# Drug Calculations and Conversions

| Equivalencies | | | |
|---|---|---|---|
| Household measure | Abbreviation | Metric measure | Apothecary measure |
| 1 cup | C | 1 C = 240 cc | 8 oz |
| 1 tablespoon | T (tbs) | 1 T = 15 cc or 15 mL | |
| 1 teaspoon | t (tsp) | 1 t = 5 cc | |
| drop | gtt | depends on size of drop | |
| pound | lb | 2.2 lb = 1 kg | 1 lb. = 16 oz |

## Drug Calculations

### Common Conversions:

1 Liter = 1000 Milliliters
1 Gram = 1000 Milligrams
1 Milligram = 1000 Micrograms
1 Kilogram = 2.2 pounds

### Methods of Calculation

Any of the following three methods can be used to perform drug calculations. Select the one that works for you. It is important to practice the method that you prefer to become proficient in calculating drug dosages.

Remember: Before doing the calculation, convert units of measurement to one system.

1. **Basic Formula: Frequently used to calculate drug dosages.**

   D (Desired dose)

   H (Dose on hand)

   V (Vehicle-tablet or liquid)

   D/H x V = Amount to Give

   D = dose ordered or desired dose

   H = dose on container label or dose on hand

   V = form and amount in which drug comes (tablet, capsule, liquid)

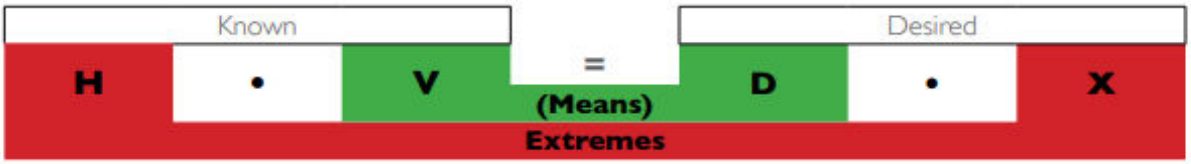
   Example:

   Order- XYZdrol 50 mg p.o. TID
   Drug available- XYZdrol 125 mg/5ml

   D=50 mg H=125 mg V=5 ml

   50/125 x 5 = 250/125 = 2 ml

II. Ratio & Proportion:




(Left side is known quantities) (Right side is desired dose & amount to give)

Multiply the means and the extremes

$$HX = DV$$
$$X = DV/H$$

Example:

Order- XYZdrol 1 gm p.o. BID
Drug available- XYZdrol 250 mg per capsule

D=1 gm (note: need to convert to milligrams) 1 gm = 1000 mg
H=250 mg
V=1 capsule

$$250 \cdot 1 = 1000 \cdot X$$
$$250X = 1000$$
$$X = \frac{1000}{250}$$
$$X = 4 \text{ capsules}$$

### III. Fractional Equation

H/V = D/X

**Cross multiply and solve for X.**

H/V = D/X
HX = DV
X = DV/H

Example:

Order - ABColol 0.25 mg p.o. QD
Drug Available – ABColol 0.125 mg per tablet

**D**=0.25 mg **H**=0.125 mg **V**=1 tablet

0.125/1 = 0.25/X
0.125X = 0.25
X = 0.25/0.125
X = 2 tablets

### IV. Intravenous Flow Rate Calculation (two methods)

**Two Step Method**

**Step 1** - Amount of fluid divided by hours to administer ml/hr

**Step 2** -

$$\frac{\text{ml/hr} \times \text{gtts/ml(IV set)}}{60 \text{ min}} = \text{gtts/min}$$

Example

**Step 1** - 1000/4 = 250

**Step 2** - 250 x 15/60 = 62.5 (62 gtts/min)

**One Step Method**

$$\frac{\text{amount of fluid} \times \text{drops/milliliter (IV set)}}{\text{hours to administer} \times \text{minutes/hour (60)}}$$

Example:

1000 ml over 4 hrs

IV set = 15 gtts/ml

1000 x 15/4 hrs x 60 = 15,000/240 = 62.5 (62 gtts/min)

## V. How to Calculate Continuous Infusions

### A. mg/min (For example - Lidocaine, Pronestyl)

$$\frac{\text{Solution cc} \times 60 \text{ min/hr} \times \text{mg/min}}{\text{Drug mg}} = \text{cc/hr}$$

$$\frac{\text{Drug mg} \times \text{cc/hr}}{\text{Solution cc} \times 60 \text{ min/hr}} = \text{mg/hr}$$

| Lidocaine & Pronestyl Rule of Thumb |
|---|
| 2 gms/250 cc D5W |
| 1 mg = 7 cc/hr<br>2 mg = 15 cc/hr<br>3 mg = 22 cc/hr<br>4 mg = 30 cc/hr |

### B. mcg/min (For example - Nitroglycerin)

$$\frac{\text{Solution cc} \times 60 \text{ min/hr} \times \text{mcg/min}}{\text{Drug mg}} = \text{cc/hr}$$

$$\frac{\text{Drug mcg} \times \text{cc/hr}}{\text{Solution cc} \times 60 \text{ min/hr}} = \text{mg/hr}$$

| Nitroglycerin Rule of Thumb |
|---|
| NTG 100 mg/250 cc<br>1 cc/hr = 6.6 mcg/min |
| NTG 50 mg/250 cc<br>1 cc/hr = 3.3 mcg/min |

### C. mcg/kg/min (For example - Dopamine, Dobutamine, Nipride, etc.)

1. To calculate cc/hr (gtts/min)

$$\frac{\text{Solution cc}}{\text{Drug mg}} \times 60 \text{ min/hr} \times \text{kg} \times \text{mcg/kg/min} = \text{cc/hr}$$

**Example:**

Dopamine 400 mg/250 cc D5W to start at 5 mcg/kg/min.
* Patient's weight is 290 lbs.

$$\frac{250 \text{ cc}}{400{,}000 \text{ mcg}} \times 60 \text{ min} \times 131.8 \times 5 \text{ mcg/kg/min} = 24.7 \text{ cc/hr}$$

2. To calculate mcg/kg/min

$$\frac{\text{Drug mcg/} \times \text{cc/hr}}{\text{Solution cc} \times 60 \text{ min/hr} \times \text{kg}} = \text{mcg/kg/min}$$

**Example: Nipride 100 mg/250 cc D5W was ordered to decrease your patient's blood pressure. The patient's weight is 221 lbs, and the IV pump is set at 30 cc/hr.**

**How many mcg/kg/min of Nipride is the patient receiving?**

$$\frac{100{,}000 \text{ mcg} \times 30 \text{ cc/hr}}{250 \text{ cc} \times 60 \text{ min} \times 100.4 \text{ kg}} = \frac{3{,}000{,}000}{1{,}506{,}000} = 1.99 \text{ mcg/kg/min}$$

## VI. How to calculate mcg/kg/min if you know the rate of the infusion

$$\frac{\text{Dosage (in mcg/cc/min) x rate on pump}}{\text{Patient's weight in kg}} = \text{mcg/kg/min}$$

**Example:**

$$\text{800mg of Dopamine in 250 cc D5W} = \frac{3200 \text{ mcg/cc}}{60 \text{ min/hr}} = 53.3 \text{ mcg/cc/min}$$

**53.3 is the dosage concentration for Dopamine in mcg/cc/min based on having 800 mg in 250 cc of IV fluid. You need this to calculate this dosage concentration first for all drug calculations.**

**Consider a 100 kg patient**

$$\frac{53.3 \text{ mcg/cc/min} \times 10 \text{ cc on pump}}{\text{Patient's weight in kg (100 kg)}} = 5.33 \text{ mcg/kg/min}$$

## VII. How to calculate drips in cc per hour when you know the mcg/kg/min that is ordered or desired

$$\frac{\text{mcg/kg/min x patient's weight in kg}}{\text{dosage concentration in mcg/cc/min}} = \text{rate on pump}$$

**Example: 800 mg Dopamine in 250 cc D5W = 53.3 mcg/cc/min**

$$\frac{3.5 \text{ mcg/kg/min} \times 100 \text{ kg}}{53.3 \text{ mcg/cc/min}} = 6.6 \text{ cc}$$

**ALWAYS WORK THE EQUATION BACKWARDS AGAIN TO DOUBLE CHECK YOUR MATH!**

**Example: 6.6 cc x 53.3 mcg/cc/min**

$$\frac{100 \text{ Kg} = 3.5 \text{ mcg/kg/min}}{100 \text{ Kg}} = 3.5 \text{ mcg/kg/min}$$

$$\frac{\text{Dosage (in mcg/cc/min) x rate on pump}}{\text{Patient's weight in kg}} = \text{mcg/kg/min}$$