Lesson 3.18

Dosage Calculations

Terminal Objective:

3.18 Solve medical mathematical problems.

Enabling Objectives:

3.18.01 Compute medicine dosage using liquid weights and measures.

3.18.02 Compute medicine dosage based on a patient's weight.

3.18.03 Compute intravenous flow rates.

COMPUTING DOSAGES FOR LIQUID/WEIGHT MEASURES

Many medications are supplied in dosages different than the dose ordered. You need to be able to compute dosages accurately in order to give medications safely.

1. Liquid and Weight Conversion Formula:

$$\frac{\text{Desired Dose}}{\text{Dosage on Hand}} \times \frac{\text{Vehicle}}{1} = \text{Dosage to be Administered}$$

Desired Dose: dosage the doctor has ordered.

Dosage on Hand: dosage the drug comes in.

Vehicle: the means by which the medication is dispensed, could be tablet, capsule, or liquid.

2. Steps in Formula Conversion:

   a. Convert desired dose and dosage on hand into like terms.

   b. Divide dosage on hand into desired dose.

   c. Multiply desired dose times the vehicle.

3. Example: The medical officer ordered 650 mg of a medication. The vial contains 325 mg of the drug per 2 ml. How many milliliters should the patient receive?

650 mg is the desired dose

325 mg is the dosage the drug comes in.

2 ml is the vehicle.

a. $\frac{650 \text{ mg}}{325 \text{ mg}} \times \frac{2 \text{ ml}}{1}$

b.
$$325 \overline{)\,650}\quad 2 \text{ (desired dose)}$$
$$\underline{650}$$
$$0$$

c. 2 (desired dose)
   X 2 ml (vehicle)
   4 ml (dosage to be administered)

COMPUTING DOSAGES BASED ON PATIENT'S WEIGHT

Some medications are ordered by the patient's body weight in kilograms. Use the

following formula when you need to calculate doses by body weight.

4. Body Weight Formula:

Desired Dose =

$$\frac{\text{Patient's Weight in Pounds}}{\text{2.2 pounds/kilograms}} \times \frac{\text{Dose}}{\text{1 kilogram}}$$

1. Steps in Formula:

   a. Convert pounds to kilograms by dividing patient's weight in pounds by 2.2 pounds/kilogram.

   b. Multiply the body weight in kilograms by the dose/kilogram.

2. Example: The medical officer ordered 15 mg of a medication per kilogram of body weight. How many grams will the patient receive if he weighs 176 lbs?

   a. $\frac{176 \text{ lbs.}}{2.2}$

b. 2.2) 176.0

c. 80 kilograms
22)1760

d. 80 (kilograms)
15 mg (dose per kilogram)
1200 mg or 1.2 grams

1200 mg or 1.2 grams is the dosage to be administered.

COMPUTING INTRAVENOUS FLOW RATES

Many treatment facilities use infusion pumps to deliver IV fluids accurately. Some situations or locations do not have IV pumps. Corpsmen will calculate IV flow rates manually in those situations. A formula for IV rate calculation follows.

3. IV Rate Flow Formula:

Drops/Minute =

$$\frac{\text{mls given every hr} \times \text{Drop factor}}{\text{60 Minutes}}$$

IV tubing comes in many different sizes. That is, the internal diameter of the tubing is larger or smaller, depending on the manufacturer. Tubing size affects the number of drops required to make one ml. The manufacturer's drop factor is the number of drops required to make 1 cc. (1 cc = 1 ml) A drop factor can be found on the IV administration set package (IV tubing set.) Common drop factors are 10, 15, 20, and 60 drops per ml.

4. Calculate flow rate.

   a. Calculate ml to be given every hour.

   b. Multiply ml per hour times drop factor.

   c. Divide by 60 minutes.

5. Example: The medical officer ordered 1000 ml D5W to be infused over 10 hours. The manufacturer's drop factor is 20. How many drops per minute will be the IV flow rate?

   a. 1000 ml D5W every 10 hours = 100 ml/hour.

   b. $\frac{100 \text{ ml}}{\text{hr}} \times \frac{20 \text{ gtts}}{\text{ml}} = \frac{2000 \text{ gtts}}{\text{hr}}$

   c. $\frac{2000}{60} = 33.3$

   Or 33 gtts/minute.

WEIGHTS AND MEASURES CONVERSION TABLE

METRIC WEIGHT MEASURE

1 Kilogram (Kg)	= 100 grams (Gm) 1 Gram (Gm)
1 Gram (Gm)	= .001kilogram (Kg)
1 Gram	= 1000 milligrams (mg)
1 Milligram (mg)	= .001 gram (Gm)
1 Milligram	= 1000 Microgams (mcg)
1 Microgram (Mcg)	= .001 Milligram (mg)

METRIC FLUID MEASURE

1 Liter (L)	= 1000 milliters (ml)
1 Milliliter (ml)	= .001 liter (L)
1 Milliliter (ml)	= 1 cubic centimeter

US LIQUID MEASUREMENTS AND METRIC FLUID MEASURES

U.S. Liquid	**Metric**
1 drop (gtt)	= .06 milliliter (ml)
15 drops (gtts)	= 1 milliliter (ml)
1 teaspoon (tsp)	= 4 milliliters (ml)
1 tablespoon (Tbsp)	= 15 milliliters (ml)
1 ounce (oz)	= 30 milliliters (ml)
1 cup (c)	= 240 milliliters (ml)
1 pint	= 480 milliliters (ml)
1 quart	= 960 milliliters (ml)
4 cups (c)	= 960 milliliters (ml)

APOTHECARY WEIGHT TO METRIC SYSTEM

1 grain (gr)	= .065 gram = 65 milligrams (sometimes considedered to be 60 to 64 milligrams)

WEIGHT CONVERSION

1 kg	= 2.2 lbs

NOTES/COMMENTS

Lesson 3.18

Dosage Calculations Worksheet

1. The Medical Officer ordered 500 mg of a medication. The label indicates 250 mg of the drug per 5 ml. How many milliliters should the patient receive?

2. The Medical Officer ordered the patient to receive 1,000 mg of a medication. Each tablet contains 325 mg. How many tablets should the patient receive?

Doctor's Order	**Medication Label Reads**	**Needed**
3. Surfak 240 mg P.O.	Surfak 120 mg/tablet	_____ Tablets
4. Alupent 50 mg P.O.	Alupent 10 mg/tablets	_____ Tablets
5. Robitussin 100 mg P.O.	Robitussin 50 mg/Tbsp.	_____ ml
6. Tylenol Elixir 25 mg P.O.	Tylenol Elixir 5 mg/gtt	_____ gtts
7. Insulin 50 units SC	Insulin 100 units/ml	_____ ml

8. Convert the following patient weights from pounds to kilograms:

   a. 110 lbs = _____ kg

   b. 198 lbs = _____ kg

   c. 143 lbs = _____ Kg

9. The doctor ordered 25 mg of a medication per kilogram of body weight. The medication comes 250 mg/tablet. How many tablets should a 154 lbs patient receive? _____ Tablets

10. The doctor ordered 10 mg of a medication per kilogram of body weight. The patient weighs 242 lbs. How many grams of medication should the patient receive? _____ Grams

11. The Medical Officer ordered 5 mg of a medication per kilogram of body weight. The medication comes 10 mg/gtt. How many drops should a 22 lbs child receive?
    _____ Drops

12. The Medical Officer ordered 20 mg of a medication per kilogram of body weight. The medication comes 200 mg/ml. How many milliliters should a 187 lbs patient receive? _____ ml

	SOLUTION	INFUSING TIME	DROP FACTOR	DROPS/MINUTE
13.	1,000 ml D5W	10 hrs	15	_____
14.	1,000 ml D5NS	8 hrs	20	_____
15.	1,000 ml RL	6 hrs	10	_____
16.	1,000 ml D5 1/2NS	5 hrs	15	_____
17.	1,000 ml NS	4 hrs	10	_____
18.	1,000 ml D5W	13.3 hrs	20	_____
19.	500 ml D5NS	4 hrs	15	_____

20. Convert the following patient weights from pounds to kilograms:

    a. 220 lbs = _____ kg

    b. 176 lbs = _____ kg

    c. 66 lbs = _____ kg

    d. 150 lbs = _____ kg

    e. 264 lbs = _____ kg

    f. 198 lbs= _____ kg

21. The Medical Officer ordered 15 mg of a medication per kilogram of weight. The medication comes 300 mg/tablet. How many tablets should a 176 pound patient receive? _____ Tablets.

22. A doctor ordered 50 mg of a drug per kilogram body weight. How many milligrams should a 198 pound patient receive? _____ mg

23. The doctor ordered 50 mg of Ampicillin per kilogram of body weight. Ampicillin comes 250 mg/5 cc. How many cc's should a 44 pound child receive? _____ cc

24. The doctor ordered 50 mg of a drug per kilogram of body weight. How many grams of the medication should a 220 pound patient receive? _____ Gm

25. The doctor ordered 10 mg of a drug per kilogram of body weight. How many milligrams should a 110 pound patient receive? _____ mg

26. The Medical Officer ordered 50 mg of a medication per kilogram of body weight. Medication on hand comes 1000 mg/tablet. How many tablets should a 242 pound patient receive? _____ Tablets

27. A 65 kg patient weights_____ lbs.

	MAR Says	Medication Label Says	Needed
28.	Erythromycin 500 mg PO	Erythromycin 250 mg/tab	_____ Tablets
29.	Oretic 50 mg PO	Oretic 25 mg/tab	_____ Tablets
30.	Terbutabline Sulfate 0.25 mg SC	Terbutabline Sulfate 1 mg/ml	_____ ml
31.	Thyroid 30 mg PO	Thyroid 1/4 gr/tab	_____ Tablets
32.	Inderal 60 mg PO	Inderal 20 mg/tab	_____ Tablets
33.	Lasix 120 mg IVP	Lasix 10 mg/ml	_____ ml
34.	Polymox Suspension 250 mg PO	Polymox Suspension 125 mg/5 cc	_____ cc
35.	Ferrous S04 Drops 24 mg PO	Ferrous S04 Drops 4 mg/gtt	_____ gtt
36.	ETH 170 mg PO	ETH 85 mg/5ml	_____ ml
37.	Ephedrine75 mg PO	Ephedrine 25 mg/cap	_____ caps
38.	Sudafed Syrup 60 mg PO	Sudafed Syrup 30 mg/5 cc	_____ cc
39.	Benadryl 100 mg PO	Benadryl 25 mg/cap	_____ caps
40.	Digitoxin 0.2 mg PO	Digitoxin 0.1 mg/tab	_____ Tablets
41.	Polymox Suspension 375 mg PO	Polymox Suspension 125 mg/5 cc	_____ cc
42.	Atarax Syrup 30 mg PO	Atarax Syrup 2 mg/ml	_____ ml
43.	Morphine Sulfate 8 mg IM	Morphine Sulfate 10 mg/cc	_____ cc
44.	Dilaudid 4 mg PO	Dilaudid 1 mg/ml	_____ ml
45.	Pronestyl 500 mg PO	Pronestyl 250 mg/cap	_____ caps
46.	Procainammide 500 mg PO	Procainamide250 mg/cap	_____ caps
47.	Dalmane 30 mg PO	Dalmane 15 mg/cap	_____ caps

INTRAVENOUS FLOW RATE CLASSROOM LABORATORY

	IV Fluid Ordered by Doctor	Infusion Time	Manufacturer's Drop Factor	
1.	1,000 ml -- D5W	4 hrs	15 ml per Hour	Drops/Min
2.	1,000 ml -- D5NS	10 hrs	20 ml per Hour	Drops/Min
3.	1,000 ml -- RL	13.3 hrs	10 ml per Hour	Drops/Min
4.	1,000 ml -- D5W	5 hrs	15 ml per Hour	Drops/Min
5.	1,000 ml -- D5W	12 hrs	20 ml per Hour	Drops/Min
6.	1,000 ml -- NS	8 hrs	10 ml per Hour	Drops/Min
7.	1,000 ml -- D5NS	20 hrs	15 ml per Hour	Drops/Min
8.	1,000 ml -- RL	6 hrs	10 ml per Hour	Drops/Min
9.	1,000 ml -- D5W	13.3 hrs	20 ml per Hour	Drops/Min
10.	500 ml -- NS	5 hrs	10 ml per Hour	Drops/Min