Content of Drug Calculation

Introduction

An important part of nurse's role is to ensure that drug dose is calculated and administered appropriately. This includes administering oral medications and intravenous infusions.

Metric System: It is the international system of weights and measures based on meter and gram. It was introduced by Talleyrand. Later it was modified to include meter, kilogram, second (time) and ampere (electricity). Units of metric system are related and rationally derived. It is simpler easier and more accurate to use. Therefore metric system is the most commonly used and widely accepted system of weights and measures. In metric system, the standard unit of measuring weight or mass is kilogram (kg).

When it is needed to use the decimal, it is necessary to be careful so that no mistake is made. Therefore smaller units may be used to avoid decimal. Example: 200mg instead of 0.2 gm.

Units of Capacity (Volume): The standard unit of measuring volume is liter.

Domestic measure: These measures are used to measure the doses of liquids at home. Common domestic measures and their accepted equivalents are teaspoonful, tablespoon, drops and ml.

Imperial system: Imperial system is an old system and is based on units which are not related. It is divided into 2 systems:

1. Avoirdupois system: the standard unit of this system is pound
2. Apothecaries system: also known as troy system is grain.

Percentage solutions and calculations: Percentage solution is the solution in which specific quantity of solute is dissolved in a definite volume of solvent to obtain a solution of definite strength and percentage.

Percentage solutions are of three types:

1. Weight in volume solution (W/V)
2. Weight in weight solution (W/W)
3. Volume by volume solution (V/V)

Weight in volume solution (W/V): In pharmacy, percentage solutions of solids and liquids are generally dispensed as W/V solutions.

Formula: 1% W/V solution means **solid** 1 part by weight is dissolved in **solvent** enough to produce 100 parts by volume of solution.

Here 1 part is not dissolved in full 100 parts because the total would be 101 parts instead of 100 parts. Therefore, the right procedure is to dissolve the solid in part of the solvent and then adjust the volume to 100 ml.

Weight in weight solution (W/W): In W/W percentage solutions, both solute and solvent are taken by weight.

1% W/W solution means **solid** 1 part by weight. **Solvent** by weight to produce 100 parts of W/W solution.

Solutions of liquids in solids and solids in solids are usually made W/W solutions.

Volume by volume (V/V) solutions: In V/V percentage solution, both the solute and solvent are taken by volume.

Formula: 1% V/V solution is **solute** 1 part by volume. **Solvent** to produce 100 parts by volume. This means 1 ml of solute is dissolved in sufficient amount of solvent to produce 100 ml of solution.

Converting metric units:

- 1 gram = 1000 milligram
- 1 milligram = 1000 micrograms
- 1 litre = 1000 millilitres
- 1 mega unit = 1,000,000 units
- 2.2 Ibs = 1 kg
- 30 ml = 1 oz
- 1 tsp = 5 ml
- 1 tbsp = 15 ml 2 tbsp = 1 oz

Dilution and strengths of solutions:

A drug when dissolved in a solution and the strength of the solution may be expressed as:

- grams per liter
- mg/ml
- ratio strength
- percentage

Drug dose calculation formula:

a) Volume or number of tablets to be given.

$$\frac{\text{Dose required}}{\text{Available dose}} \times \begin{matrix}\text{volume of stock solution or} \\ \text{number of tablets/capsules}\end{matrix}$$

b) Calculating drops per minute

$$\frac{\text{Volume to be given (mls)} \times \text{drip factor}}{\text{Time (hours)} \times 60 \text{ min}}$$

c) Calculating time required to complete an infusion

$$\frac{\text{Volume to be given (mls)} \times \text{drip factor}}{\text{rate (drops/min)} \times 60 \text{ min}}$$

d) Calculating millilitres per hour

$$\frac{\text{Total volume (ml)}}{\text{Total time (hours)}} = \text{ml/hour}$$

e) Calculating ml/hour

$$\frac{\text{Total volume to be infused (ml)} \times \text{dose (mg)} \times 60}{\text{Total amount of drug (mg)}} = \text{ml/hour}$$

f) Drug calculation by weight

$$\frac{\text{Patient weight (kg)} \times \text{mcg/kg/min} \times 60 \text{ mins} \times \text{vol of diluent (mls)}}{\text{Total micrograms in bag}} = \text{ml/hour}$$