Routs of drug administration: -Different route of drug administration are**:**

- Enteral
- Parenteral
- Topical
- Inhalation

1. Enteral rout (Oral rout)

Medications are given by mouth. Include different technique of oral rout **include:**

- **Sublingual administration.**
- **Buccal administration.**

2. **Parenteral Routes:** Parenteral administration involves injecting a medication into body tissues. The following are the four major sites of parenteral injection:
   1) **Intradermal (ID):** Injection into the dermis just under the epidermis (This technique is used primarily for local anesthesia and for sensitivity tests, such as allergy and tuberculin tests.
   2) **Subcutaneous (SC):** The SC route may be used for vaccines, insulin, heparin, and narcotics.

   ** **The sites used for this route** are the upper, lateral arm; anterior thigh; abdomen; and midback above the scapula (although this last is infrequently utilized)

   3) **Intramuscular (IM):** Injection into a muscle.

   ** **The sites for IM injection** are the ventrogluteal, deltoid, rectus femoris, and vastus lateralis muscles).

   4) **Intravenous (IV):** Injection into a vein.

3. Topical Routes

Medications applied to the skin and mucous membranes (eye, ears, nose, mouth, vagina, urethra, rectum).

4. **Inhalation Route:** Administer inhaled medications through the nasal and oral passages or endotracheal or tracheostomy tubes.

❖ **Some medications are administered into body cavities. These additional routes include**

• **Intrathecal:** into subarachnoid space or one of the ventricles of the brain. (local anesthetics, antibiotics,)

• **Intraperitoneal:** into the peritoneal cavity

• **Intra-pleural:** directly into the pleural space

• **Intra-arterial**:

• **Intra-articular:** into a joint. (e.g. Corticosteroids).

Drug forms

Medications are available in variety of forms. Drug forms can be classified according to physical form into three types:

- Solid eg :tablet ،capsule.
- Liquid eg :syrup ،eye drops.
- Semi solid eg :ointment ،lotion.

Medicines (drugs)>>>> active ingredient+ excipients (vehicle).

1. **Tablet** :It is the powdered medication compressed into hard disk or cylinder.
   a. An **enteric coating** is a wax-like layer that is used on some tablets.
   b. **Sustained-release** (also called controlled-, timed-, extended-, or prolonged-release)
2. **Capsule** :Medication covered in gelatin shell.
3. **Troches,** also called **pastilles or lozenges**, are commonly used to achieve a local effect in the mouth or pharynx (throat). The drug is embedded in hard candy or another suitably flavored vehicle that the patient holds within the mouth, where it slowly dissolves. **E.g. antihistamines, and analgesics are administered this way.**
4. **Syrups** A syrup contains the drug in a sugary, sticky solution. Acetaminophen is available as a syrup
5. **Suspension:** contains finely divided drug particles dispersed in a liquid. (should be shaken before each time of use.
6. **Elixirs**: contain drugs that are in a solution of water and alcohol. E.g. Cough medicines are often available as elixirs.
7. **Powder:** Single or mixture of finely ground drugs.
8. **Suppository:** An easily melted medication preparation in a firm base such as gelatin that is inserted into the body (rectum, vagina, urethra.

ROUTE OF ADMINISTRATION	ADVANTAGES	DISADVANTAGES
Oral	Safest and most common, convenient, and economical route of administration	• Limited absorption of some drugs • Food may affect absorption • Patient compliance is necessary • Drugs may be metabolized before systemic absorption
Intravenous	Can have immediate effects • Ideal if dosed in large volumes • Suitable for irritating substances and complex mixtures • Valuable in emergency situations • Dosage titration permissible • Ideal for high molecular weight proteins and peptide drugs	• Unsuitable for oily substances • Bolus injection may result in adverse effects • Most substances must be slowly injected • Strict aseptic techniques needed
Subcutaneous	• Suitable for slow-release drugs • Ideal for some poorly soluble suspensions	• Pain or necrosis if drug is irritating • Unsuitable for drugs administered in large volumes
Intramuscular	• Suitable if drug volume is moderate • Suitable for oily vehicles and certain irritating substances • Preferable to intravenous if patient must self-administer	• Affects certain lab tests (creatine kinase) • Can be painful • Can cause intramuscular hemorrhage (precluded during anticoagulation therapy)

9. **Ointments :**are semi-solid، greasy preparations. The base is usually anhydrous and immiscible with skin secretions.
10. **Cream**: are semi-solid emulsions ،that is mixtures of oil and water
11. **Gel:** -Gels are semisolid system in which a liquid phase is constrained within a polymeric matrix.
12. Lotion 13. Patches 13. Pessary 14. Nebulizers 15. Spray 16. Eye and ear drops.

Medication order

There are many types of medication order are commonly used:

1. **A STAT order**
   It is often associated with emergency medications that are needed for life-threatening situations. The time frame between writing the order and administering the drug should be 5 minutes or less.
2. **The single order**
   is for a drug that is to be given only once and at a specific time, such as a preoperative order.
3. **A PRN order**
   from the Latin *pro re nata*, is administered *as required* by the client's condition. The nurse makes the judgment, based on client assessment, as to when such a medication is to be administered.
4. **Standing order**
   Standing order is written in advance carried out under specific circumstances. (An example is a set of postoperative PRN prescriptions that are written for all clients who have undergone a specific surgical procedure.)

Medication system

Dosages are labelled and dispensed according to their weight, quantity, or volume. Three systems of measurement are used in pharmacology:

1. **The International System of Units (SI),** the modern **metric system**, is the most common system of drug measurement.

Expressed as:

- liter **(L)** or milliliter **(mL).** or cubic centimeter **(cc)** = **1ml** (volume).
- kilograms **(kg),** grams **(g),** milligrams **(mg),** or micrograms **(mcg or µg)** (weight).

2. **Household system:** older systems of measurement. but still encountered**,** their disadvantage is their inaccuracy.

Expressed as:

A. Volume

- Drops (1ml = 15 drops)
- Teaspoon= 5ml
- Tablespoon= 15 ml
- Glass or cup= 240-250ml
- 1 quart = 4 glasses = 1 L

B. Weight

- Pounds (2.2 pounds = 1 Kg)

3. Apothecary system

It is older system. The main units used in the apothecary system include:

- grain
- scruple
- dram
- ounce
- troy pound.
- 20 grains = one scruple.
- 3 scruples = one drams.
- 8 drams = one ounces.
- 12 ounces = one troy pound.

Metric	Apothecary	Household
1 mL	15 minims	15 drops
5 mL	1 fluidram	1 teaspoon or 75 drops
15 mL	4 fluidrams	1 tablespoon or 3 teaspoons
30 mL	8 fluidrams or 1 fluid ounce	2 tablespoons
240–250 mL	8 fluid ounces (1/2 pint)	1 glass or cup
500 mL	1 pint	2 glasses or 2 cups
1 L	32 fluid ounces or 1 quart	4 glasses or 4 cups or 1 quart
1 mg	1/60 grain	—
60–64 mg	1 grain	—
300–325 mg	5 grains	—
1 g	15–16 grains	—
1 kg	—	2.2 pounds

Table illustrate the equivalents between metric, apothecary, and household units of volume and weight

Medication errors

are situations where the wrong drug or medication is prescribed or given, the medication is improperly administered, or an incorrect dosage or protocol is used.

❖ Types of medication errors:

Wrong patient
Wrong drug
Wrong route
Wrong time
Wrong dose
Omitted dose
Wrong dosage form
Wrong diluent
Wrong strength/concentration
Wrong infusion rate
Wrong technique (dispensing a drug after its expiration date)

❖ Reduction of medication errors:

The 10 rights and **three checks of drug administration** help **to ascertain client safety and drug effectiveness.**

1. Right drug
2. Right client
3. Right dose
4. Right route of administration
5. Right time of delivery and frequency
6. Right documentation
7. Right history and assessment
8. Drug approach and right to refuse
9. Right drug-drug interaction and evaluation
10. Right education and information

1. When removing the drug from the medication drawer, refrigerator, or controlled substance locker
2. When preparing the drug, pouring it, taking it out of the unit dose container, or connecting the intravenous (IV) tubing to the bag
3. Immediately before administering the drug to the client