Chapter 6

Calculating Oral Medication Doses

Learning Outcomes

After completing this chapter, you will be able to

1. Calculate simple problems for oral medications in solid and liquid form.
2. Calculate complex problems for oral medications in solid and liquid form.
3. Calculate doses for medications measured in milliequivalents.
4. Interpret drug labels in order to calculate doses for oral medication.
5. Calculate doses based on body weight.
6. Calculate doses based on body surface area (BSA) using a formula or a nomogram.

In this chapter you will learn how to calculate doses of oral medications in solid or liquid form. You will also be introduced to problems that utilize body weight or body surface area (BSA) to calculate dosages.
Simple Problems

In the calculations you have done in previous chapters, all the equivalents have come from standard tables, for example, 60 mg = gr 1. In this chapter, the equivalent used will depend on the strength of the drug that is available; for example 1 tab = 15 mg. In the following examples, the equivalent is found on the label of the drug container.

Medication in Solid Form

Example 6.1

The order reads Cymbalta (duloxetine HCl) 120 mg PO daily. Read the drug label shown in Figure 6.1. How many capsules of this antidepressant drug will you administer to the patient?

Convert 120 mg to capsules.

\[ 120 \text{ mg} = ? \text{ cap} \]

Cancel the milligrams and calculate the equivalent amount in capsules.

\[ \frac{120 \text{ mg}}{? \text{ mg}} \times \frac{? \text{ cap}}{? \text{ mg}} = ? \text{ cap} \]

Because the label indicates that each capsule contains 30 mg, you use the unit fraction \( \frac{1 \text{ cap}}{30 \text{ mg}} \)

\[ 120 \text{ mg} \times \frac{1 \text{ cap}}{30 \text{ mg}} = 4 \text{ cap} \]

So, you would give 4 capsules by mouth once a day to the patient.

Example 6.2

The prescriber orders Diovan (valsartan) 120 mg PO once daily for a patient with hypertension. Read the drug label shown in Figure 6.2 and determine how many tablets you would give to the patient.
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Convert 120 mg to tablets.

\[ 120 \, \text{mg} = ? \, \text{tab} \]

Cancel the milligrams and obtain the equivalent amount in tablets.

\[ 120 \, \text{mg} \times \frac{? \, \text{tab}}{? \, \text{mg}} = ? \, \text{tab} \]

Because 1 tab = 40 mg, the unit fraction is \( \frac{1 \, \text{tab}}{40 \, \text{mg}} \)

\[ \frac{3 \, \text{mg}}{1 \, \text{mg}} \times \frac{1 \, \text{tab}}{40 \, \text{mg}} = 3 \, \text{tab} \]

So, you would give 3 tablets by mouth daily to the patient.

Example 6.3

Read the label in Figure 6.3. The physician’s order is Lotrel 5 mg/20 mg PO daily. How many capsules of this antihypertensive drug should be administered per day?

Lotrel is a combination drug (see Figures 2.16 and 2.17 in Chapter 2) composed of amlodipine and benazepril; therefore, for computational purposes we need only address the first listed drug (amlodipine).

Since the order requires 5 mg of amlodipine, convert the 5 mg to capsules.

\[ 5 \, \text{mg} = ? \, \text{cap} \]

Cancel the milligrams and obtain the equivalent amount in capsules.

\[ 5 \, \text{mg} \times \frac{? \, \text{cap}}{? \, \text{mg}} = ? \, \text{cap} \]

The label indicates that 1 capsule contains 2.5 mg of amlodipine.
Therefore, the fraction is \( \frac{1 \text{ cap}}{2.5 \text{ mg}} \)

\[
\frac{2}{5} \text{ mg} \times \frac{1 \text{ cap}}{2 \times \frac{1}{5} \text{ mg}} = 2 \text{ cap}
\]

So, you would give 2 capsules by mouth daily to the patient.

**Example 6.4**

The order is codeine sulfate grain \( \frac{1}{2} \) PO q4h prn pain. The label reads gr \( \frac{1}{4} \) per tablet. How many tablets should you give a patient?

In this problem you want to convert the grain \( \frac{1}{2} \) to tablets.

\[
\text{gr} \frac{1}{2} = ? \text{ tab}
\]

Cancel the grain and determine the equivalent amount in tablets.

Because 1 tab = \( \frac{1}{4} \) gr, the fraction is \( \frac{1 \text{ tab}}{\text{gr} \frac{1}{4}} \)

\[
\frac{\text{gr} \frac{1}{2}}{\frac{1}{4}} \times \frac{1 \text{ tab}}{\text{gr} \frac{1}{4}} = \frac{1 \text{ tab}}{2} = 1 \text{ tab} \times \frac{2}{4} = 2 \text{ tab}
\]

Since 2 tablets contain grain \( \frac{1}{2} \) of codeine sulfate, you would give 2 tablets by mouth every 4 hours as necessary for pain.

**Medication in Liquid Form**

Since pediatric and geriatric patients, as well as patients with neurological conditions, may be unable to swallow medication in tablet form, sometimes oral medications are ordered in liquid form. The label states how much drug is contained in a given amount of liquid.

**Example 6.5**

The physician orders Lexapro (escitalopram oxalate) 10 mg PO once daily. Read the label in Figure 6.4 and determine the number of milliliters you would administer to the patient.

Convert 10 milligrams to milliliters.

\[
10 \text{ mg} = ? \text{ mL}
\]

Cancel the milligrams and calculate the equivalent amount in mL.

\[
10 \text{ mg} \times \frac{? \text{ mL}}{? \text{ mg}} = ? \text{ mL}
\]
Because the label indicates that every 5 mL of the solution contains 5 mg of Lexapro, use the unit fraction \( \frac{5 \text{ mL}}{5 \text{ mg}} \)

\[
10 \text{ mg} \times \frac{5 \text{ mL}}{5 \text{ mg}} = 10 \text{ mL}
\]

So, you would give 10 mL by mouth once a day to the patient.

**Example 6.6**

The physician orders Omnicef (cefdinir) 500 mg PO q12h. Read the label in Figure 6.5. Determine the number of mL you would administer to the patient.

Convert 500 milligrams to mg.

\[
500 \text{ mg} = ? \text{ mL}
\]

Cancel the milligrams and calculate the equivalent amount in milliliters.

\[
500 \text{ mg} \times \frac{? \text{ mL}}{? \text{ mg}} = ? \text{ mL}
\]
Because the label indicates that every 5 mL of the solution contains 123 mg of Omnicef, use the unit fraction \( \frac{5 \text{ mL}}{125 \text{ mg}} \):

\[
\frac{4}{500 \text{ mg}} \times \frac{5 \text{ mL}}{125 \text{ mg}} = 20 \text{ mL}
\]

So, you would give 20 mL by mouth every 12 hours to the patient.

**Medications Measured in Milliequivalents**

Some drugs are measured in milliequivalents, which are abbreviated as mEq. Pharmaceutical companies label electrolytes in milligrams as well as milliequivalents.

**Example 6.7**

The physician orders K-Tab (potassium chloride) 30 mEq PO daily. Read the label in Figure 6.6 and determine how many tablets of this electrolyte supplement you should administer.

In this problem you want to change 30 mEq to tablets.

\[
30 \text{ mEq} \rightarrow ? \text{ tab}
\]

You can do this on one line as follows:

\[
30 \text{ mEq} \times \frac{? \text{ tab}}{? \text{ mEq}} = ? \text{ tab}
\]

Because the label indicates that each tablet contains 10 mEq, the unit fraction is \( \frac{1 \text{ tab}}{10 \text{ mEq}} \):

\[
\frac{3}{30 \text{ mEq}} \times \frac{1 \text{ tab}}{10 \text{ mEq}} = 3 \text{ tab}
\]

So, you would administer 3 tablets of K-Tab by mouth once daily.
Complex Problems

Sometimes dosage calculations will require that multiplication by unit fractions be repeated one or more times. Recall that we examined complex problems in Chapter 3.

For example, if each tablet of a drug contains 2.5 mg, how many tablets would contain 0.0025 gram?

It helps to organize the information you will need for the computation as follows:

- Given quantity: 0.0025 mg
- Strength: 1 tab = 2.5 mg
- Quantity you want to find: ? tab

You do not know the direct equivalence between grams and tablets.

This is a complex problem because you need to convert 0.0025 g to milligrams and then convert milligrams to tablets.

\[
0.0025 \text{ g} \rightarrow ? \text{ mg} \rightarrow ? \text{ tab}
\]

So the problem is \(0.0025 \text{ g} = ? \text{ tab}\).

First, you want to cancel grams (g). To do this you must use an equivalence containing grams to make a unit fraction with grams in the denominator.

From the equivalence \(1 \text{ g} = 1,000 \text{ mg}\), the unit fraction is

\[
\frac{1,000 \text{ mg}}{1 \text{ g}}
\]

After the grams are cancelled, only milligrams remain on the left side.

Now you need to change the milligrams to tablets. From the strength \(2.5 \text{ mg} = 1 \text{ tab}\), the unit fraction is

\[
\frac{1 \text{ tab}}{2.5 \text{ mg}}
\]

After cancelling the milligrams, only tablets remain on the left side.

Now complete your calculation by multiplying the numbers.

\[
0.0025 \times \frac{1,000 \text{ mg}}{1 \text{ g}} \times \frac{1 \text{ (tab)}}{2.5 \text{ mg}} = 2.5 \text{ tab} = 1 \text{ tab}
\]

So, 1 tablet contains 0.0025 g.

**Example 6.8**

The physician’s order is aspirin (acetylsalicylic acid) 600 mg PO stat. The label reads gr 5 per caplet. How many caplets of this antipyretic drug should be given to the patient?
Given quantity: 600 mg  
Strength: 1 cap = gr 5  
Quantity you want to find: ? cap  

There is no direct equivalence between milligrams and caplets. This is a complex problem because you need to convert 600 mg to grains and then convert grains to caplets.

\[
600 \text{ mg} \rightarrow \text{gr} \rightarrow ? \text{ cap}
\]

First change milligrams to grains. To do this, you must use an equivalence containing milligrams to make a unit fraction with milligrams in the denominator. From the equivalence \(1 \text{ g} = 60 \text{ mg}\), the

\[
\frac{\text{gr} 1}{60 \text{ mg}}
\]

After the milligrams are cancelled, only grains remain on the left side. Now you need to change the grains to caplets. From the strength \(\text{gr} 5 = 1 \text{ cap}\), the unit fraction is \(\frac{1 \text{ cap}}{\text{gr} 5}\).

\[
600 \text{ mg} \times \frac{\text{gr} 1}{60 \text{ mg}} \times \frac{1 \text{ cap}}{\text{gr} 5} = ? \text{ cap}
\]

Now complete your calculation.

\[
\frac{10}{600 \text{ mg}} \times \frac{\text{gr} 1}{60 \text{ mg}} \times \frac{1 \text{ cap}}{\text{gr} 5} = \frac{10 \text{ cap}}{5} = 2 \text{ caplets}
\]

So, you should give 2 caplets by mouth immediately to the patient.

**Example 6.9**

The order is Diflucan (fluconazole) 0.4 gram PO daily. Read the label shown in Figure 6.7 and calculate the number of tablets of this antifungal drug that should be given to the patient.

Given quantity: 0.4 g  
Strength: 1 tab = 100 mg  
Quantity you want to find: ? tab  

In this problem you want to convert 0.4 gram to milligrams and then convert milligrams to tablets.

\[
0.4 \text{ g} \rightarrow ? \text{ mg} \rightarrow ? \text{ tab}
\]
You can do this on one line as follows:

\[
0.4 \text{ g} \times \frac{\text{mg}}{\text{g}} \times \frac{\text{tab}}{\text{mg}} = \text{tab}
\]

Because 1,000 mg = 1 g, the first unit fraction is \(\frac{1,000 \text{ mg}}{1 \text{ g}}\).

Because 100 mg = 1 tab, the second unit fraction is \(\frac{1 \text{ tab}}{100 \text{ mg}}\).

\[
0.4 \text{ g} \times \frac{1,000 \text{ mg}}{1 \text{ g}} \times \frac{1 \text{ tab}}{100 \text{ mg}} = 4 \text{ tab}
\]

So, you should give 4 tablets by mouth once a day to the patient.

**Example 6.10**

The order is Tikosyn (dofetilide) 0.5 mg PO b.i.d. Read the label shown in ●Figure 6.8. Calculate how many capsules of this antifungal drug should be given to the patient. Although there are two strengths on the label (mcg and mg), calculate the problem using microgram strength.

- **Given quantity:** 0.5 mg
- **Strength:** 1 tab = 125 mcg
- **Quantity you want to find:** ? cap

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**NOTE**

Although Example 6.10 would be simpler using the milligrams, we will do the calculation using micrograms in order to practice complex problems. For safety purposes, drug manufacturers often place both microgram and milligram concentrations on drug labels.
In this problem you want to convert 0.5 milligrams to micrograms and then convert micrograms to capsules.

\[ 0.5 \text{ mg} \rightarrow ? \text{ mcg} \rightarrow ? \text{ cap} \]

You can do this on one line as follows:

\[ 0.5 \text{ mg} \times \frac{? \text{ mcg}}{? \text{ mg}} \times \frac{1 \text{ cap}}{? \text{ mcg}} = ? \text{ cap} \]

Because 1,000 mcg = 1 mg, the first unit fraction is \( \frac{1,000 \text{ mcg}}{1 \text{ mg}} \)

Because 1 cap = 125 mcg, the second unit fraction is \( \frac{1 \text{ cap}}{125 \text{ mcg}} \)

\[ 0.5 \text{ mg} \times \frac{1,000 \text{ mcg}}{1 \text{ mg}} \times \frac{1 \text{ cap}}{125 \text{ mcg}} = 4 \text{ cap} \]

So, you should give 4 capsules by mouth twice a day to the patient.

---

**Example 6.11**

The order is Daypro (oxaprozin) 1.8 g PO once daily each morning. The drug is supplied as 600 mg per caplet. How many caplets of this anti-arthritic drug should be given the patient?

Given quantity: 1.8 g
Strength: 1 cap = 600 mg
Quantity you want to find: ? cap

In this problem you want to convert 1.8 grams to milligrams and then convert milligrams to caplets.

\[ 1.8 \text{ g} \rightarrow ? \text{ mg} \rightarrow ? \text{ cap} \]

You can do this on one line as follows:

\[ 1.8 \text{ g} \times \frac{? \text{ mg}}{? \text{ g}} \times \frac{? \text{ cap}}{? \text{ mg}} = ? \text{ cap} \]

Because 1,000 mg = 1 g, the first unit fraction is \( \frac{1,000 \text{ mg}}{1 \text{ g}} \)

Because 1 cap = 600 mg, the second unit fraction is \( \frac{1 \text{ cap}}{600 \text{ mg}} \)

\[ 1.8 \text{ g} \times \frac{1,000 \text{ mg}}{1 \text{ g}} \times \frac{1 \text{ cap}}{600 \text{ mg}} = \frac{18 \text{ cap}}{6} = 3 \text{ cap} \]

So, you should give 3 caplets by mouth to the patient once a day in the morning.
Example 6.12

The physician orders Norvir (ritonavir) 0.6 g PO q12 hours. Read the label in Figure 6.9 and determine the number of mL of this protease inhibitor your patient would receive.

Given quantity: 0.6 g
Strength: 80 mg/mL
The quantity you want to find: ? mL

In this problem you want to convert 0.6 grams to milligrams and then convert milligrams to milliliters.

\[
0.6 \text{ g} \quad \rightarrow \quad ? \text{ mg} \quad \rightarrow \quad ? \text{ mL}
\]

You can do this on one line as follows:

\[
0.6 \text{ g} \times \frac{? \text{ mg}}{? \text{ g}} \times \frac{? \text{ mL}}{? \text{ mg}} = ? \text{ mL}
\]

Because 1,000 mg = 1 g, the first unit fraction is \(\frac{1,000 \text{ mg}}{1 \text{ g}}\).

Because 1 mL = 80 mg, the second unit fraction is \(\frac{1 \text{ mL}}{80 \text{ mg}}\).

\[
0.6 \text{ g} \times \frac{1,000 \text{ mg}}{1 \text{ g}} \times \frac{1 \text{ mL}}{80 \text{ mg}} = \frac{60}{8} \text{ mL} = 7.5 \text{ mL}
\]

So, you would give 7.5 mL by mouth to the patient every 12 hours.

Example 6.13

The order is Indocin (indomethacin) 75 mg PO daily in 3 divided doses. Read the label in Figure 6.10 and determine the number of teaspoons of this antiinflammatory drug you should administer.

Given quantity: 75 mg
Strength: 25 mg per 5 mL
The quantity you want to find: ? t

In this problem you want to convert 75 milligrams to milliliters and then convert mL to teaspoons.

75 mg \(\rightarrow\) ? mL \(\rightarrow\) ? t
Calculating Dosage by Body Weight

Sometimes the amount of medication is prescribed based on the patient’s body weight. A patient who weighs more will receive a larger dose of the drug, and a patient who weighs less will receive a smaller dose of the drug.

**Example 6.14**

The prescriber orders 15 milligrams per kilogram of a drug for a patient who weighs 80 kilograms. How many milligrams of this drug should the patient receive?

Body weight: 80 kg  
Order: 15 mg/kg  
Find: ? mg

Convert body weight to dosage.

\[
\frac{80\text{ kg (of body weight)}}{? \text{ mg (of drug)}} \times \frac{? \text{ mg (of drug)}}{? \text{ kg (of body weight)}} = ? \text{ mg (of drug)}
\]

Since the order is 15 mg/kg, you use the unit fraction \(\frac{15 \text{ mg}}{1 \text{ kg}}\).

\[
80 \text{ kg} \times \frac{15 \text{ mg}}{1 \text{ kg}} = 1,200 \text{ mg}
\]

Therefore, the patient should receive 1,200 mg of the drug.

**Example 6.15**

The prescriber orders Klonopin (clonazepam) 0.05 mg/kg PO daily in three divided doses for a patient who weighs 60 kilograms. If each tablet contains 1 mg, how many tablets of this anticonvulsant drug should the patient receive per day? How many tablets would the patient receive per dose?
Body weight: 60 kg
Order: 0.05 mg/kg
Strength: 1 tab = 1 mg
Find: ? tab

When drugs are prescribed based on body weight, you generally start the problem with the weight of the patient. You first change the single unit of measurement, kilograms (kg of body weight), to another single unit of measurement, milligrams (mg of drug), and then convert the milligrams to tablets.

\[
\frac{60 \text{ kg}}{} \times \frac{\text{? mg}}{\text{kg}} \times \frac{\text{? tab}}{\text{mg}} = \text{? tab}
\]

Because the order is for 0.05 mg per kg, the first unit fraction is \(\frac{0.05 \text{ mg}}{1 \text{ kg}}\).

Since each tablet contains 1 mg, the second unit fraction is \(\frac{1 \text{ tab}}{1 \text{ mg}}\).

\[
\frac{60 \text{ kg}}{} \times \frac{0.05 \text{ mg}}{1 \text{ kg}} \times \frac{1 \text{ tab}}{1 \text{ mg}} = 3 \text{ tabs}
\]

The patient should receive 3 tablets of Klonopin by mouth per day in 3 divided doses, and therefore the patient should receive 1 tablet every 8 hours.

---

**Example 6.16**

The physician orders Biaxin (clarithromycin) 7.5 milligrams per kilogram PO b.i.d. If the drug strength is 250 milligrams per 5 mL, how many mL of this antibiotic drug should be administered to a patient who weighs 70 kilograms?

Body weight: 70 kg
Order: 7.5 mg/kg
Strength: 250 mg/5 mL
Find: ? mL

Convert body weight to dosage.

\[
\frac{70 \text{ kg}}{} \times \frac{\text{? mg}}{\text{kg}} \times \frac{\text{? mL}}{\text{mg}} = \text{? mL}
\]

Since the order specifies 7.5 mg per kg, the first fraction is \(\frac{7.5 \text{ mL}}{\text{kg}}\).

Since the strength is 250 mg per 5 mL, the second fraction is \(\frac{5 \text{ mL}}{250 \text{ mg}}\).

\[
\frac{70 \text{ kg}}{} \times \frac{7.5 \text{ mg}}{\text{kg}} \times \frac{5 \text{ mL}}{250 \text{ mg}} = 10.5 \text{ mL}
\]

The patient should receive 10.5 mL of Biaxin by mouth 2 times per day.
Calculating Dosage by Body Surface Area

In some cases, body surface area (BSA) may be used rather than weight in determining appropriate drug dosages. This is particularly true when calculating dosages for children, those receiving cancer therapy, burn patients, and patients requiring critical care. A patient’s BSA can be estimated by using formulas or nomograms.

BSA Formulas

Body surface area can be approximated by formula using either a handheld calculator or an online website. BSA, which is measured in square meters (m²), can be determined by using either of the following two mathematical formulas:

Formula for metric units:

\[ BSA = \sqrt{\frac{\text{weight in kilograms} \times \text{height in centimeters}}{3,600}} \]

Formula for household units:

\[ BSA = \sqrt{\frac{\text{weight in pounds} \times \text{height in inches}}{3,131}} \]

Example 6.17

Find the BSA of an adult who is 183 cm tall and weighs 92 kg. Because this example has metric units (kilograms and centimeters), we use the following formula:

\[ BSA = \sqrt{\frac{92 \times 183}{3,600}} \]

At this point we need a calculator with a square root key.

\[ = \sqrt{4.6767} \]

\[ = 2.16256 \]

Therefore, the BSA of this adult is 2.16 m².

Example 6.18

What is the BSA of a man who is 4 feet 10 inches tall and weighs 142 pounds?

First you convert 4 feet 10 inches to 58 inches.

NOTE

In Example 6.17, the metric formula for BSA was used, and in Example 6.18, the household formula for BSA was used. However, each formula provided the BSA measured is square meters (m²). In this book, we will round off BSA to two decimal places.
Because the example has household units (pounds and inches), we use the following formula:

\[
\text{BSA} = \sqrt{\frac{\text{weight in pounds} \times \text{height in inches}}{3,131}}
\]

\[
= \sqrt{\frac{142 \times 58}{3,131}}
\]

\[
= \sqrt{26,305}
\]

\[
= 1.62187
\]

Therefore, the BSA of this adult is 1.62 m².

### Nomograms

BSA can also be approximated by using a chart called a nomogram (Figure 6.11). The nomogram includes height, weight, and body surface area. If a straight line is drawn on the nomogram from the patient’s height (left column) to the patient’s weight (right column), the line will cross the center column at the approximate BSA of the patient. Before handheld calculators were used, the nomogram was the best tool available for determining BSA. Since electronic technology has been incorporated into most health care settings to ensure more accurate measurements, nomograms are becoming obsolete.

In Example 6.17 we used the formula to calculate the BSA of an 183 cm, 92 kg patient to be 2.16 m². Now let’s use the adult nomogram to do the same problem. In Figure 6.12, you can see that the line from 183 cm to 92 kg intersects the BSA column at about 2.20 m².

In Example 6.18, by using the formula we calculated the BSA of a 4 ft 10 in, 142 lb patient to be 1.62 m². If we use the adult nomogram to determine the BSA (Figure 6.13), we get 1.59 m².

### Example 6.19

The physician orders 40 mg/m² of a drug PO once daily. How many milligrams of the drug would you administer to an adult patient weighing 88 kg with a height of 150 cm?

The first step is to determine the BSA of the patient. This can be done by formula or nomogram.

Using the formula, you get

\[
\text{BSA} = \sqrt{\frac{88 \times 150}{3,600}}
\]

\[
= \sqrt{3.6667}
\]

\[
= 1.91 \text{ m}^2
\]

Using the adult nomogram, you get 1.81 m². So, you can use either 1.91 m² or 1.81 m² as the BSA. If you choose to use 1.81 m², you want to convert BSA to dosage in mg.

<table>
<thead>
<tr>
<th>BSA:</th>
<th>1.81 m²</th>
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<tbody>
<tr>
<td>Order:</td>
<td>40 mg/m²</td>
</tr>
<tr>
<td>Find:</td>
<td>? mg</td>
</tr>
</tbody>
</table>

\[
1.81 \text{ m}^2 = ? \text{ mg}
\]

\[
1.81 \text{ m}^2 \times \frac{? \text{ mg}}{\text{m}^2} = ? \text{ mg}
\]
### Table: Calculating Dosage by Body Surface Area

<table>
<thead>
<tr>
<th>HEIGHT (cm)</th>
<th>BODY SURFACE AREA (m²)</th>
<th>WEIGHT (kg)</th>
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</tr>
<tr>
<td>147-148</td>
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</tr>
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</table>

Figure 6.11: Adult nomogram.
Figure 6.12
Nomogram for Example 6.17.
Calculating Dosage by Body Surface Area

Figure 6.13
Nomogram for Example 6.18.
Since the order is $40 \text{ mg/m}^2$, the unit fraction is $\frac{40 \text{ mg}}{\text{m}^2}$

$$1.81 \text{ m}^2 \times \frac{40 \text{ mg}}{\text{m}^2} = 72.4 \text{ mg}$$

If you use the BSA of $1.91 \text{ m}^2$, the calculations are similar.

$$1.91 \text{ m}^2 \times \frac{40 \text{ mg}}{\text{m}^2} = 76.4 \text{ mg}$$

So, if you use $1.81 \text{ m}^2$, you would administer $72.4 \text{ mg}$. However if you use $1.91 \text{ m}^2$, you would administer $76.4 \text{ mg}$ of the drug to the patient.

**Example 6.20**

The prescriber ordered $30 \text{ mg/m}^2$ of a drug PO stat for a patient who has a BSA of $1.65 \text{ m}^2$. The “safe dose range” for this drug is 20 to 40 mg per day. Calculate the prescribed dose in milligrams and determine if it is within the safe range.

**BSA:** 1.65 m²
**Order:** 30 mg/m²
**Find:** ? mg

You want to convert the BSA of $1.65 \text{ m}^2$ to the number of milligrams ordered.

$$1.65 \text{ m}^2 = ? \text{ mg}$$

$$1.65 \text{ m}^2 \times \frac{30 \text{ mg}}{\text{m}^2} = 49.5 \text{ mg}$$

Because the order is $30 \text{ mg per m}^2$, the unit fraction is $\frac{30 \text{ mg}}{\text{m}^2}$

$$1.65 \text{ m}^2 \times \frac{30 \text{ mg}}{\text{m}^2} = 49.5 \text{ mg}$$

The safe dose range is 20–40 mg per day.

So, the dose prescribed, $49.5 \text{ mg}$, is higher than the upper limit (40 mg) of the daily “safe dose range.” Therefore, the prescribed dose is not safe, and you would not administer this drug. You would consult with the prescriber.

**Example 6.21**

The order is Trexall (methotrexate) $3.3 \text{ mg/m}^2$ PO q12h for three doses. How many scored 5 mg tablets of this antineoplastic drug would you administer to patient with a BSA of $2.29 \text{ m}^2$?

**BSA:** 2.29 m²
**Order:** 3.3 mg/m²
**Strength:** 1 tab = 5 mg
**Find:** ? tab

Convert the body surface area to tablets.

$$2.29 \text{ m}^2 \rightarrow \frac{? \text{ mg}}{\text{m}^2} \rightarrow \frac{? \text{ tabs}}{\text{mg}}$$

$$2.29 \text{ m}^2 \times \frac{\frac{? \text{ mg}}{\text{m}^2}}{\text{m}^2} \times \frac{? \text{ tab}}{? \text{ mg}} = ? \text{ tab}$$
Because the order is 3.3 mg/m², the first unit fraction is \( \frac{3.3 \text{ mg}}{m^2} \).

Because 1 scored tablet contains 5 mg, the second unit fraction is \( \frac{1 \text{ tab}}{5 \text{ mg}} \).

\[
2.29 \frac{m^2}{m^2} \times \frac{3.3 \text{ mg}}{m^2} \times \frac{1 \text{ tab}}{5 \text{ mg}} = 1.51 \text{ tabs}
\]

The patient should receive \( 1\frac{1}{2} \) scored tablets of Trexall by mouth every 12 hours for 3 doses.

**Summary**

In this chapter, you learned the computations necessary to calculate dosages of oral medications in liquid and solid form.

**Calculating doses for oral medications in solid and liquid form**
- The label states the strength of the drug (e.g., 10 mg/tab, 15 mg/mL).
- Sometimes oral medications are ordered in liquid form for special populations such as pediatrics, geriatrics, and patients with neurological conditions.
- Special calibrated droppers or oral syringes that are supplied with some liquid oral medications may be used to administer *only those medications*.
- Some drugs, such as electrolytes, are measured in milliequivalents (mEq).

**Calculating doses by body weight**
- Dosages based on body weight are generally measured in milligrams per kilogram (mg/kg).
- Start calculations with the weight of the patient.
- Medications may be prescribed by body weight in special populations such as pediatrics and geriatrics.
- It is crucial to ensure that every medication administered is within the recommended safe dosage range.

**Calculating doses by body surface area**
- Body surface area (BSA) is measured in square meters (m²).
- Start calculations with the BSA of the patient.
- BSA is determined by using either a formula or a nomogram.
- BSA may be utilized to determine dosages for special patient populations such as those receiving cancer therapy, burn therapy, and for patients requiring critical care.

---

**Case Study 6.1**

Mr. M. is a 68-year-old male patient with a past medical history of diabetes mellitus Type II and severe ischemic cardiomyopathy. He reported that for 6 weeks he had been experiencing shortness of breath and fatigue with moderate activity, difficulty sleeping at night, and has a weight gain of 5 lbs, even though he described his appetite as poor. There is no evidence of smoking or illegal drug use. Upon examination, the practitioner noted periorbital edema and bilateral 4+ pitting edema in both lower extremities. His present weight is 154 lb and his vital signs are BP 160/100, T 98.4, P 104, and R 28. Mr. M. was admitted for intravenous support and aggressive diuresis.

**His orders are as follows:**
- Complete CBC and SMA18
- Coronary angiogram; ECG; stress perfusion scan; chest X-ray.
Practice Reading Labels

Calculate the following doses using the labels shown. You will find the answers in Appendix A in the back of the book.

1. Lopressor (metoprolol) 0.05 gram = ________ tab
2. Wellbutrin (bupropion hydrochloride) 200 mg = ________ tab

3. The diuretic drug Lasix (furosemide) is available in 20 mg tablets.
   (a) How many tablets will you administer for the stat dose?
   (b) How many tablets will the patient have received within the first 20 hours?
4. How many milliequivalents of the electrolyte supplement micro-K will the patient have received after 5 days of therapy?
5. Colace (docusate sodium), a stool-softening drug, is supplied as an oral liquid, 20 mg/5 mL.
   (a) How many times a day does the patient receive this medication?
   (b) How many mL would the patient receive in two days?
6. The available strength of Ativan (lorazepam) is 1 mg/tab. How many tablets of this sedative contain the prescribed dose?
7. The cardiac drug digoxin is supplied in the following strengths: 50 mcg, 100 mcg, and 200 mcg tablets. Which combination of tablets would yield the least number of tablets that would deliver the prescribed dose?
8. Mr. M. remains hospitalized for one week.
   (a) How many milligrams of Diabinese (chlorpropamide) would he have received by the end of the first seven days?
   (b) The Diabinese is available in 250 mg scored tablets. How many tablets would Mr. M. have received by the end of the seven days?
3. Cymbalta (duloxetine HCl) 0.04 g = ____________ cap

4. Prozac (fluoxetine) 40 mg = ____________ mL

5. Ery-Tab (erythromycin) 0.666 g = ____________ cap

6. Gleevec (imatinib mesylate) 800 mg = ____________ tab

7. Symbax (olanzapine/fluoxetine) 12mg/50mg = ____________ cap

8. quinidine gluconate 20 mg = ____________ mL

9. Epivir (lamivudine) 0.6 g = ____________ tab

10. Retrovir (zidovudine) 100 mg = ____________ mL

11. Lanoxin (digoxin) 125 mcg = ____________ mL

12. Lanoxicap (digoxin) 0.2 mg = ____________ cap
13. Toprol-XL (metoprolol succinate) 0.4 g = ____________ tab

14. Plendil (felodipine SR) 5 mg = ____________ tab

15. Atacand HCT (candesartan cilexetil) 16 mg = ____________ tab

16. Prilosec (omeprazole) 80 mg = ____________ cap

17. Lopressor (metoprolol) 0.05 mg = ____________ mL

18. Lotrel (amlodipine) 5/20 mg = ____________ cap

19. Sandostatin (octreotide) 0.1 mg = ____________ mL

20. Diovan (valsartan) 0.08 g = ____________ mL

21. Norvir (ritonavir) 130 mg = ____________ mL

22. Zonegran (zonisamide) 75 mg = ____________ cap
23. Avandia (rosiglitazone) 8 g = ____________ tab

24. Lanoxin (digoxin) injection 400 mcg = ____________ mL

25. Epivir (lamivudine) 300 mg = ____________ tab

26. Valtrex (valacyclovir) 2 grams = ____________ caplets

27. Clorazil (clozapine) 150 mg = ____________ tab

28. Halcion (triazolam) 0.25 mg = ____________ tab

29. Clozaril (clozapine) 75 mg = ____________ tab

30. Vibramycin 100 mg = ____________ mL

31. Cipro (ciprofloxacin) 0.5 g = ____________ tab

32. Lithium Carbonate 900 mg = ____________ tab

33. Levitra (vardenafil) 2500 mcg = ____________ tab
34. Zometa (zoledronic acid) 4 mg = ________ mL

35. Norvasc (amlodipine) 10 mg = ________ tab

36. Detrol (tolterodine) 4 mg = ________ tab

37. Zyvox (linezolid) 400 mg = ________ mL

38. Provera (medroxyprogesterone) 20 mg = ________ tab

39. Zyvox (linezolid) 0.6 g = ________ tab

40. Zoloft (sertraline) 200 mg = ________ tab

41. Glucotrol XL (glipizide) 10 mg = ________ tab

42. Norvasc (amlodipine) 5 mg = ________ tab

43. OxyContin (oxycodone) 80 mg = ________ tab
44. Strattera (atomoxetine) 75 mg ____________ cap

45. Zithromax (azithromycin) 1,000 mg ____________ mL

46. Atarax (hydroxyzine) 50 mg ____________ tab

47. Terramycin (oxytetracycline HCl) 500 mg ____________ tab

48. Cardura (doxazosin) 16 mg ____________ tab

49. Rimadyal (carprofen) 75 mg ____________ tab

50. Biaxin (clarithromycin) 0.5 gram ____________ tab

51. Celexa (citalopram) 20 mg ____________ tab

52. naproxen 375 mg ____________ mL

53. methadone HCl 8 mg ____________ mL
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<th>Dose</th>
<th>Form</th>
<th>Note</th>
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<td>tab</td>
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</tr>
<tr>
<td>55.</td>
<td>Vistaril 75 mg</td>
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<td>56.</td>
<td>Prednisone 80 mg</td>
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<tr>
<td>57.</td>
<td>Diclofenac 100 mg</td>
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<td>tab</td>
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<tr>
<td>58.</td>
<td>Avelox (moxifloxacin HCl) 0.4 g</td>
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<tr>
<td>59.</td>
<td>Emend (aprepitant) 0.08 g</td>
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</tr>
<tr>
<td>60.</td>
<td>Crixivan (indinavir sulfate) 0.8 g</td>
<td>=</td>
<td>cap</td>
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</table>
Practice Sets

The answers to Try These for Practice, Exercises, and Cumulative Review appear in Appendix A at the end of the book. Ask your instructor for answers to the Additional Exercises.

Try These for Practice

Test your comprehension after reading the chapter.

1. The order is Accupril (quinapril HCl) 30 mg PO b.i.d.
   (a) Read the label in Figure 6.14 to determine how many tablets of this antihypertensive drug you will administer.
   (b) Express the daily dose in grams.

2. The physician orders Trexall (methotrexate) 25 mg/m² PO twice per week to treat leukemia. How many milligrams would you administer in one week if the patient is 150 centimeters tall and weighs 70 kg?

3. The physician ordered E.E.S (erythromycin ethylsuccinate) 300 mg PO q6h. Read the label in Figure 6.15. How many mL of this antibacterial drug will the patient receive in 24 hours?

4. A physician’s order reads: Lyrica (pregabalin) 50 mg PO t.i.d. The bottle contains 25-mg capsules. How many capsules of this anticonvulsive medication would you administer in 24 hours?

5. The physician orders Mellaril (thioridazine HCl) 80 mg PO t.i.d. for a patient with schizophrenia. If you have 10, 15, and 50 mg nonscored tablets to choose from, which combination of tablets would contain the exact dosage with the smallest number of tablets?
Exercises

Reinforce your understanding in class or at home.

1. Paxil (paroxetine HCl) 40 mg PO daily has been ordered for your patient. Each tablet contains 0.02 gram. How many tablets of this antidepressant will you prepare?

2. The physician prescribes 500 mcg of Baraclude (entecavir) per day via NG (nasogastric tube) for a patient with chronic hepatitis B virus infection. The oral solution contains 0.05 mg of entecavir per milliliter. How many mL of this antiviral medication would you deliver?

3. The order reads Prilosec (omeprazole) 40 mg PO once daily for 4 weeks. Read the drug label in Figure 6.16 and determine the total number of delayed-release capsules of this antacid drug you would administer to the patient over the entire treatment period.

4. The prescriber ordered Precose (acarbose) 75 mg PO t.i.d. with meals. The medication is available in 25 mg tablets. How many tablets of this α-glucosidase inhibitor (antidiabetic agent) will you give your patient in 24 hours?

5. Toprol-XL (metoprolol succinate) extended-release tablets 200 mg PO daily has been prescribed for a patient. After reading the label in Figure 6.17, how many tablets of this antihypertensive drug would the patient have received after 7 days?

6. Keftab (cephalexin) is prescribed for an elderly patient who weighs 40 kilograms. The order is 50 milligrams per kilogram PO in two equally divided doses. Each tablet contains 500 mg. How many tablets of this cephalosporin antibiotic will the patient receive per dose?
7. Zyvox (linezolid) 600 mg PO q12h has been prescribed for an elderly patient with pneumonia. Read the label in Figure 6.18 and determine how many milliliters of the antibacterial suspension you would administer.

8. A patient is scheduled to receive 0.015 g of a drug by mouth every morning. The drug is available as 7.5 mg tablets. How many tablets would you administer?

9. A patient with osteoarthritis is ordered Voltaren (diclofenac sodium) 150 mg PO per day in 3 divided doses. There are 25-milligram tablets available. How many tablets will you give in a single dose?

10. An elderly patient with depression is ordered Aventyl (nortriptyline HCl) 25 mg PO t.i.d. The label reads Aventyl Oral Solution 10 mg/5 mL. How many mL will you administer?

11. Antivert (meclizine HCl) 25 mg PO once daily for three days has been ordered for a patient with a history of motion sickness who is planning extensive traveling. Read the information on the label in Figure 6.19 and calculate the number of scored tablets that the patient will receive when the prescription is completed at the end of the three days.

12. The physician orders 7.5 mg of Tranxene SD (clorazepate dipotassium) PO t.i.d. for an elderly patient with extreme anxiety. This drug is available in 15 mg scored tablets. How many tablets would the patient receive in 24 hours?

13. A patient develops a mild skin reaction to a transfusion of a unit of packed red blood cells and is given 75 milligrams of Benadryl (diphenhydramine HCl) PO stat. The only drug strength available is 25 mg capsules. How many capsules will you give?

14. The physician orders two Tylenol #3 (codeine 30 mg, acetaminophen 300 mg) PO every 6 hours for a postpartum patient experiencing discom-
fort from afterpains. How many milligrams of acetaminophen will the patient have received by the end of the day?

15. The physician orders Detrol LA (tolterodine tartrate) 4 mg PO daily for a patient with an overactive bladder. Read the label in Figure 6.20 and determine how many tablets you will give this patient.

16. A patient with difficulty sleeping is medicated for insomnia with 0.25 g PO at bedtime of a sedative drug. The drug is available as 500 mg per scored tablet. How many tablets will you administer to your patient?

17. The physician orders Coumadin (warfarin sodium) 6.5 mg PO every other day from Monday through Sunday. How many milligrams of Coumadin will your patient receive in that week?

18. A physician is treating a patient for H. influenzae. He writes the following prescription:

\[
\text{Vantin (cefpodoxime proxetil) 200 mg PO q12h for 14 days}
\]

Read the label in Figure 6.21 and determine how many mL you will give this patient.

19. The physician orders Deltasone (prednisone) 60 mg/m² PO daily as part of the treatment protocol for a patient with leukemia.

(a) How many milligrams of this steroid drug would you administer if the patient is 5 feet 6 inches tall and weighs 140 pounds?

(b) The drug is supplied in 50 mg per tablet. How many tablets will you administer?

20. The antibiotic, Zithromax (azithromycin), is ordered to treat a patient with a bacterial exacerbation of Chronic Obstructive Pulmonary Disease (COPD). The order is:

\[
\text{Zithromax (azithromycin) 500 mg PO as a single dose on day one, followed by 250 mg once daily on days 2 through 5}
\]

How many milligrams will the patient receive by the completion of the prescription?
Additional Exercises

Now, test yourself!

1. A drug (40 mg PO daily) has been ordered for your client. Each tablet contains 0.02 grams. How many tablets of this drug will you prepare?

2. The physician ordered a drug (0.55 mg/kg PO). The patient weighs 32 kilograms. The drug is supplied with a strength of 30 mg/mL. Calculate the number of milliliters you would administer.

3. Glucophage (metformin) 850 mg PO ac breakfast and dinner has been prescribed for your client. What is the patient’s daily dose expressed in grams?

4. Prescriber’s order:

   **Micronase (glyburide) 5 mg PO with breakfast**

   Each tablet contains 2.5 mg. How many tablets will you prepare?

5. Ditropan XL (oxybutynin chloride) 20 mg per day PO for 5 days has been prescribed for a patient. Each tablet contains 5 mg. How many tablets of this anticholinergic medication will the patient receive by the end of the treatment?

6. Norvasc (amlodipine) 5 mg PO once daily for 7 days has been ordered for a patient with angina. Each tablet contains 0.0025 grams. How many tablets will you administer to this patient for the week?

7. Vasotec (enalapril maleate) 7.5 mg PO daily has been prescribed. Tablets available are 2.5 mg, 5 mg, 10 mg, and 20 mg. Which combination of tablets would yield the least number of tablets that would deliver this ACE-inhibiting antihypertensive drug?

8. Alprazolam 0.5 mg PO t.i.d. has been prescribed for your client. Read the information on the label in Figure 6.22. How many mL of this antianxiety drug will you administer to your patient?

9. A patient is to receive 0.01 g PO qhs of a drug. Each tablet contains 0.005 g. How many tablets will you administer to your patient?

10. Order:

    **Coumadin (warfarin sodium) 2.5 mg PO Monday, Wednesday, and Friday and 1 mg PO Tuesday, Thursday, Saturday, and Sunday**

    How many milligrams of Coumadin will your patient receive in one week?
11. A drug (0.5 g PO stat) has been ordered for your patient. Each tablet contains 0.25 gram. How many tablets of this drug will you give to your patient?

12. Decadron (dexamethasone) 3 mg PO q12 h has been ordered for a patient. The drug is supplied in 1.5 mg tablets. Calculate the number of tablets of this steroid that the patient will receive in 24 hours.

13. Physician’s order:

**Furosemide 80 mg PO daily**

The drug is supplied in 20 mg tablets. What would the patient’s daily dose be if it were expressed in grams?

14. Physician’s order:

**Pavabid (papaverine) 300 mg PO q12h**

Each tablet contains 0.15 g. How many tablets would you administer?

15. Prescriber’s order:

**Motrin (ibuprofen) 600 mg PO q8h for five days only**

Each caplet contains 200 mg. How many caplets will you give this patient in the 5 days?

16. The antigout medication colchicine 1.2 mg PO q1h for 8 doses has been ordered. Each tablet contains 0.6 mg. How many milligrams of colchicine will the patient receive in eight hours?

17. Physician’s order:

**Cytovene (ganciclovir) 500 mg PO q3h while awake**

The drug is available in 250 mg capsules. How many capsules will you administer?

18. The physician ordered Retrovir (zidovudine) PO, an antiyiral drug used for the treatment of CMV retinitis. The order is 160 mg/m² every 8 hours. The patient weighs 60 kg and is 140 cm in height. How many milligrams of this drug will you give the patient per day? (Use the formula for BSA.)

19. Physician’s order: Cytoxan (cyclophosphamide) 3 mg/kg twice weekly. The client weighs 148 lb. The drug is supplied in 50 mg tablets. How many tablets will you prepare?

20. Physician’s order: prednisone 40 mg PO q12h for 5 days for a patient with acute asthma. The drug is supplied in 20 mg tablets. How many tablets will you give this patient?

---

**Cumulative Review Exercises**

Review your mastery of earlier chapters.

1. Physician’s order: **atropine sulfate gr 1/150 PO now**

   Each tablet contains 0.4 mg. How many tablets will you prepare for your patient? ________
2. Lorabid (loracarbef) 400 mg PO q12h. The label reads 200 mg in 5 mL. How many mL will you give your patient? _________

3. Azithromycin 0.2 g PO has been ordered. Convert this dose to grains. _________

4. 0.4 g = _________ mg

5. 2.5 liters = _________ milliliters

6. 7 lb 11 oz = _________ g

7. 1 pint = _________ cups

8. The order reads 267 mg/m² of a drug PO. The patient weighs 72 kg and is 70 in tall. The label reads 50 mg/mL. How many mL will you administer to this patient? Use the nomogram to estimate the BSA.

9. A physician orders Tylenol (acetaminophen) 650 mg PO q8h. The label reads as follows: Each capsule contains 325 mg. How many capsules will you give this patient?

10. The order reads Tenormin (atenolol) 100 mg PO daily. Each tablet contains 0.025 g. How many tablets will you prepare?

11. The physician orders Parlodel (bromocriptine mesylate), 7.5 mg PO b.i.d. with meals. Each tablet contains 2.5 mg. How many tablets of this anti-Parkinsonian drug will you prepare?

12. A patient must receive 60 mEq of potassium chloride PO stat. Each tablet is labeled 20 mEq/tab. How many tablets will you prepare?

13. 200 mg = _________ g

14. A patient must receive Videx (didanosine) 2.2 mg/kg PO. The patient weighs 90 kg. How many tablets will the patient receive if each tablet contains 100 mg?

15. 1 t = _________ mL.