A child or a malnourished adult will generally require less medicine than an overweight patient.

Technical Math for Allied Health
Class notes
Calculating Dosages: Part II: Dosages Based on Weight and Body Surface Area (Module 8)

Keep in mind that if *not* specifically asked for a total dose (for the entire treatment) or a daily dose (for the whole day), find the single dose for problems.

We will be finding a **recommended dosage**. We might also be given a range of dosages called a **safe dosage range**. This will have a minimum and a maximum dosage assumed to be safe. If a patient order does *not* fall within this range, it is cause for concern.

Dosages Based on Weight:
It probably makes good sense to you that medicine for a child, whose weight can vary quite a lot from child to child, even within a single age group, should be based on their weight. Patients in intensive care, whose health is compromised, may also be dosed by weight. I have often thought about how, as a small woman, I could *not* possibly need the same amount of medicine as a large man.

Medicines are often labeled with "200 mg per 20 kg" or the like. This refers to the weight of the patient and provides a sliding scale for dosages.

This chart comes from https://heartlandhealth.org/dosing-charts/ and shows child dosage instructions for ibuprofen using weight. Ages are for reference only.

These dosages have conveniently been figured for each weight group. Our job will *not* be so easy as looking up a value on a table.

Many of our drug labels (given in the appendix of the 114 Book) will contain such information.

Ibuprofen (Motrin / Advil) Dosing Chart

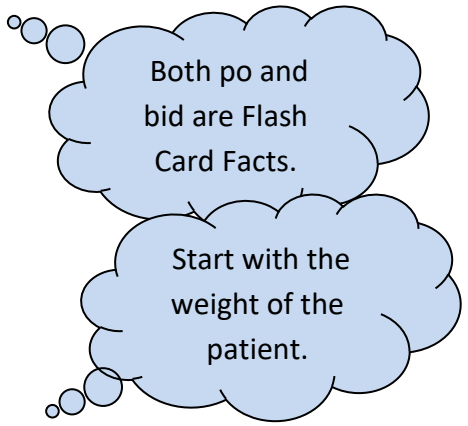
Give every 6–8 hours as needed. Use weight to determine dose. Age is for reference only. Always confirm the concentration on the bottle, measure carefully.

- **Do not give more than 4 doses in 24 hours.**
- **Do not use for babies under 6 months.**

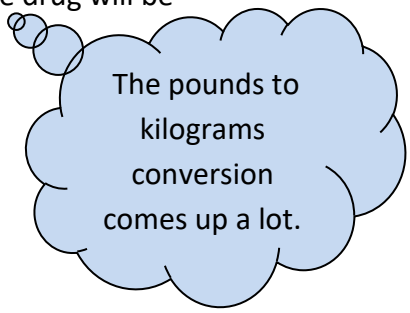
Weight (lbs)	Age	Infant Drops 50 mg/ml	Liquid 100 mg/5mL	Chewable 50 mg	Junior Strength 100 mg
12–17	Under 2	1 mL	2.5 mL	N/A	N/A
18–23	Under 2	1.5 mL	3.75 mL	N/A	N/A
24–35	2–3 years	2.5 mL	7.5 mL	2 tabs	1 tablet
36–47	4–5 years	N/A	7.5 mL	3 tabs	1.5 tablets
48–59	6–8 years	N/A	10 mL	4 tabs	2 tablets
60–71	9–10 years	N/A	12.5 mL	5 tabs	2.5 tablets
72–95	11 years	N/A	15 mL	6 tabs	3 tablets
96+	12 years+	N/A	20 mL	8 tabs	4 tablets

You also see drug strengths given in the column headings.

example 1: A patient order reads “3.5 mg/kg po bid”. The patient weighs 76 kg and the strength of the drug is 100 mg/mL. How many milliliters should you administer?



example 2: The recommended dose for sulfasalazine, an antibiotic, is 30 mg/kg/day. A patient who weighs 110 pounds is instructed to take this drug “tid”. How much of the drug will be administered in a day? How much should each dose be?



example 3: A doctor orders aztreonam 700 mg IM tid for a child who weighs 44 pounds. The manufacturer recommends a dose of 30 mg/kg q8h, *not* to exceed 120 mg/kg per day. Is this order within the safe range?

Dosages Based on Body Surface Area (BSA):

Two people can be the same weight but have dramatically different body types. Imagine a basketball player at 6 feet, 6 inches and an elderly woman who tips the scales at his same weight but is only 5 feet, 2 inches tall. Body type affects how drugs are absorbed.

Some systems will base dosages on the "ideal body weight" for a patient and *not* his or her actual weight. The office may have a chart similar to this one shown here. I got this one from https://www.inchcalculator.com/ideal-body-weight-calculator/.

Another possibility, which is what we will practice in this section, is to base dosages on a patient's **body surface area (BSA)**.

Just like how the surface area of a ball measures the amount of material needed to form the ball itself or its total area if laid flat (and *not* its volume), we will find the area of a person's skin.

Since taking a person's skin off and laying it flat is *not* an option (Medical ethics?!? Am I right?), we will settle for estimating BSA with a formula.

IDEAL BODY WEIGHT

MEN		WOMEN	
HEIGHT	WEIGHT	HEIGHT	WEIGHT
5'	106 - 124 lbs	4' 8"	80 - 105 lbs
5' 1"	112 - 127 lbs	4' 9"	85 - 108 lbs
5' 2"	118 - 130 lbs	4' 10"	90 - 111 lbs
5' 3"	124 - 133 lbs	4' 11"	95 - 114 lbs
5' 4"	130 - 136 lbs	5'	100 - 117 lbs
5' 5"	134 - 139 lbs	5' 1"	105 - 120 lbs
5' 6"	138 - 143 lbs	5' 2"	110 - 123 lbs
5' 7"	142 - 147 lbs	5' 3"	115 - 126 lbs
5' 8"	146 - 153 lbs	5' 4"	120 - 129 lbs
5' 9"	151 - 159 lbs	5' 5"	125 - 132 lbs
5' 10"	155 - 165 lbs	5' 6"	129 - 135 lbs

We have two formulas, one for metric measures and one for English measures. Due to that number on the bottom, the **units for BSA will always be meters squared, abbreviated m^2**.

$$\text{Metric BSA} = \sqrt{\frac{(\text{weight in kg})(\text{height in cm})}{3600}}$$

$$\text{English BSA} = \sqrt{\frac{(\text{weight in lb})(\text{height in inches})}{3131}}$$

A typical child has a BSA below 1.5 m^2 and an adult will range from 1.5 to 3 m^2.

We will always round BSA to the nearest hundredth (two decimal places).

example 4: Let's practice finding square roots on the calculator. Find $\sqrt{65}$ and write the answer, rounded to two decimal places. What does this number tell us about 65? In other words, what do square roots do for us?

example 5: A patient weighs 86 kg and is 166 cm tall. They must receive 30 mg/m^2 of a drug daily. What is this patient's BSA? (Round before going on.) How many milligrams should be given daily? If the strength of the drug is 2 mg/mL, how many milliliters per day are needed?

example 6: An adult patient is 6 feet, 3 inches tall. She weighs 200 lb. Her medicine, Dilantin, is prescribed at a rate of 100 mg/m^2. What is this patient's BSA? (Round before going on.) What dose should she receive?

