

DRUG DOSE CALCULATIONS

Made ~~Easy~~ Easier

FINDING THE ORDERED DOSE

The ordered dose is the most simple dosage calculation for the prehospital care provider. In this type of problem, the paramedic is given an order to administer to a patient. There are five (5) components to locate in this type of problem: the desired dose, the concentration of the drug, volume on hand, is a weight conversion needed, and what unit to administer. Let's take a look at each of the five components and what each means.

1. THE DESIRED DOSE

The desired dose is an order from the doctor and includes the amount of the medication and should also include the route of administration. The route of administration may be subcutaneous, intramuscular, intravenous (IV), endotracheal, sublingual, intraosseous, transdermal, oral, and rectal. Orders can be verbal or written as a standing orders in your protocol. The desired dose in the example that follows is known as a *basic doctor's order*. → (2.5 mg of medication)

2. CONCENTRATION

The second item to identify is the concentration. The paramedic is given the concentration of a vial, an ampule, a prefilled syringe, or a tablet. Concentration can be listed as common fractions, percentages solutions, or by mass (e.g., grams and milligrams). Example: 10 mg/ml

3. VOLUME ON HAND

The volume on hand refers to the amount of liquid that the drug is in. In the example: 10 mg/ml, there is a 10 mg concentration of drug in **1 ml of liquid**.

4. LB TO KG

Look at the Doctor's basic order. Is it directly tied to the patient's weight? Example: Give 5 mg/kg of drug X, Patient weights 220 lb. Remember, not all drug orders are based on weight.

5. UNIT TO ADMINISTER

It is essential to look at the doctor's order and identify the unit of measurement that will be administered to the patient. Some texts refer to the unit to administer as "what you are looking for." Example: How many ml will you administer?

Desired Dose:

Concentration:

Volume on Hand:

Lb to Kg:

Looking for:

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EXAMPLE PROBLEM

Doctor orders **2.5 mg** of morphine to be administered IV to a patient with substernal chest pain. You have 1 ml vial that contains 10mg of morphine (**10 mg/ml**). How many **milliliters** are you going to have to draw up into a syringe and push IV into your patient's IV line port?

NOTE: Some problems may not ask, "How many milliliters?" You will have to deduce "milliliters" from the context of the problem.

The **KEY** to solving dosage calculation problems consistently and accurately, you must be **ORGANIZED**. Developing the habit of organization early will make drug dosage problems much-MUCH easier. So, before starting any calculations, organize all of the key components to the problem.

Desired Dose: 2.5 mg of morphine IV

Concentration: 10 mg

Volume on Hand: 1 ml

Lb to Kg: None

Looking for: ml to be given

Now that you have identified the components of the doctor's order, you can now fill-in the formula and solve the problem. There are several books and methods used to calculate drug dosages and this is what confuses most Paramedic Student, (Multiple Methods). For the purpose of this class, we will be using the **Formula Method**.

TOP

Cancel any like units (g, mg) and/or (zeros): BOTTOM

Formula #1

$$\frac{\text{Desired Dose}}{\text{Concentration}} \times \text{Volume on Hand} = \text{___ ml to be given}$$

$$\frac{2.5 \text{ mg}}{10 \text{ mg}} \times 1 \text{ ml} = \frac{2.5 \text{ ml}}{10} \text{ or } (2.5 \div 10) = \underline{0.25 \text{ ml}} \text{ to be given}$$

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FINDING THE UNITS PER KILOGRAM

Finding the units per kilogram adds a new dimension to the previous problem. Instead of the basic order, the doctor will order a certain number of units (e.g., gram, milligrams, micrograms) of the drug to be administered based on the patients weight, almost always given in kilograms. This is referred to as an order based on patient's weight. Look at the following example.

The Doctor orders **5 mg/kg** of Bretylium IV to be administered to your patient. You have premixed syringes with 500 mg/10ml. Your patient weights **176 lb**. How many milliliters will you administer?

Look at the Doctor's order again. It is directly tied to the patient's weight (5 mg/kg). Put another way, the order is saying, "For every kilogram of patient, give 5 mg of Bretylium."

First Things First!!! Convert lb to kg and then apply kg to the basic order to obtain the Desired Dose. Now, organize the other key components in the order.

Desired Dose: 400 mg → (176 lb ÷ 2.2 = 80 kg → 80 X 5 mg = 400 mg, this is the **Desired Dose**)

Concentration: 500 mg

Volume on Hand: 10 ml

Lbs to Kg: (Yes) → 176lb = 80 kg

Looking for: ml to be given

****USE THE SAME FORMULA AS BEFORE****

TOP

Cancel any like units (g, mg) and/or (zeros): BOTTOM

Formula #1

$$\frac{\text{Desired Dose} \times \text{Volume on Hand}}{\text{Concentration}} = \text{___ml to be given}$$

$$\frac{400 \text{ mg} \times 10 \text{ ml}}{500 \text{ mg}} = \frac{40 \text{ ml}}{5} = 8 \text{ ml to be given}$$

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CALCULATE AN IV DRIP INFUSION

In many cases, patients require medication to be infused on a continual base. Paramedics will receive orders to administer a certain number of units (usually milligrams or micrograms) of a medication per minute to a patient through an IV. Known as an infusion, it is also referred to as an IV drip because it involves calculating the number of drops that "drip" and are delivered intravenously each minute to deliver the amount of drug the doctor is ordering. Even though most of these IV infusions are commercially available already premixed, paramedics will be tested on mixing the medication and starting the infusion correctly without the medication being premixed.

Formula #2 The Doctor orders 2 mg/min of Lidocaine to be infused to a patient who is experiencing an arrhythmia. Your ambulance carries only 250 ml bags of D5W. You have a 60 gtt/mL microdrip setup. How many drops per minute will you adjust your administration set to drip?

Before starting any drug calculation, organize the key information just as you've been doing, but, there will be a couple of new categories in this formula and set up a little differently.

Desired Dose: 2 mg Lidocaine IV

Concentration: 1 g Lidocaine

IV Bag in ml: 250 ml D5W

Lbs to Kg: None

Admin. Setup: 60 gtt/ml

Looking for: gtt/min

$$\frac{\text{IV bag volume (ml)}}{\text{Concentration of Drug}} \times \frac{\text{Desired Dose}}{1 \text{ min}} \times \frac{\text{Admin. Setup (gtt)}}{1 \text{ ml}} = \text{gtt/min}$$

$$\frac{250 \text{ ml}}{1 \text{ g}} \times \frac{2 \text{ mg}}{1 \text{ min}} \times \frac{60 \text{ gtt}}{1 \text{ ml}} = \text{gtt/min}$$

Note: Convert the grams you mixed in the bag to match the milligrams in the Doctor's order:

$$\frac{250 \text{ ml}}{1000 \text{ mg}} \times \frac{2 \text{ mg}}{1 \text{ min}} \times \frac{60 \text{ gtt}}{1 \text{ ml}} = \frac{25}{10} \times \frac{2}{1 \text{ min}} \times \frac{6 \text{ gtt}}{1} = 300 \div 10 = 30 \text{ gtt/min}$$

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MILLILITERS PER HOUR for IV Fluids

Often, doctor's order or protocols state that you are to run an IV in milliliters per hour of over a specific period of time. To set an IV's administration set, the mL must be converted to drops per minute. This section shows how to convert that type of order. This may sound confusing but a simple conversion formula is all that is needed.

EXAMPLE PROBLEM

The Doctor orders you to start an IV of normal saline to run at **100 ml/hr**. You have a macrodrip set of **15 gtt/ml**. How many drops per minute will you set your administration set to drip?

Formula #3:

$$\frac{\text{volume to be infused}}{\text{infusion time in minute}} \times \frac{\text{drip rate}}{1\text{ml}} = \text{gtt/min}$$

$$\frac{100 \text{ ml}}{1 \text{ hr}} \times \frac{15 \text{ gtt}}{1 \text{ ml}} = \underline{\hspace{2cm}} \text{ gtt/min} \qquad \frac{100 \cancel{\text{ ml}}}{60 \text{ min}} \times \frac{15 \text{ gtt}}{1 \cancel{\text{ ml}}} = \underline{\hspace{2cm}} \text{ gtt/min}$$

$$\frac{10}{6 \text{ min}} \times \frac{15 \text{ gtt}}{1} = \frac{150 \text{ gtt}}{6 \text{ min}} = 150 \div 6 = \underline{25 \text{ gtt/min}}$$

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DRUG DOSAGE FORMULA'S

Formula #1 → Used for calculating IV push medications, (draw up into syringe)

$$\frac{\text{Desired Dose}}{\text{Concentration}} \times \text{Volume on Hand} = \text{___ ml to be given}$$

Organize The Info: Desired Dose:
Concentration:
Volume on Hand:
Lb to Kg:
Looking for:

Formula #2 → Used for calculating infusions/piggyback type drips

$$\frac{\text{IV Bag Volume (mL)}}{\text{Concentration of Drug}} \times \frac{\text{Desired Dose}}{\text{Time in (min)}} \times \frac{\text{IV Drip Set (gtt)}}{1 \text{ ML}} = \text{___ gtt/min}$$

Organize The Info: Desired Dose:
Concentration:
IV Bag in ml:
Lbs to Kg:
IV Drip Setup:
Looking for:

Formula #3 → Used for simple IV fluid flow rates, (no medications involved)

$$\frac{\text{Volume to be infused}}{\text{Time in (min)}} \times \frac{\text{IV Drip Set (gtt)}}{1 \text{ ml}} = \text{___ gtt/min}$$

NOTES: _____

