Idaho Society of Health-System Pharmacists

Pharmacy Calculations Commonly Used in Prescription Drug Preparation

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Disclosures

- We have no conflicts of interest to disclose.

Learning Objectives

- Calculate common unit conversions used in pharmacy dosing
- Interpret compounding instructions and prescriptions appropriately
- Apply common pharmacy equations used in dosage calculations

Common unit coversions

- Metric scale
- Pounds to kg
- Ounces to Milliliters
- Teaspoon/tablespoon to milliliters
- Percentage strength (w/v, w/w, v/v)
- Insulin - milliliters to units

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Dimnesional Analysis

- Dimensional analysis is a mathematical tool used for converting one unit to another
- Example: I want to drive my jeep from Spokane, WA to Moab, UT for the Easter Jeep Safari, how many tanks of gas will I need to make the round trip?

- Jeep gets 8 miles/gallon
- Jeep has a 23-gallon tank
- 962 miles one way

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Dimensional Analysis

- Need tanks/trip

962 miles	2 ways	1 gallon	1 tank	
1 way	1 trip	8 miles	23 gallons	

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Dimensional Analysis

- Need tanks/trip

962 miles	2 ways	1 gallon	1 tank	10.5 tanks
1 way	1 trip	8 miles	23 gallons	trip

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The Metric Scale

Metric System Prefixes

Metric Units		Prefix	Symbol	
1,000,000,000,000	10^{12}	tera	T	
1,000,000,000	10^{9}	giga	G	
1,000,000	10^{6}	mega	M	
1,000	**10^{3}**	**kilo**	**k**	★
100	**10^{2}**	**hecto**	**h**	
10	**10**	**deka**	**da**	
				★
0.1	**10^{-1}**	**deci**	**d**	
0.01	**10^{-2}**	**centi**	**c**	
0.001	**10^{-3}**	**milli**	**m**	★
0.000001	10^{-6}	micro	μ	★
0.000000001	10^{-9}	nano	n	★
0.000000000001	10^{-12}	pico	p	

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Pounds to Kilograms

- Most weight based drugs are dosed per kilogram, but weight is often reported in pounds
- 1 kilogram equals 2.2 pounds

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A 48 year-old man weighs 187 pounds, what is his weight in kilograms?

187 lbs	1 kg	
	2.2 lbs	

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A 48 year-old man weighs 187 pounds, what is his weight in kilograms?

187 lbs	1 kg	70 kg
	2.2 lbs	

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Common Conversions

- 1 ounce has 30 mL
- 1 Teaspoon has 5 mL
- 1 Tablespoon has 15 mL

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How many milliliters are needed to complete the prescription?

- A prescription reads: Amoxicillin 200mg/5ml suspension, take 2 teaspoons PO TID for 10 days

6 teaspoons	5 ml	10 days	
1 day	1 teaspoon		

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How many milliliters are needed to complete the prescription?

- A prescription reads: Amoxicillin 200mg/5ml suspension, take 2 teaspoons PO TID for 10 days

6 teaspoons	5 ml	10 days	300 ml
1 day	1 teaspoon		

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Assessment # 1

Miralax powder is generally mixed with 4-8 ounces of juice or water for administration, how many milliliters of liquid will be used?

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Assessment # 1

Miralax powder is generally mixed with 4-8 ounces of juice or water for administration, how many milliliters of liquid will be used?

4-8 ounces	30 ml	120-240 ml
	1 ounce	

Answer: 120-240 mL

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Percentage Strength

- A number or ratio as a fraction of 100
  - W/W (g/100g)
  - W/V (g/100mL)
  - V/V (mL/100mL)
- When doing weight to volume, weight should be in grams, volume should be in milliliters
  - 1 mL of water = 1gram
- W/W and V/V the units should match in numerator and denominator

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How many milligrams of hydrocortisone and in a 30 gram tube of 2.5% hydrocortisone cream?

30 grams cream	2.5 grams hydrocortisone	1000 mg	
	100 grams cream	1 gram	

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How many milligrams of hydrocortisone and in a 30 gram tube of 2.5% hydrocortisone cream?

30 grams cream	2.5 grams hydrocortisone	1000 mg	750 mg hydrocortisone
	100 grams cream	1 gram	

Answer: 750mg hydrocortisone

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Assessment # 2

What is the percentage strength of a 1.25 liter solution that contains 80 grams of a drug?

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Assessment # 2

What is the percentage strength of a 1.25 liter solution that contains 80 grams of a drug?

- 1.25 liters = 1250 milliliters
- 80g/1250 ml X 100% = 6.4%

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Insulin

- Often comes in 100 units/mL concentrations
- There are also 200 units/ml, 300 units/ml and 500 units/ml concentrations

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Insulin

- A patient uses 15 units of Humalog/day, how many mls will be left over after 14 days if she was given a 10 mL vial of Humalog 100 units/mL?

14 days	15 units	1 mL	
	1 day	100 units	

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Insulin

- 10 ml vial – 2.1 mls used = 7.9 mls left

14 days	15 units	1 mL	2.1 mL
	1 day	100 units	

Answer: 2.1mL

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Prescription Quantity

- Uses
  - When a prescription states "quantity sufficient"
  - Calculating number of suspension bottles needed to fulfill a prescription
  - Calculating day supply
- Steps
  1. Amount (tablets, mL) for one dose (A)
  2. How many doses in one day (B)
  3. **Amount (tablets, mL) used in one day (A x B = C)**
  4. Number of days (D)
  5. **Amount needed for the entire prescription (C x D = E)**

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Amoxicillin 45mg/kg twice daily for 7 days
(Child weighs 25kg)

1. Amount per dose
   - 45mg/kg x 25kg = 1125mg
2. Number of doses per day
   - 2 doses/day
3. Amount per day
   - 1125mg/dose X 2doses/day = **2250mg/day**
4. Number of days
   - 7 days
5. Amount per prescription
   - 2250mg/day X 7 days = **15,750mg/prescription**

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What to dispense?

- Amoxicillin 125mg/5mL (80mL/bottle)
- How many mL/dose

5 mL	**1125 mg**
125mg	**Dose**

= **45mL/dose**

- How many bottles need to be dispensed

1 bottle	**5 mL**	**15, 750mg**
80 mL	**125mg**	

= 7.8 → **8 Bottles**

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Assessment # 3

Oxycodone 5mg tablet
1 to 2 tablets every 4 to 6 hours as needed for pain.
Dispense #36

How many days would this subscription last if the maximum daily tablets allowed were used?

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Assessment # 3

Oxycodone 5mg tablet
1 to 2 tablets every 4 to 6 hours as needed for pain.
Dispense #36

- How many days would this subscription last if the maximum daily tablets allowed were used?
  - 2 tablets per dose
  - Every 4 hours = 6 times per day
  - 2 x 6 = 12 tablets/day
  - 36 tablets dispensed
  - 36/12 = 3 days

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Compounding Recipes

- Compounding recipes are written to dispense a certain amount
  - Some prescriptions may call for either more or less
  - Will have to adjust the amounts in the recipe to compound the prescription

$$\frac{\text{Quantity of formula desired}}{\text{Quantity of formula specified}} = \frac{\text{Quantity of ingredient desired}}{\text{Quantity of ingredient specified}}$$

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Practice

- The following recipe makes 10 capsules
  - Drug X 5g
  - Starch 25g
- How much of Drug X is needed to make 55 capsules

$$\frac{\text{5g Drug X}}{\text{10 capsules}} = \frac{\text{??? Drug X}}{\text{55 capsules}}$$

- 5g Drug X x 55 capsules = 275
- 275/10 capsules = 27.5g Drug X
- 27.5g of Drug X are needed to make 55 capsules

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Assessment # 4

- A topical ointment calls for 45g to be dispensed.
- The recipe is as follows
  - Betamethasone 121mg
  - Alcohol 20mL
  - Propylene glycol 20mL
  - Pluronic F127 22g
  - Purified water qs 100g
- How many grams of betamethasone are needed?

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Assessment # 4

- How many grams of betamethasone are needed?

$$\frac{\text{45g desired total}}{\text{100g formula total}} = \frac{\text{??? Desired betamethasone}}{\text{121mg formula betamethasone}}$$

- 45g x 121mg = 5445
- 5445/100 = **54.45mg betamethasone needed**

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Dilutions

- Used to decrease the strength of a product
- Useful for when a prescription requests one strength but a different strength is stocked

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Dilutions

- Q1 x C1 = Q2 x C2
  - Q1 – old quantity
  - C1 – old concentration
  - Q2 – new quantity
  - C2 – new concentration
- Units must match on each side!

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Dilutions

- How many mLs of a 0.4% stock solution are required to make 2 L of a 0.06% solution, using water as the solvent

- What are our Q1, C1, Q2, C2?
  - C1 = 0.06%
  - Q1 = 2 L
  - C2 = 0.4%
  - Q2 = x mL

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Dilutions

How many mLs of a 0.4% stock solution are required to make 2 L of a 0.06% solution, using water as the solvent

- Q1 x C1 = Q2 x C2
- 2000mL x 0.06% = Q2 x 0.4%
  - 120 = Q2 x 0.4
  - 300 = Q2
- Answer = **300mL** of 0.4% stock solution
- How many mL of solvent are needed to make 0.06% stock solution
  - 2000 mL – 300 mL = **1700 mL of solvent**

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Assessment # 5

- Using 20 grams of a 9% boric acid ointment base, a technician will make a 5% ointment. How much diluent is required?

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Assessment # 5

Using 20 grams of a 9% boric acid ointment base, a technician will make a 5% ointment. How much diluent is required??

- Q1 = 20g; C1 = 9%; Q2 = X; C2 = 5%
- 20g x 9% = Q2 x 5%
  - 180 = Q2 x 5
  - Q2 = 36g of 5% ointment can be made
- 36g total – 20g already present = 16g of diluent

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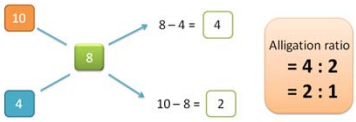
Allegation

- Used to make a new strength out of two different strengths in stock



Alligation ratio
= 4 : 2
= 2 : 1

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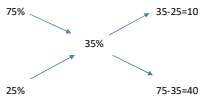
You need to make 100g of a 35% drug X cream, but you only have 25% and 75% creams in stock, how many grams of each do you need?



- 10 parts 75% cream
- 40 parts 25% cream
- 50 parts total
- 2 g/part

2 grams	10 parts 75%	20 grams 75%
1 part		

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Assessment # 6

You need to make 1500 ml of a 3% drug X solution, but you only have 15% and 1% solutions in stock, how many mls of 15% solution do you need?

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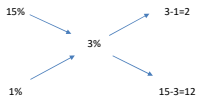
Assessment # 6

You need to make 1500 ml of a 3% drug X solution, but you only have 15% and 1% solutions in stock, how many mls of 15% solution do you need?



- 2 parts 15% solution
- 12 parts 1% solution
- 14 parts total
- 107.14 mL/part

107.14 mls	2 parts 15%	214 mLs of the 15%
1 part		

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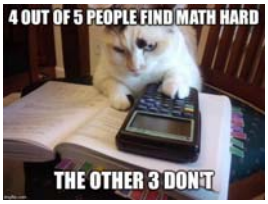
Questions?



References

- Hardy, YM. Pharmacy Calculations Review. Pharmacy Tech Topics. https://www.ichpnet.org/publications_resources/member_resources_and_toolkits/ptt/Pharmacy_Calculations_Review.pdf. (Accessed Aug 10, 2018)