

Drug Dosage & IV Rates Calculations

Drug Dosage Calculations

Drug dosage calculations are required when the amount of medication ordered (or desired) is *different* from what is available on hand for the nurse to administer.

Formula:

$$\frac{\text{Amount DESIRED (D)}}{\text{Amount on HAND (H)}} \times \text{QUANTITY (Q)} = Y \text{ (Tablets Required)}$$

Note: When medication is given in tablets, the QUANTITY = 1 since the amount of medication available is specified per (one) tablet.

Example 1: Toprol XL, 50 mg PO, is ordered. Toprol XL is available as 100 mg per tablets. How many tablets would the nurse administer?

Step 1: Determine your givens.	Amount desired (D) = 50 mg Amount on hand (H) = 100 mg tablets Quantity = 1
Step 2: Plug in what you know into the formula and simplify.	$\frac{50 \text{ mg}}{100 \text{ mg}} \times 1 = \boxed{0.5 \text{ tablets}}$

Therefore, the nurse would administer 0.5 of a tablet.

Example 2: 1200 mg of Klor-Con is ordered. This medication is only available as 600 mg per tablet. How many tablets should the nurse give?

Step 1: Determine your givens.	Amount desired (D) = 1200 mg Amount on hand (H) = 600 mg Quantity = 1
Step 2: Plug in what you know into the formula and simplify.	$\frac{1200 \text{ mg}}{600 \text{ mg}} \times 1 = \boxed{2 \text{ tablets}}$

Therefore, the nurse should give 2 tablets.

The same formula can be used for dosage calculations where the medication is available as amount per certain volume.

In these types of calculations, the volume available on hand is the **QUANTITY**.

Example 3: Dilantin-125 is available as 125 mg/5 mL. Dilantin-125, 0.3 g PO, is ordered. How much should the nurse administer to the patient?

Step 1: Determine your givens.	Amount desired (D) = 0.3 g Amount on hand (H) = 125 mg Quantity = 5 mL
Step 2: Convert 0.3 g to mg (since the ordered dose is in grams but the drug is available on hand in milligrams).	$0.3 \text{ g} \times 1,000 \text{ mg/g} = 300 \text{ mg}$
Step 3: Plug in what you know into the formula and simplify.	$\frac{300 \text{ mg}}{125 \text{ mg}} \times 5 \text{ mL} = \boxed{12 \text{ mL}}$

Therefore, the nurse would administer 12 mL.

Example 4: Furosemide is available as 40 mg in 1 mL. 10 mg is ordered to be administered through an IV. What amount of furosemide should the nurse administer?

Step 1: Determine your givens.	Amount desired (D) = 10 mg Amount on hand (H) = 40 mg Quantity = 1 mL
Step 2: Plug in what you know into the formula and simplify.	$\frac{10 \text{ mg}}{40 \text{ mg}} \times 1 \text{ mL} = \boxed{0.4 \text{ mL}}$

Therefore, the nurse should administer 0.4 mL of furosemide.

Dosage Calculations based on Body Weight

Dosage calculations based on body weight are required when the dosage ordered and administered is dependent on the weight of the patient. For example, many pediatric drugs are ordered and given per weight (usually in kg).

Dosage calculations based on body weight are calculated in two main stages.

Stage 1: Using the formula below, calculate the total required dosage based on given the body weight.

$$\text{Weight (kg)} \times \text{Dosage Ordered (per kg)} = Y \text{ (Required Dosage)}$$

Stage 2: Apply the $\frac{D}{H} \times Q$ formula to calculate the actual amount of medication to be administered.

Example 1: Medrol 4 mg/kg is ordered for a child weighing 64.8 lb. Medrol is available as 500 mg/4mL. How many milliliters of medication must the nurse administer?

<p>Step 1: Determine your givens.</p>	<p>Weight: 64.8 lb Dosage ordered: 4mg/kg Available on hand: 500 mg/4mL</p>
<p>Step 2: Convert 64.5 lb to kg since the infant's weight is given in pounds (lb) but the dosage ordered is in mg per kilogram.</p>	<p>$64.8 \text{ lb} \div 2.2 \text{ lb/kg} = 29.45 \text{ kg}$ Therefore, the infant's weight is 29.45 kg.</p>
<p>Step 3: Calculate the required dosage (mg) of medication based on the child's weight.</p>	<p>Weight (kg) x Dosage Ordered (per kg) = Y (Required dosage) $29.45 \text{ kg} \times 4 \text{ mg/kg} = 117.8 \text{ mg}$ Therefore, the required dosage of medication is 58.64 mg.</p>
<p>Step 4: Calculate the volume of medication (mL) to be administered based on what's available on hand.</p>	$\frac{\text{Amount Desired}}{\text{Amount on Hand}} \times \text{Quantity} = \boxed{Y}$ $\frac{117.8 \text{ mg}}{500 \text{ mg}} \times 4 \text{ mL} = \boxed{0.942 \text{ mL}}$

Therefore, the nurse must administer 0.942 mL of medication.

Example 2: A doctor prescribes 250 mg of Ceftin to be taken by a 20.5 lb infant every 8 hours. The medication label indicates that 75-150 mg/kg per day is the desired dosage range. Is this doctor's order within the desired range?

<p>Step 1: Determine your givens.</p>	<p>Weight: 20.5 lb Dosage ordered: 250 mg Desired dosage range: 75-150 mg/kg</p>
<p>Step 2: Convert 20.5 lb to kg since the infant's weight is given in pounds (lb) but the medication label is in mg per kilogram.</p>	<p>$20.5 \text{ lb} \div 2.2 \text{ lb+/kg} = 9.32 \text{ kg}$</p>

<p>Step 3: Calculate the minimum and maximum dosage for a 9.32 kg infant.</p>	<p>$\text{Weight (kg)} \times \text{Dosage Ordered (per kg)} = Y$</p> <p>Minimum dosage: $9.32 \text{ kg} \times 75 \text{ mg/kg} = 699 \text{ mg}$</p> <p>Maximum dosage: $9.32 \text{ kg} \times 150 \text{ mg/kg} = 1398 \text{ mg}$</p>
<p>Step 4: Calculate the amount of medication the doctor has ordered for one day or 24 hours.</p>	<p>$24 \text{ hr} \div 8 \text{ hr} = 3$</p> <p>The doctor has ordered the medication to be given 3 times per day.</p> <p>Every dose is 250 mg.</p> <p>$250 \text{ mg} \times 3 = 750 \text{ mg}$</p> <p>Therefore, the doctor has ordered 750 mg of medication per day.</p>
<p>Step 5: Compare the total amount of medication ordered for one day to the dosage range listed on the medication label.</p>	<p>750 mg is within the desired range of 699-1398 mg since $699 < 750 < 1398$</p> <p>Therefore, the doctor has ordered a dosage within the desired range.</p>

Calculation of Intravenous Drip Rates

In these types of calculations, for a given volume, time period, and drop factor (gtts/mL), the required IV flow rate in drops per minute (gtts/min) is calculated.

Note: Since a fraction of a drop is not possible to give to a patient, it is usual to **round the answers** to the nearest whole number.

Formula:

$\frac{\text{Volume (mL)}}{\text{Time (min)}} \times \text{Drop Factor (gtts/mL)} = Y \text{ (Flow Rate in gtts/min)}$
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Example 1: Calculate the IV flow rate for 250 mL of 0.5% dextrose to be administered over 180 minutes. The infusion set has drop factor of 30 gtts/mL.

<p>Step 1: Determine your givens.</p>	<p>Volume: 250 mL</p> <p>Time: 180 min</p>
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	Drop factor: 30 gtts/mL
Step 2: Use the formula to calculate the IV flow rate. No unit conversions are required. Remember to round the final answer to the nearest whole number.	$\frac{\text{Volume (mL)}}{\text{Time (min)}} \times \text{Drop Factor} \left(\frac{\text{gtts}}{\text{mL}} \right) = Y \text{ (gtts/min)}$ $\frac{250 \text{ mL}}{180 \text{ min}} \times 30 \left(\frac{\text{gtts}}{\text{mL}} \right) = 41.66 \text{ gtts/min}$

Therefore, the IV flow rate is 42 gtts/min.

Example 2: The infusion set is adjusted for a drop factor of 15 gtts/mL. Calculate the IV flow rate if 1500 mL IV saline is ordered to be infused over 12 hours.

Step 1: Determine your givens.	Volume: 1500 mL Time: 12 hours Drop factor: 15 gtts/mL
Step 2: Convert 8 hours into minutes.	12 h x 60 min/h = 720 min
Step 3: Use the formula to calculate the IV flow rate (gtts/min).	$\frac{\text{Volume (mL)}}{\text{Time (min)}} \times \text{Drop Factor} \left(\frac{\text{gtts}}{\text{mL}} \right) = Y \text{ (gtts/min)}$ $\frac{1500 \text{ mL}}{720 \text{ min}} \times 15 \left(\frac{\text{gtts}}{\text{mL}} \right) = 31.25 \text{ gtts/min}$

Therefore, the IV flow rate is 31 gtts/min.

Calculation of Flow Rate for an Infusion Pump

Infusion pumps do not have a calibrated drop factor. The flow rate depends on the volume of fluid ordered and the time of infusion.

Formula:

$\frac{\text{Volume (mL)}}{\text{Time (h)}} = Y \text{ (Flow Rate in mL/h)}$
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Example 1: 1200 mL D5W IV is ordered to infuse in 10 hours by infusion pump. Calculate the flow rate in milliliters per hour.

Step 1: Determine your givens.	Volume: 1200 mL Time: 10 h
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Step 2: Since the volume is given in mL and the time is given in hours, the flow rate can be calculated in one step using the formula.	$\frac{\text{Volume (mL)}}{\text{Time (h)}} = Y \text{ (Flow Rate in mL /h)}$
Step 3: Use the formula to calculate the IV flow rate (gtts/min).	$\frac{1200 \text{ mL}}{10 \text{ h}} = 120 \text{ mL/h}$

Therefore, the IV flow rate is 120 mL/hr.

Example 2: 600 mL of antibiotic is to be infused over the 180 minutes by an infusion pump. Calculate the flow rate (mL per hour).

Step 1: Determine your givens.	Volume: 600 mL Time: 180 min
Step 2: Convert 180 min into hours since the flow rate must be stated in mL/h.	$180 \text{ min} \div 60 \text{ min/h} = 3 \text{ h}$
Step 3: Calculate the flow rate in mL/h using the formula.	$\frac{\text{Volume (mL)}}{\text{Time (h)}} = Y \text{ (Flow Rate in mL /h)}$ $\frac{600 \text{ mL}}{3 \text{ h}} = 200 \text{ mL/h}$

Therefore, the flow rate is 200 mL/h.