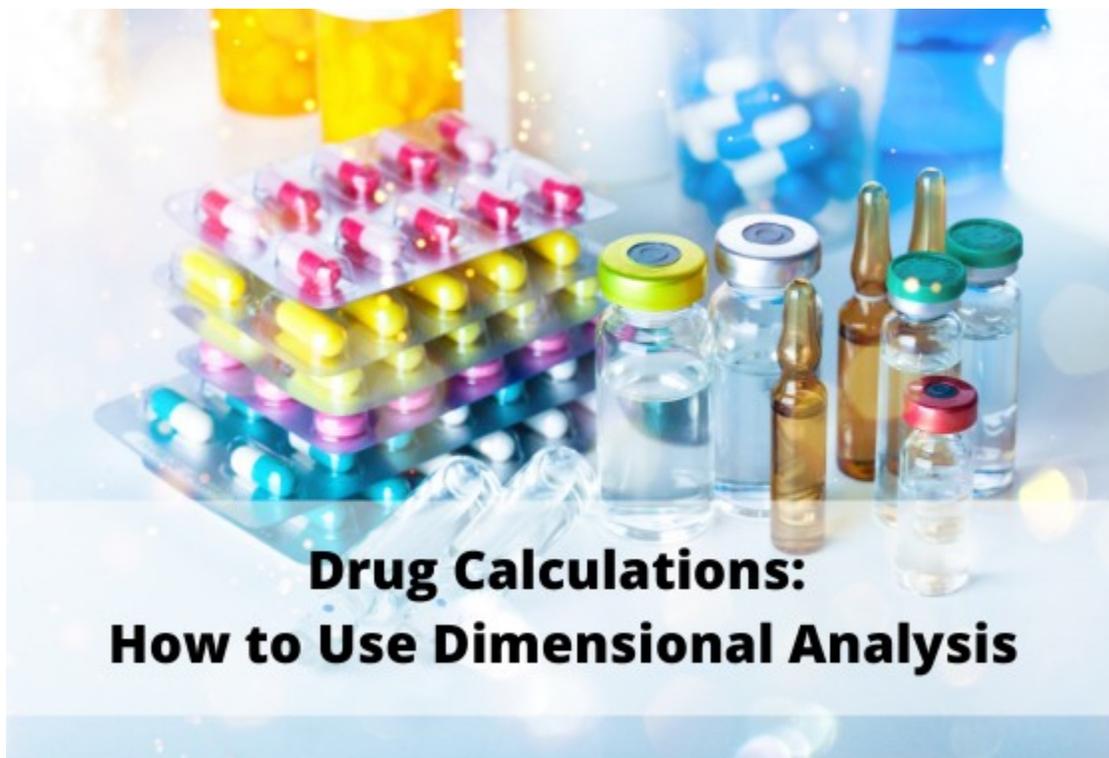


Drug Calculations: How To Use Dimensional Analysis

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In this blog series, we review several drug calculation methods. In our first blog, we discussed the universal formula, or “desired over hand” method. In Part 2, we take a look at dimensional analysis (DA) which is helpful in calculating weight-based dosing and more complex continuous intravenous (IV) infusions.

Don't forget, every nurse should be comfortable with basic metric conversions. You can find a handy conversion chart in our [Nursing Pocket Card: Common Calculations](#).

Dimensional Analysis (Cookson, 2013)

Dimensional analysis (DA) or factor-label method uses a series of conversion factors of equivalency from one system of measurement to another but doesn't require memorizing specific formulas. This method reduces errors and can be used for all dosage calculations.

1. To set up the equation, start with the label or unit of measure needed in the answer.
2. Build the equation by placing information with the same label as the preceding denominator in the numerator so that unwanted labels will cancel out. Repeat until all units of measure not needed in the answer are cancelled out.
3. Calculate to determine the correctly labeled numeric answer. Don't round any numbers in the equation until you have the final answer.

Let's take a look an example to illustrate this method.

Example: IV Dose

Administer digoxin 0.5 mg IV daily. The drug concentration available from the pharmacy is digoxin 0.25 mg/mL. How many mL will you need to administer a 0.5 mg dose?

Step 1: What unit of measure (label) is needed? Place this on the left side of the equation

mL? =

Step 2: On the right side, place the information given with the same

label needed in the numerator. In this example, we know that the drug concentration available is 0.25 mg/mL. Place mL in the numerator and 0.25 mg in the denominator.

$$\text{mL?} = \frac{\text{mL}}{0.25 \text{ mg}}$$

Step 3: The desired dose is 0.5 mg. Place information with the same label as the preceding denominator into the equation in the numerator to cancel out the unwanted labels. Repeat this step sequentially until all unwanted labels are canceled out.

$$\text{mL?} = \frac{\text{mL}}{0.25 \text{ mg}} \times 0.5 \text{ mg} =$$

Step 4. Multiply numbers across the numerator, then multiply all the numbers across the denominator. Divide the numerator by the denominator for the final answer with the correct label.

$$\text{mL?} = \frac{\text{mL}}{0.25 \text{ mg}} \times 0.5 \text{ mg} = \frac{0.5 \text{ mL}}{0.25} = 2 \text{ mL}$$

Answer: Administer 2 mL of digoxin daily.

How about giving it a try? Using the DA method, calculate the following dosage.

Administer penicillin 0.5 grams p.o. every 6 hours. The pharmacy dispenses penicillin in 250 mg tablets. How many tablets should you administer for each dose?

Please leave your answer in the comments!

These were simple examples. In the next few blogs we will go into more depth with Dimensional Analysis and work on more complex dosage calculations such IV drip rates like milliliters per hour (mL/hour), micrograms per minute (mcg/min) and micrograms per

kilogram per minute (mcg/kg/min). We'll include the answer to our question in the next blog. Keep practicing and good luck!

Remember these Tips:

- Check that your answer makes sense clinically.
- Double check your work.
- Have a colleague or pharmacist check your work.
- Know general therapeutic drug doses for commonly administered medications.

References:

Cookson, K.L. (2013). Dimensional analysis: Calculate dosages the easy way. *Nursing2013*, 43(6), 57-62.

Koharchik, L.S. & Hardy, E.C. (2013). As easy as 1, 2, 3! Dosage calculations. *Nursing Made Incredibly Easy!*, 11(1), 25 - 29.

Wilson, K.M. (2013). The nurse's quick guide to I.V. drug calculations. *Nursing Made Incredibly Easy*