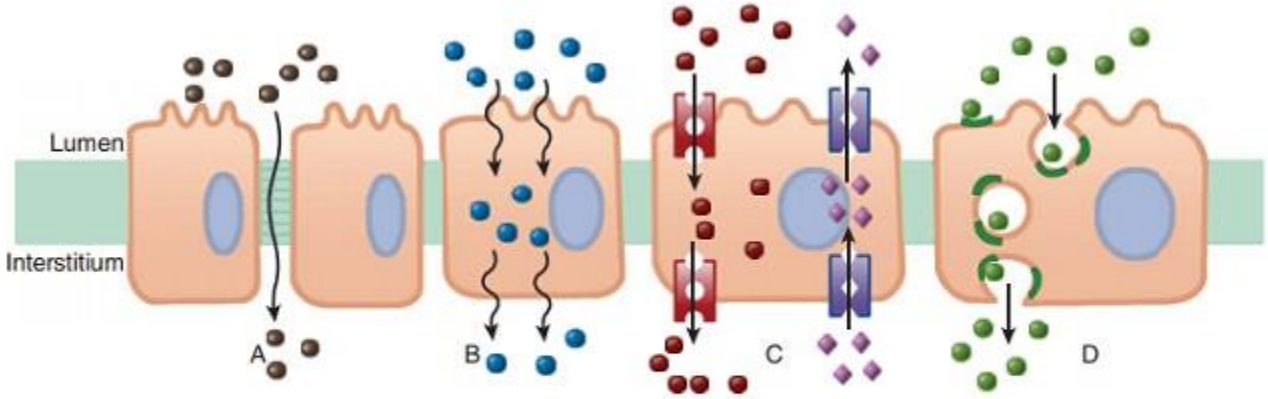
SPIRAL INTEGRATION

PARTICLE SIZE

Larger is the particle size, slower will be the diffusion and absorption and vice versa.



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SPIRAL INTEGRATION

DEGREE OF IONIZATION

- Different drugs are either
  - acidic or basic
  - ionized or unionized
- Basic drugs are better absorbed in?
- Acidic drugs are better absorbed in?

PHYSICAL FORMS

- Gases>Liquids>Solids
- so syrup or suspension form are rapidly absorbed than the tablets or capsules..
- Use of volatile gases in anesthesia

CHEMICAL NATURE

- Drugs in inorganic form are better absorbed than organic forms.

- Salt forms of drugs are better absorbed than the organic compounds.

DOSAGE FORMS

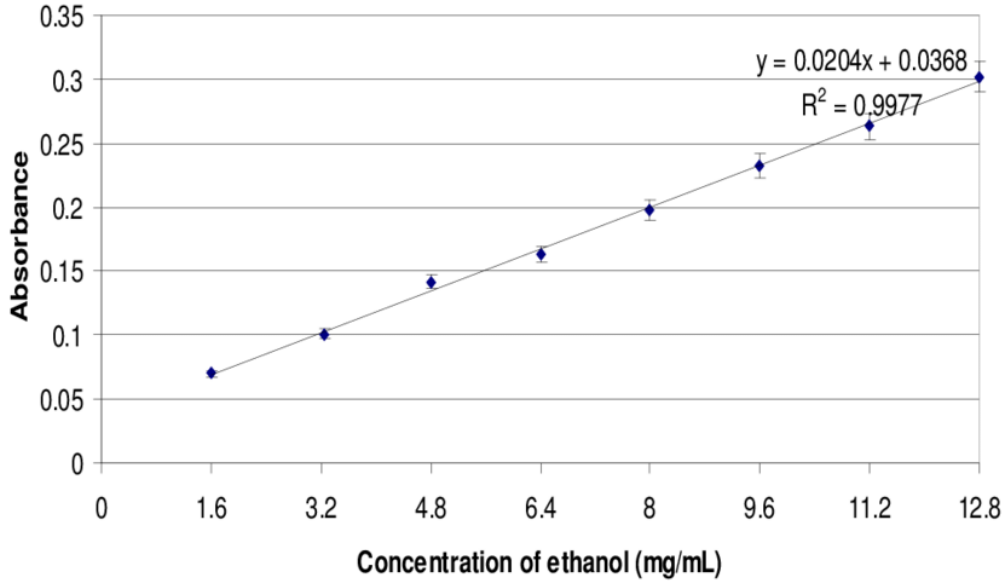
- Dosage forms affect the rate and extent of absorption.
- Example: Nitroglycerine in sublingual tablet, oral tablet and patch.

FORMULATION

- When drugs are formed some vehicles, diluents or excipients may be added
- Normally they are inert, but if they interact, they can change the bioavailability. Examples include Na+ which can interact to decrease the absorption.

CONCENTRATION

- According to Fick's law, higher the concentration more flux occurs across the membrane.



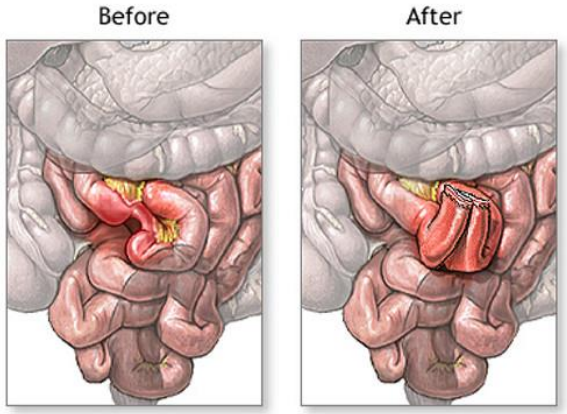
Factors Related to Body

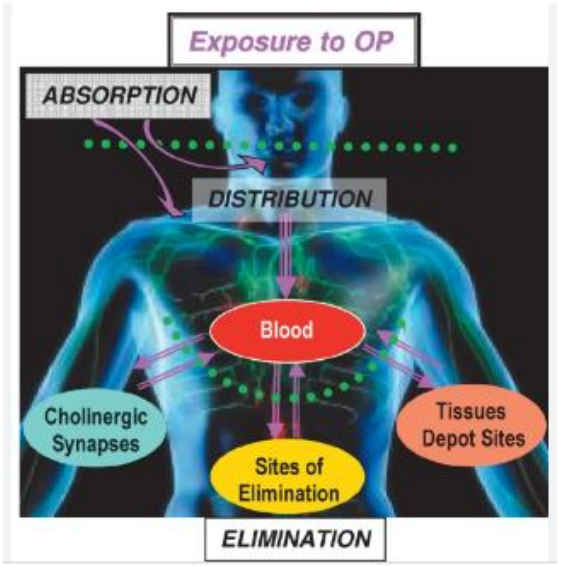
AREA OF ABSORPTIVE SURFACE

- Topical drugs applied on large area
- Intestinal surface area

CLINICAL SIGNIFICANCE

- Intestinal resection alter drug absorption.
- Organophosphate poisoning.





VASCULARITY

- Role of massage in IM injection
- Local anesthesia and vasoconstrictors
- Shock

CORE PLUS VERTICAL INTEGRATION

pH

- Acidic pH favors acidic drug absorption while basic pH is better for basic drugs.

CORE SUBJECT

PRESENCE OF OTHER SUBSTANCES

- Foods alter the rate of absorption of drug. Especially for the drugs given orally, food can increase or decrease the absorption.
- Examples
- Vitamin C enhances the absorption of iron.
- Milk decreases the absorption of tetracycline.
- Statins are better absorbed when taken with the food.
- Iron when given with milk has decreased absorption.

P-Glycoprotein

- Transmembrane transporter protein
- Increases the efflux of some drugs outside the cell
- The general function of P-glycoprotein is now known to **protect the body from harmful substances** by: Removing drugs absorbed in the intestines back into the gut lumen. Maintaining the integrity of the blood brain barrier. Removing drugs from the kidneys and liver into the urine and bile respectively.
- It is also associated with multi drug resistance

GI MOBILITY

- GI mobility must be optimal for absorption of oral drugs.
- It should be neither increased nor decreased

CORE SUBJECT

CLINICAL SIGNIFICANCE

- Excess motility causes rapid peristalsis, decreasing contact time and thus the extent of absorption is decreased.
- Decreased motility affects disintegration and dissolution

VERTICAL INTEGRATION

CLINICAL DISORDERS AFFECTING ABSORPTION OF DRUGS

- **a. Diarrhea**
- **b. Malabsorptive syndrome**
- **c. Achlorhydria**
- **d. Cirrhosis**
- **e. Emphysema**
- **f. Lipodystrophy**

RESEARCH ARTICLES

- **A Mechanistic Approach to Understanding the Factors Affecting Drug Absorption: A Review of Fundamentals**https://accp1.onlinelibrary.wiley.com/doi/abs/10.1177/009700020420060 05
- **Pulmonary drug delivery. Part I: Physiological factors affecting therapeutic effectiveness of aerosolized medications https://bpspubs.onlinelibrary.wiley.com/doi/full/10.1046/j.1365-2125.2003.01892.x**

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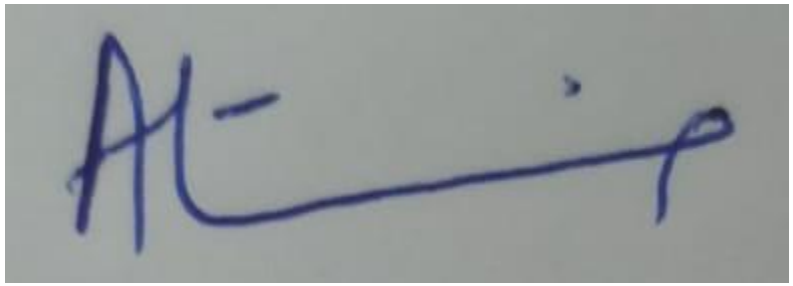
BIOETHICS

- Protect and promote the health of patients and the public
- Provide a good standard of practice and care –
- Keep your professional knowledge and skills up to date
- Recognize and work within the limits of your competence




جزاك الله خيرا