

## Module 9 MEDICATION ADMINISTRATION

### INTRODUCTION

This module is designed to help you review the basics of medication administration. It is primarily geared toward the adult patient, although many of the same procedures also apply to children. Occasionally, differences between adults and children will be noted, but this is not intended to be a guide for pediatric medications. This module does not preclude your responsibility for knowing hospital policy concerning administration of medications.

The module contains six units, each of which has objectives, comments, self-tests and answers to the self-tests. After reading the objectives for each unit, proceed through the comments. At the end of each unit you can check your understanding of the material by taking the self-test. Check your responses to the self-tests with the answers at the end of the module. When you feel you have mastered the material in the first unit, proceed with Unit 2 and so on.

When you have successfully completed all six units, you are ready to take the final examination.

### UNIT 1 GENERAL CONSIDERATIONS

#### OBJECTIVES

Upon completion of this unit, you should be able to:

- Name the “six rights” of medication administration.
- State major considerations under each of the State major considerations under each of the “six rights.”
- Identify common abbreviations used in medication orders.
- Identify four common types of medication orders.

#### COMMENTS

There are several standard precautions that should be taken when administering medications. The first and foremost is to never consider medication administration a “routine” task. Most of the safeguards center around observing the “six rights.” Always consider:

- Am I giving the **right drug**?
- Am I giving the **right dosage**?
- Am I administering the drug to the right **patient**?
- Is this the **right route**?
- Is this the **right time**?
- Did I use the **right documentation**?

Many of us have these rules committed to memory. But are we giving each one **considerable** thought? Think about the following:

### **Right Medication**

Avoid distractions when you are setting up or checking medications. Your complete concentration is essential.

Never give any medication without a physician's order.

Each hospital differs as the procedure for checking medications. Procedures vary according to the system used. Follow hospital policy, but always check the medication administration record (MAR) or Kardex for expiration date of order, name of drug, dosage, route, time, and frequency of administration. If you question an order or are confused as to its meaning check the physician's order. Errors do occur in transferring the order from the doctor's order sheet to the MAR or Kardex. This is why it is so vital to know the actions, side effects, etc. of the drugs you administer, as well as your patient's diagnosis. Put all this together. Does it match?

Read package inserts! Follow manufacturer's recommendations. If the drug is ordered differently, check with the physician prior to administration. **Do not** be lulled into poor practices just because a drug is commonly given this way at a particular institution.

Check the dispensed medication against your Kardex/MAR. Be familiar with generic names. Has the physician given approval to use generic drugs?

Make sure you can read the label. If you cannot, send the drug back to the pharmacy for relabeling.

Is your patient taking drugs that are compatible?

Does the drug contain a component that your client is allergic to?

Is the drug itself outdated? If so, discard according to hospital policy.

Always read the label on the container three times:

- First—when you remove the container from the shelf or drawer.
- Second—immediately after pouring the medication.
- Third—when you return the medication to the shelf or drawer.

### **Right dose**

Be familiar with therapeutic dosage ranges of the drugs you are giving. If you are not sure, look it up! If the dosage ordered is not within the recommended limits, contact the physician before giving the medication.

Be sure the dosage you are giving matches the dosage ordered.

Does the dosage ordered by the physician match what the pharmacy dispensed? Do you need to calculate the proper dosage?

Is your place of employment still using the symbols for ounces and drams? Encourage physicians to write out “ounces” and “drams” to avoid medication errors.

### **Right Patient**

Be conscientious and **always** identify your patient. Have the patient state her or his name and check the wristband for confirmation. Do not rely on a name posted above the bed.

Identify and explain the drugs you will be giving your patient. Listen to your patient. If he or she says there is a variance in what you are giving and what the patient usually receives, check it out.

Be sure to check for an allergy band.

Remain with your patient while he or she takes the medication unless the physician specifically orders that the medication may be left at the bedside.

Know the agency’s name alert procedure when clients with the same or similar last names are on the nursing unit.

### **Right route**

Be familiar with acceptable routes of administration for the drugs you are giving.

Does the ordered route coincide with the patient’s condition? For example, if the patient is vomiting and this medication is ordered to be taken orally, can the drug be given by a different route?

Always use accepted injection sites and the proper length of needle. You will need to assess the size of your patient. A longer needle may be required for an IM on a large person.

Aspirate before giving IM, and most sub-Q injections.

### **Right time or frequency**

Be positive you are giving the dosage at the correct time. Recheck am/pm dosages.

Know whether the drug should be given with a meal or on an empty stomach.

Be mindful of drugs that expire rapidly, e.g., narcotics and antibiotics.

It is obvious from this brief review that passing medications is not a “routine” task. You must be aware of multiple factors regarding each drug you are giving. Take time to look up needed information if you are unsure of yourself. Ignorance is no excuse.

### **Right Documentation**

Record-keeping systems will vary from institution to institution; some guidelines are as follows:

- First and foremost, know what your institution’s policy states.

- Always document as soon as possible after giving a drug, not before. When an injection is given, record the site.
- If the drug was an analgesic, record why you gave the medication and later record its effectiveness.
- Always record any adverse reaction or side effects to medications. Include the actions you took, for example, when you notified the physician, any information about withholding future doses, and what the vital signs were.
- If a medication is not given for some reason (e.g., patient refuses to take medication or it was withheld until after x-rays or lab tests were given), chart the reason.
- If time of administration differs for prescribed time, note the time on the medication record and explain reason and follow-through activities (e.g. patient will return from x-ray in 2 hours) in nursing notes.
- Report any medication errors. Failure to do so may endanger a patient's life.
- If a name brand drug is ordered but the physician consents to giving a generic drug, check hospital policy for the documentation procedure. (Some hospitals require that the generic drug is recorded first, followed by the name brand ordered.)
- Write out the words that may be confusing to others:

Ounces and drams—

Never abbreviate the word “unit.” Someone may misread a “u” for a poorly written “o” and administer an incorrect dose.

Always put an “0” before dosages that have a decimal point (0.125).

**Table 1**  
**Common Abbreviations Used in Medication Orders**

<u>Abbreviation</u>	<u>Explanation</u>	<u>Abbreviation</u>	<u>Explanation</u>
a.c.	before meals	q.	every
ad lib.	freely, as desired	q.d.	every day
agit.	shake, stir	q.a.m. (o.m.)	every morning
aq.	water	q.h. (q.lh.)	every hour
aq. dest.	distilled water	q.2h.	every two hours
b.i.d.	twice daily	q.3h.	every three hours
c	with	q.4h.	every four hours
cap.	capsule	q.5h.	every six hours
comp.	compound	q.h.s.	every night at bedtime
dil.	dissolve, dilute	q.i.d.	four times a day
elix.	elixir	q.o.d.	every other day
gtt.	drop	q.s.	sufficient quantity
h.	an hour	rept.	may be repeated

h.s.	at bedtime	Rx	take
M. or m.	mix	S	without
no.	number	Sig. or S.	label
non rep	do not repeat	s.o.s.	if it is needed
OD	right eye	SS or ss	one half
OS or o.l.	left eye	stat.	at once
OU	both eyes	sup. or supp.	suppository
p.c.	after meals	susp.	suspension
p.o.	by mouth	t.i.d.	three times a day
p.r.n.	when needed	Tr. or tinct.	tincture

May want to use Table 33-7 Commonly Used Abbreviations from Fundamentals Op Nsg Kozier (pg. 795).

## Medication Administration

**Table 2**  
**Approximate Weight Equivalents for**  
**Metric and Apothecaries' Systems**

<u>Metric</u>	<u>Apothecaries'</u>	<u>Metric</u>	<u>Apothecaries'</u>
0.1 mg	1/600 gr	30mg	½ gr
0.12 mg	1/500 gr	40 mg	2/3 gr
0.15 mg	1/400 gr	50 mg	¾
0.2 mg	1/300 gr	60 mg	1 gr
0.25 mg	1/250 gr	100 mg (0.1 gm)	1-1/2 gr
0.3 mg	1/200 gr	150 mg (0.15 gm)	2-1/2 gr
0.4 mg	1/150gr	200 mg (0.2 gm)	3 gr
0.5 mg	1/120 gr	300 mg (0.3 gm)	5 gr
0.6 mg	1/100 gr	400 mg (0.4 gm)	6 gr
0.8 mg	1/80 gr	500 mg (0.5 gm)	7 gr
1 mg	1/66 gr	600 mg (0.6 gm)	10 gr
1.2 mg	1/50 gr	1 gm	15 gr
1.5 mg	1/40 gr	1.5 gm	22 gr
2 mg	1/30 gr	2 gm	30 gr
3 mg	1/20 gr	3 gm	45 gr
4 mg	1/15 gr	4 gm	60 gr (1 dr)
5 mg	1/12 gr	5 gm	75 gr
6 mg	1/10 gr	6 gm	90 gr
8 mg	1/8 gr	7.5 gm	120 gr (2 dr)
10 mg	1/6 gr	10gm	2-1/2 dr grgr
12 mg	1/5 gr	30 gm	1 oz (8 dr)
15 mg	1/40 gr	500 gm	1.1 lb
22 mg	1/30 gr	1000 gm	2.2 lb
25 mg	3/8 gr		

## Types of medication orders

There are several ways that a medication may be ordered. Four of the major types include: the stat order, the single order, the standing order, and the prn order.

The **stat order**—such as “Lasix 40 mg IV stat”—should be given immediately. A stat order is also given only once.

A **single order** is to be given only once and only at the specified time. For example, “Seconal 100 mg PO hs before surgery.”

The **standing order** is used in many agencies and may or may not have an expiration date. Sometimes, certain physicians may have standing orders to be instilled on all of their admissions or on all of their patients with a certain diagnosis. The physician may also have a standing order on the procedure that should be carried out on certain treatments.

A prn order permits the nurse to use his or her judgment to assess when the patient needs the medication. For example, “Demerol 50 mg IM q 3-4 hrs prn.” The nurse must assess the patient correctly and use his or her judgment as to when the medication is needed and when it can be safely administered.

**UNIT 1**  
**Self-Test**

1. List the five rights of medication administration.
  
2. Name five important factors to check when reviewing the Medication Administration Record (MAR) from a medication order.
  
3. If you are unable to read the label on a medication, what would be your action?
  
4. How would you identify your patient prior to administering a medication? Circle the best answer among a-d below.
  1. Check his/her wristband.
  2. Ask the patient to state his/her name.
  3. Check the name posted above the bed.
  4. Ask "Are you Mrs. Jones?"
  - a. 2 only
  - b. 1 and 2
  - c. 1 and 3
  - d. 1 and 4
  
5. State at least two pieces of data you would record in the chart if a patient had an adverse reaction to a drug.
  
6. What does OD stand for?

## UNIT 2

### GASTROINTESTINAL ADMINISTRATION

#### OBJECTIVES

Upon completing this unit, you should be able to:

- List essential guidelines for administering medications.
- Identify essential information to be given to the patient or client about her or his medication.
- Outline the general procedure for administering medications.

#### COMMENTS

A medication is generally prepared for one or more routes of administration. This unit will discuss the oral, sublingual, buccal, and rectal routes of administration.

#### Oral administration

The oral route is the most common form of drug administration. Always keep in mind the six rights of drug administration as well as infection control practices such as washing hands prior to setting up medications and washing hands between patients. Some general procedures for administering oral medications are as follows:

1. Identify the medication order and use hospital policies to check this order.
2. Wash your hands.
3. Prepare your medication.
4. Identify your patient or client.
5. Explain the medication to the patient.
6. Take the required assessment measures (B/P, P).
7. Assist the patient to take the medication.
8. Stay with the patient until all medications have been taken.
9. Document the medication administration.
10. Evaluate the effects of the medication.
11. Report any untoward effects.

It is important that you let your patient know as much as possible about the oral medication that he or she is taking. Tell your patient the following:

1. The name of the medication.
2. What it is for (explain in common language).
3. What the effects are—the good effects as well as possible adverse effects.
4. Why the medications are scheduled the way they are, e.g., why they need to be taken with meals or on an empty stomach, whether certain foods will affect this medication, the reason this medication is scheduled at regular intervals around the clock.
5. Not to chew coated tablets and to be sure to drink plenty of water with enteric coated tablets and capsules.

If the patient is planning to go home:

1. Be specific with instructions on how to take medication and work out a schedule that fits around the patient's routine at home.
2. Instruct the patient on what to do if he or she misses a dose.
3. Make sure the patient understands why it is important not to discontinue the medication without consulting his or her doctor.
4. Emphasize how important it is not to share medications with others who may have similar symptoms.
5. Write your instructions out for the patient—in **clear language**.
6. Have the patient repeat the instructions back to you.

Following are specific instructions for various forms of medicine to be taken orally.

### **Tablets and capsules**

- If you pour medications from a bottle with multiple doses, always pour the correct number of tablets or capsules into the bottle cap. This way, if you pour too many you can put the excess back without contaminating them. If they do become contaminated, you must discard the dosage.
- After pouring the capsules or tablets in the bottle cap, pour them into a medicine cup and recap the bottle.

Note: If you are working with a unit dose system, in which the medicine cart is stocked for a set period of time, you must notify the pharmacy if you discard a contaminated drug. If you fail to do so, the last dosage will be missing. The nurse on duty must then scramble to get the last dosage up on time.

- Never divide a tablet that is not scored. Unless the manufacturer marked it for this purpose, you will be giving an inaccurate dosage.
- Do not forget the option of crushing a tablet or opening a capsule if your client has trouble swallowing. A general rule concerning this is that you can crush uncoated tablets and open soft, uncoated capsules, but never crush a coated tablet or open a hard-coated capsule.

### **Liquids**

- Obtain a disposable medicine cup with the markings that you will need.
- After opening the medication bottle, place the cap on the **table inside** up to avoid contamination.
- Put your thumbnail on the correct marking on the medicine cup, hold the cup at eye level, and then pour your medication. If you pour the medication from the side opposite the label, you will avoid spilling contents on the label and possibly obscuring it.
- When reading the correct dosage for the medication, read at the base of the meniscus at eye level on a level surface. Remember that a double line will form at the top of the liquid, which is the meniscus. The lower base line is where you need to take your reading.
- If you have poured too much, dispose of the excess in the sink. Do not return it to the bottle.

- A semi-Fowler's position for your patient will enhance administration.

NOTE: Keep in mind that liquid medications are absorbed more rapidly than solids such as tablets and capsules.

### **Administering liquids with a syringe**

Patients who are unable to drink from a cup can be given liquid medications with a syringe. First pour the medication into a cup, withdraw the correct amount, and remember to dispose of the excess. Next, check the dosage at eye level by reading the measurement from the top edge of the rubber stopper.

You can also aspirate the correct amount of medication by using a syringe with a sterile needle. Discard the needle according to hospital policy after medication is withdrawn.

To administer the medication with a syringe:

- Position your client in a semi-Fowler's or upright position.
- Gently put the syringe tip between the patient's cheek mucosa and second molar.
- Instill slowly, being sure that the medication is being swallowed.

NOTE: When administering a liquid iron preparation or **hydrochloric acid**, have the patient take the medication through a straw, placing the straw to the back of the patient's mouth to avoid staining any teeth.

### **Sublingual**

For sublingual medication administration, the medication is placed under the tongue until it is absorbed. The drug is largely absorbed into the blood vessels on the underside of the tongue. (e.g. Nitroglycerin).

### **Buccal**

Buccal medication is placed between the cheek and teeth and is held there until it is absorbed. It is easier if the client holds the tablet against his or her cheek with the mouth closed. In buccal administration the medication is a tablet.

In both sublingual and buccal administration, caution the client not to swallow the medication.

### **Rectal administration**

If your client is vomiting, unconscious, or unable to swallow, the rectal route is often the route of choice.

If you are administering a rectal suppository, lubricate the tip with a water soluble lubricant after removing the foil. Provide privacy for the patient and place him or her in a side-lying position. Ask the client to take a deep breath and insert the pointed end of the suppository past the internal sphincter (approximately 3 inches).

You usually will want to instruct your clients to attempt to retain the suppository at least 20 minutes unless, of course, its purpose is to relieve constipation. In this case, the client should defecate as soon as he or she has the urge.

## **Unit dose**

Many hospitals are equipped with a unit dose medication system. This system is set up so that each patient has his or her own medication drawer in a medication cart. The cart is stocked for a specified period of time, depending on hospital procedure. The pharmacist stocks each patient's drawer with the medications ordered. This system makes it much easier for the nurse to administer medications to a large number of patients because the cart can be wheeled down the hall and medications poured immediately before administration. With this system, the medications are checked against an MAR (medication administration record). Each patient has an individual sheet. Once the medication is administered, it can be immediately recorded on the MAR.

**UNIT 2**  
**Self-Test**

1. Oral medications are generally the most easily taken of all drugs, but some adjustments may need to be made for the very young, the very old, or those who have difficulty swallowing solids. List four ways that an adjustment may be made in a medication order for these situations.
  
2. Liquid medications form a meniscus. Where do you measure the correct amount of medication?
  
3. When pouring tablets from a bottle, what is the reason for pouring the required number of tablets into the bottle cap first?
  
4. What is the main difference between administering medications by the sublingual and the buccal route?
  
5. Name at least three major items to instruct your client about the medications that he or she is taking.
  
6. How far do you usually insert a rectal suppository?

## UNIT 3 PARENTERAL MEDICATION ADMINISTRATION

### OBJECTIVES

After completing this unit, you should be able to:

- Identify the main routes of parenteral administration.
- Identify the acceptable sites of administration for each route (i.e., intradermal, SQ, IM, Z-track).
- Identify correct needle sizes to use based on route of administration and assessment of patient.
- List the techniques of administration for each route.

### COMMENTS

Parenteral medications are those that are administered by some other route than the alimentary canal. They are given subcutaneously, intramuscularly, intradermally, or intravenously. Since they are absorbed more quickly than oral medications and are irretrievable once injected, it is essential that the nurse prepare and administer them carefully and accurately. Some additional considerations include:

- Route—subcutaneous, intradermal, intramuscular, or intravenous
- Preparation of medications
- Needle size (length and gauge)
- Acceptable sites for injection procedure for administering

#### Route

Subcutaneous. This type of injection is given into subcutaneous tissue, which lies between the skin and muscles.

Intradermal. This type of injection is given within the skin (intracutaneous).

Intramuscular. This type of injection is given within or inside muscle tissue.

Intravenous. The intravenous route is discussed in another module and, therefore, will not be discussed further in this unit.

#### Preparation of medication

As a review, the following parts of a syringe are considered sterile: plunger, inside of barrel, the point and shaft of the needle, and the tip of the syringe. Most of the medications you will encounter for parenteral administration will come in a vial or ampule.

#### Use of vial

- If the solution in the vial needs to be mixed, roll the vial in the palms of your hands.
- Clean the rubber stopper with alcohol.

- Prepare your syringe by pulling back the syringe plunger to the exact point where the air in the barrel equals the amount of medication you want to take from the vial.
- Insert the needle into the center of the rubber cap on the vial and inject the air, being careful not to inject the air into the liquid medication since this may form air bubbles.
- Invert the vial and withdraw the prescribed amount of medication.
- After withdrawing the needle from the vial, replace the cap over the needle to avoid contamination.

### **Use of an ampule**

- Remove any medication from the upper stem of the ampule by flicking it several times with your finger.
- You may need to score the neck of the ampule with a file if the manufacturer has not already done this.
- Wrap a gauze pad around the top of the ampule, covering the neck and snap the top off.
- Insert a filter needle into the open ampule and withdraw the needed medication. Be careful not to let the needle touch the inside of the ampule because this can dull the point or form a burr. Cover the needle with its safety sheath or cap. Change the needle on the syringe before administering medications.

### **Needle size**

The basic needle sizes for each route of administration are discussed below.

<u>Intradermal</u>	3/8” to 5/8” length 25 G to 26 G diameter with short bevel
<u>Subcutaneous</u>	3/8” to 5/8” length 24 G to 26 G diameter with medium bevel
<u>Intramuscular</u>	1” to 3” length (usually 1” to 1 ½”) 19 G to 23 G diameter with medium bevel (usually 20-22 G)
<u>Intravenous</u>	Since intravenous therapy is discussed in another module, it will not be discussed here.

Do not forget these important points about needles:

- Gauges may vary from 13 (largest) to 27 (smallest). You will want to use a larger gauge needle if you have a thick solution to administer. The larger the gauge number, the smaller the diameter of the shaft.
- Take into account the size of your patient when deciding on needle length. A small, thin patient will need a shorter needle than an obese patient.

### **Acceptable sites for injection**

#### Subcutaneous

- Outer aspects of upper arms and anterior aspects of thighs
- Scapular areas of upper back

- Lower abdomen, above iliac crest

### Intradermal

- Inner aspect of lower arm
- Upper aspect of the chest
- The back beneath the scapulae

### Intramuscular

- Ventrogluteal. When using the ventrogluteal site, the medication is being injected into the gluteus medius muscle. To find the site, place your hand on the patient's hip with your fingers pointing upward. The index finger is placed on the anterior superior iliac spine and the middle finger is stretched to palpate the crest of the ilium, then you press below it. The triangle formed by the index finger and the third finger is the safe area for an injection. NOTE: This procedure is easier if you use your RIGHT hand for the patient's LEFT HIP and your LEFT hand for the patient's RIGHT HIP.
- Deltoid. The deltoid muscle is found on the lateral aspect of the upper arm. To locate the injection site, palpate the lower edge of the acromial process and the midpoint on the lateral aspect of the arm that is in line with the axilla. A triangle can be formed over the safe injection site.

Dorsogluteal. Two methods can be used to locate this spot:

1. Divide the buttock into imaginary lines, with a line extending from the crest of the ilium to the gluteal fold and another line extending from the medial fold to the lateral aspect of the buttock. The upper outer quadrant is considered safe. Be sure to **palpate** the landmarks. Do not rely on a guess.
2. Palpate the posterior superior iliac spine and draw a line to the greater trochanter of the femur. The injection site is lateral and superior to this line.
  - Vastus lateralis. This site is found by dividing the area between the greater trochanter of the femur and the lateral femoral condyle into thirds. The acceptable site is located in the middle third.
  - Rectus femoris. The rectus femoris is located on the anterior aspect of the thigh. This site can be used for infants and children and for adults when other sites are contraindicated. An injection at this site can cause considerable discomfort for some patients.

## **Procedure for injection**

### Subcutaneous

1. Clean the site, starting at the center and working out in a circular fashion.
  - Be sure the site you have selected for injection has a fat fold of approximately one inch when you pinch the area between your thumb and forefinger.
  - If injections are going to be administered over a long period of time, be sure sites are rotated by checking the chart for previously used sites.
2. While the antiseptic is drying, remove the cap from the needle.

3. Recommendations vary as to whether the skin should be pinched up or spread for an injection. Check the policy at your agency.
4. Be sure the bevel is up and insert the needle with a quick motion. (If you are using a ½” needle, insert at a 90° angle; if you are using a 5/8” or longer needle, insert at a 45° angle.)
5. Pull back on the plunger and, if no blood appears in the syringe, inject your medication slowly.
6. After the medication is in, quickly withdraw the needle at the same angle you inserted it.
7. If you did aspirate blood upon pulling back on the plunger, withdraw the needle, discard everything and start again, selecting a new site.

Intradermal medications are commonly used to diagnose allergies and to administer some types of immunizations.

1. Prepare to give the injection in the same manner you would for subcutaneous
2. Hold the syringe between your thumb and fingers with your palm up.
3. Pull the skin taut at the site of the injection.
4. With the bevel of the needle up at a 15° angle to the skin surface, insert carefully into the dermis.
5. Inject your medication slowly. You will see a small blob form on the skin.
6. Withdraw your needle quickly and wipe the site gently with a swab. Do not massage the area.

Intramuscular. The intramuscular route is frequently chosen for those clients who are unable to take medications orally, or for whom subcutaneous medications are contraindicated.

1. When preparing to administer an intramuscular injection, select a site with adequate, healthy muscle mass. A site with bruises, infection, or abrasions is not acceptable.
2. The size of needle used will be determined by the amount of adipose tissue and muscle mass at the chosen site.
3. After choosing the site and checking the landmarks, clean a 2” diameter area around the site moving in a circular motion away from the injection site.
4. Place the swab used to cleanse the site between two of your fingers for later use.
5. With a quick, dartlike motion, insert the needle at a 90° angle.
6. Aspirate for blood by pulling back on the plunger. If no blood appears, inject slowly. Withdraw the needle quickly.
7. Place alcohol wipe over site.

8. If blood does appear, withdraw the needle slightly and aspirate again. If blood still appears, withdraw the needle and prepare a new injection.

Z-track. A Z-track intramuscular injection is a special technique used for administering intramuscular injections that are highly irritating to subcutaneous and skin tissues. The steps for a Z-track injection are as follows:

1. Draw up 0.3 to 0.5 cc of air into the syringe when drawing up the needed medication.
2. Replace the needle with a sterile, 3" needle.
3. Select the site and pull the skin and subcutaneous tissue at the injection site to one side.
4. Cleanse your site, insert the needle quickly, and inject the medication slowly.
5. After injecting the medication, wait ten seconds before withdrawing the needle. This prevents medication seepage from the site.
6. Withdraw the needle.
7. Allow skin to return to its regular position. This will seal off the needle tract.
8. Do not massage the site or allow the patient to wear tight-fitting cloths. To do either could force medication into subcutaneous tissue and cause irritation.
9. Encourage the patient to walk, which increases the absorption rate.



## UNIT 4 EYE, EAR, NOSE MEDICATIONS

### OBJECTIVES

Upon completion of this unit, you should be able to:

- State important preparations to use prior to administering eye, ear, and nose medications.
- List the procedural guidelines to follow when administering eye, ear, and nose medications.

### EYE

Eye medications can come in the form of liquids or ointments. Remember these **general** points when administering eye medications.

- Always be especially careful to use clean techniques because an eye dropper is easily contaminated.
- Warm eye solutions to room temperature before administering.
- Use the same precautions for administering eye medications which apply to administering medication, e.e., washing your hands, checking the medication against orders, and identifying the client.
- Review frequently used abbreviations such as OD (right eye), OS (left eye), and OU (both eyes).
- Check the drug for an expiration date.
- Check the label to be sure it is safe for ophthalmic use.

### Eye drops

Follow these steps when administering eye drops.

1. Wash your hands.
2. Explain the procedure to the patient.
3. Have the patient lie on his or her back, or sit with the head tilted slightly backward.
4. Clean the eyelids and lashes with a sterile gauze pad moistened with normal saline solution. This will help remove crusts and secretions.
5. Have the patient tilt his or her head back and turn it slightly to the side of the affected eye to prevent the medication from draining into the tear duct.
6. Draw up the correct number of drops into the dropper and discard the first bead.
7. Have the patient focus on an object while looking up.

8. Gently expose the lower conjunctival sac by pulling down on the skin covering the patient's cheekbone. Do not press on the eyeball.
9. Squeeze the correct number of drops into the center of the lower conjunctival sac. (Do not touch the eyeball or the eyelashes with the dropper.)
10. Allow the patient to close his or her eyes and blink to help distribute the medication.
11. To avoid systemic absorption of the drug through the vascular nasal mucosa via the lacrimal duct, gentle pressure may be applied to the lacrimal sac for 1-2 minutes.
12. Blot the excess fluid, wiping from the inner to the outer canthus.
13. Instruct the patient not to rub his or her hers.

### **Eye ointment**

Follow the same procedure for eye ointments as those described for eye drops with these added steps.

1. Squeeze a thin ribbon of ointment in the conjunctival sac starting at the inner canthus.
2. To detach the ointment, rotate the tube without touching the conjunctival sac.
3. Release the patient's lid and instruct the patient to leave his or her eyes closed for approximately two minutes to allow the medication to spread.

### **EAR**

Follow these steps when administering ear drops.

#### **Ear drops**

1. Wash your hands and assemble the equipment.
2. Be sure to check the medication order.
3. Warm the solution to body temperature by holding the bottle between your hands for 1-2 minutes.
4. Explain the procedure to the patient.
5. Place the patient on his or her side so the affected ear is accessible.
6. Fill the ear dropper with medication.
7. Straighten the patient's ear canal by gently pulling the auricle up and back (for children, pull down and back).
8. Without touching the ear with the dropper, instill the prescribed number of drops.
9. Direct the drops along the side of the canal.

10. Instruct the patient to remain on his or her side for approximately 5-10 minutes to prevent the drops from running back out of the ear.

### **Nasal spray**

1. Always confirm the order as with other medications.
2. Wash hands.
3. Explain the procedure to the patient.
4. Occlude one nostril while spraying the medication into the opposite nostril.
5. Have the patient breathe in at the same time the medication is being sprayed into the nostril.

### **Nasal drops**

1. Confirm the order.
2. Determine the position the patient should assume according to his or her condition. If the patient is receiving the nose drops for a sinus condition, use the Parkinson or Proetz position.

The Parkinson position helps treat the maxillary and frontal sinuses.

The Proetz position helps treat the sphenoid and ethmoid sinuses.

If the nose drops are being used for ordinary nasal congestion, have the patient sit upright and tip his or her head back.

3. Explain the procedure to the patient.
4. Have the patient blow his or her nose.
5. Help the patient to the correct position.
6. Draw up enough medication into the dropper for the correct number of drops. This decreases the risk of contamination if you do not reinsert the dropper into the bottle.
7. Open the patient's nostril by pushing up gently on the tip of the nose.
8. Hold the tip of the dropper just above the nostril, or place the dropper approximately 1/3" inside the nostril if you do not touch the patient's nose (which would cause contamination).
9. Direct the dropper toward the midline of the superior concha to help the medication flow down the back of the patient's nose.
10. Instill the correct number of drops while the patient breathes through the mouth. This will prevent sniffing medication into the sinuses.
11. Repeat for the other nostril, if indicated.

12. Have the patient stay in the position for approximately five minutes. The patient may resume normal breathing.

13. Discard the remaining medication in the dropper.

If the patient will be doing this procedure at home, be sure to instruct him or her on how to do it for maximum effectiveness. Instruct the patient to discard any medication that is discolored or has sediment in it. Remind the patient to avoid sharing nasal drops or sprays; this may spread infection.

**UNIT 4**  
**Self-Test**

When administering eye drops, where do you place the medication?

When administering eye ointment, what is the best way to detach the ointment without touching the conjunctival sac?

When administering ear drops, in which direction do you pull the auricle of an adult's ear?

If you were to instill nose drops to help treat a condition in the ethmoid and sphenoid sinuses, which position would you have the patient assume?

How long should a patient maintain sitting or lying after instillation of nose drops?

## UNIT 5 VAGINAL MEDICATIONS

### OBJECTIVES

After completing this unit, you should be able to

- State how to prepare a patient for vaginal medication.
- Outline the procedure for administering vaginal medication.

### COMMENTS

Vaginal medication can be in the form of creams, jellies, foams, suppositories, or irrigations (douches). Creams, jellies, and foams are administered through a tubular applicator with a plunger. Suppositories can be inserted with one finger of a gloved hand.

### All vaginal medications

1. Follow the six rights for administering medications.
2. Wash your hands.
3. Assemble the necessary equipment.
4. Prepare your patient by explaining the procedure, having her void, and providing privacy by draping.

### Vaginal medications with an applicator

1. Help the patient to lie on her back with her knees flexed.
2. Observe a clean technique but wear sterile gloves to minimize risk of infections.
3. Insert the prescribed dose of medication in an applicator and lubricate the tip with a water-soluble gel.
4. Spread labia.
5. Clean the patient's perineum. Use clean cotton balls and clean the patient with downward strokes down the left side, right side, and center of labia.
6. Check for any vaginal excoriation (withhold medication until notifying a physician if the patient has a burning sensation).
7. Gently insert the applicator approximately 2 inches, angling toward the sacrum.
8. Push the plunger to insert the medication and remove the applicator.
9. Instruct the patient to remain in a reclining position for approximately 30 minutes.

10. Observe mucosa around vagina after administration for any allergic reactions such as red or swollen tissue.

### **Vaginal suppository**

1. Have the patient lie on her back with knees flexed.
2. Unwrap the foil around the suppository and place suppository on the opened wrapper.
3. Put gloves on.
4. Lubricate the rounded end of the suppository and your gloved index finger with water-soluble gel.
5. Spread the labia.
6. Insert the suppository about 3-4 inches, angling toward sacrum.
7. Have the patient remain lying in supine position for approximately 30 minutes following insertion.

### **Vaginal irrigation**

1. Have the patient lie on her back with buttocks on bedpan, knees flexed and legs spread apart.
2. Raise the head of the bed 30°.
3. Put a pad under the patient.
4. Prepare a douche bag with solution, lubricate the nozzle with water-soluble jelly and hang bag about 12 inches above vagina.
5. Flush tubing with solution and close roller clamp.
6. Observe a clean technique but wear sterile gloves.
7. Spread labia.
8. Clean the patient's perineum of any discharge with cotton balls soaked in warm soapy water. (Use a fresh cotton ball for each downward swipe.)
9. Insert the nozzle about two inches directing it toward the sacrum.
10. Open the clamp and allow gravity to draw solution into the vagina.
11. You can slowly rotate and advance the nozzle another 1 to 2 inches **if the patient has not had recent surgery and does not have cervical cancer.**
12. After the solution is instilled, remove the nozzle and bedpan. Help patient pat area dry.

**UNIT 5**  
**Self-Test**

When administering a vaginal medication using an applicator, how far do you insert the applicator?

After inserting a vaginal suppository, how long should you instruct the patient to remain in a supine position?

When administering a vaginal irrigation, how far above the vagina should the bag be hung?

When administering a vaginal irrigation, what are the conditions under which you would not rotate and advance the nozzle past 2 inches?

List at least two observations you may make if the patient is having an allergic reaction.

## UNIT 6 CALCULATING DOSAGES

### OBJECTIVES

After completing this unit, you should be able to:

- Calculate correct dosages for administering adult medications.
- Calculate correct dosages for administering medications to pediatric patients.

### COMMENTS

There are times when you may be required to calculate the correct dosage for the administration of medications. If one dose is ordered and you do not have the exact dosage on hand, you can set up an easy equation to determine the correct dosage.

#### Formula for calculation of drug dosages

Formula:

$$\frac{(D) \text{ Dose Required}}{(X) \text{ Units to be administered}} = \frac{H \text{ (Dose available)}}{(\text{Number of units containing dose available})}$$

To solve for “x,” the unknown, cross-multiply and divide.

Example:

The physician orders 16 mg of an elixir. The dose on hand is 4 mg/4 ml. How many ml should be administered?

$$\frac{16}{x} = \frac{4}{4} \quad 4x = 64 \text{ ml} \quad x = \frac{64}{4} = \underline{16 \text{ ml}}$$

Another way to solve this problem is by using “Math Magic,” developed by Susan G. Moore (1986). Multiply the doctor’s order by what is on hand:

$$\frac{\text{Doctor's order}}{1} \times \frac{\text{Form (tablet, capsule, ml)}}{\text{Dosage (grains, grams, mg)}}$$

$$\frac{16 \text{ mg}}{1} \times \frac{4 \text{ ml}}{4 \text{ mg}} =$$

Cancel out “words” to determine how to label your answer.

$$\frac{16 \text{ mg}}{1} = \frac{4 \text{ ml}}{4 \text{ mg}} = \frac{64 \text{ ml}}{4} = \underline{16 \text{ ml}}$$

Examples:

1. Order reads: "Gentamycin 40 mg IM." On hand you have a vial labeled Gentamycin 80 mg/2 cc. You would give \_\_\_\_ cc.

$$\frac{40 \text{ mg}}{x} = \frac{80 \text{ mg}}{2 \text{ cc}} \quad 80x = 80 \quad x = \underline{1 \text{ cc}}$$

$$\text{OR } \frac{40 \text{ mg}}{1} \times \frac{2 \text{ cc}}{100 \text{ mg}} = \frac{80 \text{ cc}}{80} = \underline{1 \text{ cc}}$$

2. Order reads: "Demerol 75 mg IM." On hand: Demerol 100 mg/2 cc. How many ml would you give?

$$\frac{75 \text{ mg}}{x} = \frac{100 \text{ mg}}{2 \text{ cc}} \quad 100x = 150 \quad x = \underline{1.5 \text{ cc}}$$

$$\text{OR } \frac{75 \text{ mg}}{1} \times \frac{2 \text{ cc}}{100 \text{ mg}} = \frac{150 \text{ cc}}{100} = \underline{1.5 \text{ cc}}$$

3. Order reads: "Penicillin 600,000 units IM." On hand: Penicillin 2,000,000 units per 5 ml. How many ml would you give?

$$\frac{600,000 \text{ u}}{x} = \frac{2,000,000 \text{ mg}}{5 \text{ ml}} \quad 2,000,000x = 3,000,000 \quad x = \underline{1.5 \text{ ml}}$$

$$\text{OR } \frac{600,000 \text{ u}}{1} \times \frac{5 \text{ ml}}{2,000,000 \text{ u}} = \frac{3,000,000 \text{ ml}}{2,000,000} = \underline{1.5 \text{ ml}}$$

4. Order reads: "Valium 15 mg po." On hand: Valium 5 mg tablets. How many tablets would you give?

$$\frac{15 \text{ mg}}{x} = \frac{5 \text{ mg}}{1 \text{ tab}} \quad 5x = 15 \quad x = \underline{3 \text{ tabs}}$$

$$\text{OR } \frac{15 \text{ mg}}{1} \times \frac{1 \text{ tab}}{5 \text{ mg}} = \frac{15 \text{ tab}}{5} = \underline{3 \text{ tabs}}$$

## Conversions

On occasion, you may need to convert from one form of measurement to another in calculating drug dosages. For example, the physician may order a medication in milligrams, and you find your stock drug is in grains. The following table contains equivalencies that will help you in determining a dosage when conversion is necessary.

1 Gram (Gm) = 1000 milligrams (mg.)

1 mg = 1000 micrograms (mcg)

1 kilogram (kg) = 1000 Gm = 2.2 lb.  
 1 milliliter (ml) = 1 cubic centimeter (cc)  
 1000 ml = 1 liter (L.)

$$60 \text{ mg} = \text{grain (gr)} \frac{\cdot}{\text{T}}$$

$$1 \text{ mg} = \text{gr} \frac{1}{60}$$

1 Gm = gr XV (grain 15)

Examples:

Order reads: "Thyroid tablets 120 mg daily."

On hand: Thyroid tablets gr  $\frac{\cdot}{\text{T}}$ ."

How many ml. would you give?

(Remember 60 mg = gr  $\frac{\cdot}{\text{T}}$ .)

Setting the problem up as an equation:

$$\frac{60 \text{ mg}}{1 \text{ tablet}} = \frac{120 \text{ mg}}{x}$$

$$60x = 120$$

$$x = \underline{2 \text{ tabs}}$$

Or, using the "Math Magic" concept, look at the physician's order and what you have on hand:

$$\frac{120 \text{ mg}}{1} \times \frac{1 \text{ tab}}{1 \text{ gr}}$$

You must add an equivalent in order to solve the problem; all words must cancel out except the units of the medication we are to give. The equivalent you need here is

$$60 \text{ mg} = \text{gr} \frac{\cdot}{1}$$

$$\frac{120 \text{ mg}}{1} \times \frac{1 \text{ tab}}{1 \text{ grain}} \times \frac{1 \text{ grain}}{60 \text{ mg}} \text{ Now cancel out the words:}$$

$$\frac{120 \cancel{\text{mg}}}{1} \times \frac{1 \text{ tab}}{1 \cancel{\text{grain}}} \times \frac{1 \cancel{\text{grain}}}{60 \cancel{\text{mg}}} = \frac{120 \text{ tab}}{60} = \underline{2 \text{ tabs}}$$

2. Order reads: "Codeine 60 mg po q 4h prn." On hand: Codeine tablets gr 1/2. How many tablets would you give?

(Remember 60 mg = gr  $\frac{1}{160}$ .)

$$\frac{\text{gr } \frac{1}{2}}{1} = \frac{\text{gr } .1}{x} \times \frac{1}{2}x = 1 \quad x = \underline{2 \text{ tabs}}$$

$$\text{OR } \frac{60 \text{ mg}}{1} \times \frac{1 \text{ tab}}{\frac{1}{2} \text{ gr}} \times \frac{1 \text{ gr}}{60 \text{ mg}} = \frac{60 \text{ tabs}}{30} = \underline{2 \text{ tabs}}$$

3. Order reads: "Demerol gr  $\frac{3}{4}$  q 4 h prn." On hand: Demerol 75 mg/cc. How many ml. would you give?

$$\text{Step 1: } \frac{60 \text{ mg}}{\text{gr } 1} = \frac{x}{\text{gr } \frac{3}{4}} \quad x = 60 \times \frac{3}{4} = 45 \text{ mg}$$

$$\text{Step 2: } \frac{75 \text{ mg}}{1 \text{ cc}} = \frac{45 \text{ mg}}{x} \quad 75x = 45 \quad x = \underline{0.6 \text{ cc}}$$

$$\text{OR } \frac{\frac{3}{4} \text{ gr}}{1} \times \frac{1 \text{ cc}}{75 \text{ mg}} \times \frac{60 \text{ mg}}{1 \text{ gr}} = \frac{45 \text{ cc}}{75} = \underline{0.6 \text{ cc}}$$

4. Order reads: "Ampicillin .75 Gm po q 6h." On hand: Ampicillin 250 mg tablets. How many tablets would you give?

$$\text{Step 1: } \frac{100 \text{ mg}}{1 \text{ Gm}} = \frac{x}{\text{gr } \frac{3}{4}} \quad x = 60 \times \frac{3}{4} = 45 \text{ mg}$$

$$\text{Step 2: } \frac{750 \text{ mg}}{x} = \frac{250 \text{ mg}}{1 \text{ tab}} \quad 250x = 750 \quad x = \underline{3 \text{ tabs}}$$

$$\text{OR } \frac{.75 \text{ Gm}}{1} \times \frac{1 \text{ tab}}{250 \text{ mg}} \times \frac{1000 \text{ mg}}{1 \text{ Gm}} = \frac{750 \text{ tab}}{250} = \underline{3 \text{ tabs}}$$

5. Order reads: "Valium 10 mg po t.i.d." On hand: Valium 0.002 Gm tablets. How many tablets would you give?

$$\text{Step 1: } \frac{100 \text{ mg}}{1 \text{ Gm}} = \frac{x}{0.002 \text{ Gm}} \quad x = 2 \text{ mg}$$

$$\text{Step 2: } \frac{2 \text{ mg}}{1 \text{ tab}} = \frac{10 \text{ mg}}{x} \quad 2 = 10 \quad x = \underline{5 \text{ tabs}}$$

$$\text{OR } \frac{10 \text{ mg}}{1} \times \frac{1 \text{ tab}}{0.002 \text{ Gm}} \times \frac{1 \text{ Gm}}{1000 \text{ mg}} = \frac{10 \text{ tab}}{2} = \underline{5 \text{ tabs}}$$

## Pediatric dosages

Because children and infants are different from adults, a simple linear reduction in the adult dose is rarely adequate in achieving a safe and effective pediatric dose. The most reliable information for figuring a dosage for a pediatric patient is provided by the manufacturer in the package insert. If this information is not available, an approximation can be made using one of the following equations:

### Clark's Rule

$$\frac{\text{Wt. in pounds} \times \text{adult dose}}{150} = \text{safe dosage for individual child}$$

#### Example: Clark's Rule

Adult dose of Ampicillin is 600,000 u. What is the correct dosage for a child weighing 90 lb?

$$\frac{90 \times 600,000}{150} = 360,000 \text{ u}$$

### Young's Rule

Used for computation of pediatric dosage for a child over 2 years of age:

$$\frac{\text{Age in years} \times \text{adult dose}}{\text{Age in years} + 12} = \text{safe dosage for child}$$

#### Example: Young's Rule

The adult dose of Erythromycin is 250 mg. How many mg would be appropriate for an 8 year-old child?

$$\frac{8 \times 250}{8 + 12} = \frac{2000}{20} = 100 \text{ mg}$$

Note: Clark's Rule is somewhat more precise than Young's Rule.

Pediatric dosages are often ordered according to the child's weight.

#### Example:

The doctor ordered Garamycin IV piggyback 7.5 mg/kg/day. The child weighs 30 lb. How many mg. Should he receive per day?

$$\frac{2.2 \text{ lb}}{1 \text{ kg}} = \frac{30 \text{ lb.}}{x}$$

$$2.2x = 30$$

$$x = 13.6 \text{ kg}$$

$$13.6 \text{ kg} \times \frac{7.5 \text{ mg}}{\text{kg}} = 102 \text{ mg/day}$$

Dosages can also be calculated using nomograms for determining body surface area from height and weight. If available, these are more likely to be adequate and safe than using one of the above formulas.

None of these formulas and calculations should be used if the manufacturer provides a pediatric dosage. Most drugs approved for use in children have doses recommended. Generally, these doses are stated as so many milligrams per kilogram or per pound. When pediatric doses are calculated, the pediatric dose should never exceed the adult dosage no matter what method is used to calculate the dosage.

**UNIT 6**  
**Self-Test**

Calculate the following drug dosages:

1. Order reads: "Penicillin 100,000 units IV."  
On hand: Penicillin 200,000 units/5 cc.  
How much should you give?
  
2. Order reads: "Ampicillin 150 mg po."  
On hand: Ampicillin 250 mg/5 cc.  
How many ml. should you give?
  
3. Order reads: "Furadantin 0.5 Gm po."  
On hand: Furadantin 500 mg tablets.  
How many tablets should you give?
  
4. Order reads: "Dilaudid HCl 4 mg po."  
On hand: Dilaudid HCl 2 mg tablets.  
How many tablets would you give?
  
5. Order reads: "Liquiprin gr  $\frac{\dots}{\dots}$  ."  
  
On hand: Liquiprin 60 mg/1.25 ml.  
How many ml. would you give?
  
6. Order reads: "Mintezol 25 mg/kg of body weight."
  - a. If the child weighs 44 lb., how many mg will you give?
  - b. The bottle reads Mintezol 250 mg/5 cc. How many ml. will you give?
  
7. The adult dosage for a particular drug is 100 mg. What would the pediatric dosage be for a child weighing 15 lb.?
  
8. If the adult dosage for a medication is 60 ml., what would be the dose for a 5 year-old child?

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**MODULE 9**  
**Answers to Self-Test**

**Unit 1**

1.
  - a. Right drug
  - b. Right dose
  - c. Right patient
  - d. Right route
  - e. Right time
  
2.
  - a. Expiration date
  - b. Name of drug
  - c. Dosage
  - d. Route
  - e. Time and frequency
  
3. Send the drug back to the pharmacy for re-labeling.
  
4. #b should be circled (1 and 2). Do not rely on a name posted above the bed, and many patients will say “yes” to a question stated as in answer d.
  
5. Description of the reaction (e.g., rash, where it is, k type, color, etc.)  
Vital signs  
Any other actions you took (e.g., notifying the physician, withholding future medications).
  
6. Right eye

**Unit 2**

1.
  - a. Crushing uncoated tablets.
  - b. Opening soft, uncoated capsules.
  - c. Administering the medication in liquid form, if possible.
  - d. Using a syringe to administer liquid medication.
  - e. Right time
2. At the base of the meniscus
  
3. Prevents contamination. If too many are poured, the remaining ones can be returned to the bottle.

4. The medication should not be swallowed.
  
5. Name of medication                      How to take it  
What it is for                                What to do about a missed dose  
Good effects                                 Not to share  
Possible adverse effects                 Not to discontinue on own
  
6. Past the internal sphincter (approximately 3 inches).

### Unit 3

1.
  - a. Intradermal
  - b. Subcutaneous
  - c. Intramuscular
  - d. Intravenous
  
2.
  - a. Ventrogluteal
  - b. Deltoid
  - c. Dorsogluteal
  - d. Vastus lateralis
  - e. Rectus femoris
  
3. 3/8" to 5/8"  
24G-26G diameter with a medium bevel.
  
4. Dermis  
15°  
up
  
5. Wait 10 seconds before withdrawing the needle, withdraw the needle and allow the skin to return to its regular position.

### Unit 4

1. The outer canthus of the eye in the lower conjunctival sac.
2. Rotate the tube.

3. Up and back.
4. Proetz position.
5. Approximately 5 minutes.

### Unit 5

1. Approximately 2 inches
2. Approximately 30 minutes.
3. 12 inches.
4. If the patient had a recent surgery or has cervical cancer.
5. Red or swollen tissue  
Burning sensation  
Vaginal excoriation

### Unit 6

1.

$$\frac{200,000 \text{ u mg}}{5 \text{ cc}} = \frac{100,000}{x} \quad 2,000,000x = 50,0000 \quad x = \underline{2.5 \text{ cc}}$$

$$\text{OR } \frac{100,000 \text{ } \mu}{1} \times \frac{5 \text{ cc}}{200,000 \text{ } \mu} = \underline{2.5 \text{ cc}}$$

2.

$$\frac{250 \text{ mg}}{1} = \frac{150}{x} \quad 250x = 750 \quad x = \underline{3 \text{ cc}}$$

$$\text{OR } \frac{150 \text{ mg}}{1} \times \frac{5 \text{ cc}}{250 \text{ mg}} = \underline{3 \text{ cc}}$$

3.

$$\underline{0.5 \text{ Gm}} = \underline{1 \text{ Gm}} \quad x = 500 \text{ mg} \quad 500 \text{ mg} = \underline{1 \text{ tab}}$$

$$\frac{\quad}{x} \quad \frac{1000 \text{ mg}}{\quad}$$

$$\text{OR } \frac{0.5 \text{ Gm}}{1} \times \frac{1 \text{ tab}}{500 \text{ Gm}} \times \frac{1000 \text{ mg}}{1 \text{ Gm}} = \underline{1 \text{ tab}}$$

4.

$$\frac{4 \text{ mg}}{x} = \frac{2 \text{ mg}}{1} \quad 2x = 4 \quad x = \underline{2 \text{ tabs}}$$

$$\text{OR } \frac{4 \text{ mg}}{1} \times \frac{1 \text{ tab}}{2 \text{ mg}} = \underline{2 \text{ tabs}}$$

5.

$$60 \text{ mg} = \text{gr } 1 \quad \frac{\text{gr } 1}{1.25 \text{ ml}} = \frac{\text{gr } 3}{x} \quad x = \underline{3.75}$$

$$\text{OR } \frac{\cancel{\text{gr}}}{111} \times \frac{1.25 \text{ ml}}{60 \text{ mg}} \times \underline{2 \text{ tabs}}$$

6.

$$\text{Step 1: } \frac{2.2 \text{ lb}}{1 \text{ kg}} = \frac{44 \text{ lb}}{x} \quad 2.2x = 44 \quad x = \underline{20 \text{ kg}}$$

$$20 \text{ kg} \times 25 \text{ mg/kg} = \underline{500 \text{ mg}}$$

$$\text{Step 2: } \frac{250 \text{ mg}}{5 \text{ cc}} = \frac{500 \text{ mg}}{x} \quad 250x = 2500 \quad x = \underline{10 \text{ cc}}$$

$$\text{OR } \frac{500 \text{ mg}}{1} \times \frac{5 \text{ cc}}{250 \text{ mg}} \times \underline{10 \text{ cc}}$$

7. Using Clark's Rule

$$\frac{15 \text{ mg}}{150} \times 100 = \frac{1500}{150} = \underline{10 \text{ mg}}$$

8. Using Young's Rule:

$$\frac{5 \times 60}{5 + 12} = \frac{300}{17} = \underline{17.6 \text{ ml}}$$

