

# The Administration of Drugs

## Key Terms

<i>buccal</i>	<i>parenteral</i>
<i>drug errors</i>	<i>standard precautions</i>
<i>extravasation</i>	<i>subcutaneous</i>
<i>infiltration</i>	<i>sublingual</i>
<i>inhalation</i>	<i>transdermal</i>
<i>intra dermal</i>	<i>unit dose</i>
<i>intramuscular</i>	<i>Z-track</i>
<i>intravenous</i>	

## Chapter Objectives

On completion of this chapter, the student will:

- Name the six rights of drug administration.
- Identify the different types of medication orders.
- Discuss once-a-week dosing of certain drugs.
- Describe the various types of medication dispensing systems.
- List the various routes by which a drug may be given.
- Discuss the administration of oral and parenteral drugs.
- Discuss Occupational Safety and Health Administration (OSHA) guidelines concerning needle stick injuries and precautions.
- Discuss the administration of drugs through the skin and mucous membranes.
- Discuss nursing responsibilities before, during, and after a drug is administered.

The administration of a drug is a fundamental responsibility of the nurse. An understanding of the basic concepts of administering drugs is critical if the nurse is to perform this task safely and accurately.

In addition to administering the drug, the nurse monitors the therapeutic response (desired response) and reports adverse reactions. In the home setting, the nurse is responsible for teaching the patient and family members the necessary information to administer drugs safely in an outpatient setting.

## THE SIX RIGHTS AND DRUG ADMINISTRATION

The nurse preparing and administering a drug to a patient assumes responsibility for this procedure. Responsibility entails preparing and administering the prescribed drug. There are six “rights” in the administration of drugs:

- *Right patient*
- *Right drug*
- *Right dose*

- *Right route*
- *Right time*
- *Right documentation*

## Right Patient

When administering a drug, the nurse must be certain that the patient receiving the drug is the patient for whom the drug has been ordered. This is accomplished by checking the patient’s wristband containing the patient’s name (see Fig. 2-1). If there is no written identification verifying the patient’s name, the nurse obtains a wristband or other form of identification before administering the drug. In some instances the nurse may ask the patient to identify himself. However, the nurse should not ask, “Are you Mr. Jones?” Some patients, particularly those who are confused or have difficulty hearing, may respond by answering yes even though that is not their name.

Some nursing homes or extended care facilities have pictures of the patient available, which allows the nurse to verify the correct patient. If pictures are used to identify patients, it is critical that they are recent and bear a good likeness of the individual.

## Right Drug

Drug names are often confused, especially when the names sound similar or the spellings are similar. Nurses who hurriedly prepare a drug for administration or who fail to look up questionable drugs are at increased risk for administering the wrong drug. Table 2-1 identifies

examples of drugs that can easily be confused. The nurse should compare medication, container label, and medication record (see Fig. 2-2).

## Right Dose, Route, and Time

The nurse should obtain a primary care provider's written order for the administration of all drugs. The primary care provider's order must include the patient's name, the drug name, the dosage form and route, the dosage to be administered, and the frequency of administration. The primary care provider's signature must follow the drug order. In an emergency, the nurse may administer a drug with a verbal order from the primary care provider. However, the primary care provider must write and sign the order as soon as the emergency is over.

It is important to question any order that is unclear. This includes unclear directions for the administration of the drug, illegible handwriting on the primary care provider's order sheet, or a drug dose that is higher or lower than the dosages given in approved references.

## Right Documentation

After the administration of any drug, the nurse records the process immediately (see Fig. 2-3). Immediate documentation is particularly important when drugs are given on an as-needed basis (PRN drugs). For example, most analgesics require 20 to 30 minutes before the drug begins to relieve pain. A patient may forget that he or she received a drug for pain, may not have been told that the administered

TABLE 2-1

Examples of Drugs That Are Easily Confused

Accupril	Accutane
albuterol	atenolol
Alupent	Atrovent
Amikin	Amicar
Bentyl	Aventyl
Capitol	captopril
Cefzil	Ceftin
Celebrex	Celexa
DiaBeta	Zebeta
dobutamine	dopamine
Elavil	Mellaril
Eurax	Serax
Flomax	Fosamax
Inderal	Isordil
K-Dur	Imdur
Klonopin	clonidine
Lodine	codeine
Nicobid	Nitro-Bid
nifedipine	nicardipine
prednisolone	prednisone
Prilosec	Prozac
Retrovir	ritonavir
Taxol	Paxil
TobraDex	Tobrex
Versed	VePesid
Zocor	Zolof
Zyvox	Vioxx

drug was for pain, or may not know that pain relief is not immediate and may ask another nurse for drugs. If the administration of the analgesic were not recorded, the patient might receive a second dose of the analgesic shortly after the first dose. This kind of situation can be extremely serious, especially when narcotics or other central nervous system depressants are administered. Immediate documentation prevents accidental administration of a drug by another individual. Proper documentation is essential to the process of administering drugs correctly.

## CONSIDERATIONS IN DRUG ADMINISTRATION

### Drug Errors

**Drug errors** can be defined as any occurrence that can cause a patient to receive the wrong dose, the wrong drug, an incorrect dosage of the drug, a drug by the wrong route, or a drug given at the incorrect time. Errors may occur in transcribing drug orders, when the drug is dispensed, or in administration of the drug. Nurses serve as the last defense against detecting drug errors. When a drug error occurs, it must be reported immediately so that any necessary steps to counteract the action of the drug or any observation can be made as soon as possible. In most institutions, the nurse must complete an incident report and notify the primary care provider. It is important to report errors even if the patient suffers no harm.

Drug errors occur when one or more of the six “rights” has not been followed. Each time a drug is prepared and administered, the six rights must be a part of the procedure. In addition to consistently practicing the

six rights, the nurse should adhere to the following precautions to help prevent drug errors:

- Confirm any questionable orders.
- When calculations are necessary, verify them with another nurse.
- Listen to the patient when he or she questions a drug, the dosage, or the drug regimen. Never administer the drug until the patient’s questions have been adequately researched.
- Concentrate on only one task at a time.

Most errors are made during administration of the drug. Errors most commonly occur because of a failure to administer a drug that has been ordered, administration of the wrong dose or strength of a drug, or administration of the wrong drug. Two drugs often associated with errors are insulin and heparin.

The United States Pharmacopeia (USP) in cooperation with the Institute of Safe Medication Practices instituted a program called Medication Errors Reporting Program. This program is designed to identify the number and type of drug errors occurring around the country. The goal of this voluntary reporting system is to collect data and disseminate information that will prevent such errors in the future. A copy of the report form is included in Appendix C. Nurses are urged to participate in this important program as a means of protecting the public by identifying ways to make drug administration safer.

### The Medication Order

Before a medication can be administered in a hospital or other agency the nurse must have a physician’s order. Medications are ordered by the primary health care provider such as a physician, dentist, or in some cases a nurse practitioner.

Common orders include the standing order, the single order, the PRN order, and the STAT order. See Display 2-1 for an explanation of each.

#### DISPLAY 2-1 • Types of Medication Orders

**Standing Order:** This type of order is given when the patient is to receive the drug as prescribed on a regular basis. The drug is administered until the physician discontinues the drug’s use. Occasionally a drug may be ordered for a specified number of days, or in some cases a drug can only be given for a specified number of days before the order needs to be renewed.

**Example:** Lanoxin 0.25 mg PO QD.

**Single order:** An order to administer the drug one time only.

**Example:** Valium 10 mg IVP @ 10:00 AM.

**PRN order:** An order to administer the drug as needed.

**Example:** Demerol 100 mg IM q4h PRN for pain.

**STAT order:** A one-time order given as soon as possible.

**Example:** Morphine 10 mg IV STAT.

## Once-a-Week Drugs

Soon many drugs will be available for once-a-week, or even twice-a-month, administration. The doses are designed to replace daily doses of drugs. One of the first is alendronate (Fosamax), a drug used to treat osteoporosis (see Chapter 21). In 2001, the FDA approved two new strengths for this drug to be given once a week: 70-mg and 35-mg tablets. The 70-mg tablet is used to treat postmenopausal osteoporosis, and the 35-mg tablet for prevention of osteoporosis in postmenopausal osteoporosis. In clinical trials the once-a-week dosing showed no greater adverse reactions than the once-daily regimen. Once-a-week dosing may prove beneficial for those experiencing mild adverse reactions in that the reactions would be experienced once a week, rather than every day.

## Drug Dispensing Systems

There are a number of drug dispensing systems for the nurse to use to dispense medication after it has been ordered for the patient. A brief description of three methods is given below.

### Computerized Dispensing System

Automated or computerized dispensing systems are used in many hospitals or agencies dispensing drugs. Drugs are dispensed in the pharmacy from drug orders that are sent from the individual floors or units. Each floor or unit has a medication cart in which medications are placed for individual patients. Medication orders are filled in the hospital pharmacy and are placed in the drug dispensing cart. When orders are filled, the cart is delivered to the unit. To administer the drugs, nurses enter the patient's name and the drug to be administered. The drug is dispensed and automatically recorded into the computerized system. After drugs are dispensed and the cart is almost empty, it goes back to the pharmacy to be refilled and for new drug orders to be placed.

### Unit Dose System

The **unit dose** system is a method of dispensing medications in which drug orders are filled and medications dispensed to fill each patient's medication order(s) for a 24-hour period. The pharmacist dispenses each dose (unit) in a package that is labeled with the drug name and dosage. The drug(s) are placed in drawers in a special portable medication cart with a drawer for each patient. Many drugs are packaged by their manufacturers in unit doses. That is, each package is labeled by the manufacturer and contains one tablet or capsule, a premeasured amount of a liquid drug, a prefilled syringe, or one supposi-

tory. Hospital pharmacists also may prepare unit doses. The pharmacist restocks the cart each day with the drugs needed for the next 24-hour period. The nurse takes the drug cart into each patient's room (Figure 2-4).

Some hospitals are using a bar code scanner in the administration of unit dose drugs. To use this system, a bar code is placed on the patient's hospital identification band when the patient is admitted to the hospital. The bar codes, along with bar codes on the drug unit dose packages, are used to identify the patient and to record and charge routine and PRN drugs. The scanner also keeps an ongoing inventory of controlled substances, which eliminates the need for narcotic counts at the end of each shift.

### Floor Stock

Some agencies, such as nursing homes or small hospitals, use a floor stock method to dispense drugs. Some special units in hospitals, such as the emergency department, may use this method. In this situation, drugs most frequently prescribed are kept on the unit in containers in a designated medication room or at the nurses' station. The nurse takes the medication from the appropriate container and administers the drug to the patient and records the drug in the patient's administration record.

## General Principles of Drug Administration

The nurse must have factual knowledge of each drug given, the reasons for use of the drug, the drug's general action, the more common adverse reactions associated

with the drug, special precautions in administration (if any), and the normal dose ranges.

Some drugs may be given frequently; the nurse becomes familiar with pharmacologic information about a specific drug. Other drugs may be given less frequently, or a new drug may be introduced, requiring the nurse to obtain information from reliable sources, such as the drug package insert or the hospital department of pharmacy. *It is of utmost importance to check current and approved references for all drug information.*

It also is important for the nurse to take patient considerations, such as allergy history, previous adverse reactions, patient comments, and change in patient condition, into account before administering the drug. Before giving any drug for the first time, the nurse should ask the patient about any known allergies and any family history of allergies. This not only includes allergies to drugs but also to food, pollen, animals, and so on. Patients with a personal or family history of allergies are more likely to experience additional allergies and must be monitored closely.

If the patient makes any statement about the drug or if there is any change in the patient, these situations are carefully considered before the drug is given. Examples of situations that require consideration before a drug is given include:

- Problems that may be associated with the drug, such as nausea, dizziness, ringing in the ears, and difficulty walking. Any comments made by the patient may indicate the occurrence of an adverse reaction. The nurse should withhold the drug until references are consulted and the primary caregiver contacted. The decision to withhold the drug must have a sound rationale and must be based on knowledge of pharmacology.
- Comments stating that the drug looks different from the one previously received, that the drug was just given by another nurse, or that the patient thought the primary care provider discontinued the drug therapy.
- A change in the patient's condition, a change in one or more vital signs, or the appearance of new symptoms. Depending on the drug being administered and the patient's diagnosis, these changes may indicate that the drug should be withheld and the primary care provider contacted.

## Preparing a Drug for Administration

When preparing a drug for administration, the nurse should observe the following guidelines:

- Always check the health care provider's written orders and verify any questions with the primary health care provider.

- Prepare drugs for administration in a quiet, well-lit area.
- Always check the label of the drug three times: (1) when the drug is taken from its storage area, (2) immediately before removing the drug from the container, and (3) before returning the drug to its storage area.
- Never remove a drug from an unlabeled container or from a container whose label is illegible.
- Wash hands immediately before preparing a drug for administration.
- Do not let hands touch capsules or tablets. To remove an oral drug from the container, the correct number of tablets or capsules is shaken into the cap of the container and from there into the medicine cup.
- Always observe aseptic technique when handling syringes and needles.
- Be alert for drugs with similar names. Some drugs have names that sound alike but are very different. To give one drug when another is ordered could cause serious consequences. For example, digoxin and digitoxin sound alike but are different drugs.
- Replace the caps of drug containers immediately after the drug is removed.
- Return drugs requiring special storage to the storage area immediately after they are prepared for administration. This rule applies mainly to the refrigeration of drugs but may also apply to drugs that must be protected from exposure to light or heat.
- Never crush tablets or open capsules without first checking with the pharmacist. Some tablets can be crushed or capsules can be opened and the contents added to water or a tube feeding when the patient cannot swallow a whole tablet or capsule. Some tablets have a special coating that delays the absorption of the drug. Crushing the tablet may destroy this drug property and result in problems such as improper absorption of the drug or gastric irritation. Capsules are gelatin and dissolve on contact with a liquid. The contents of some capsules do not mix well with water and therefore are best left in the capsule. If the patient cannot take an oral tablet or capsule, consult the primary care provider because the drug may be available in liquid form.
- Never give a drug that someone else has prepared. The individual preparing the drug must administer the drug.
- When using a unit dose system, do not remove the wrappings of the unit dose until the drug reaches the bedside of the patient who is to receive it. After administering the drug, the nurse charts immediately on the unit dose drug form. The method of administering drugs by the unit dose system is widely used.



## ADMINISTRATION OF DRUGS BY THE ORAL ROUTE

The oral route is the most frequent route of drug administration and rarely causes physical discomfort in patients. Oral drug forms include tablets, capsules, and liquids. Some capsules and tablets contain sustained-release drugs, which dissolve over an extended period of time. Administration of oral drugs is relatively easy for patients who are alert and can swallow.

### Nursing Responsibilities

The nurse should observe the following points when giving an oral drug:

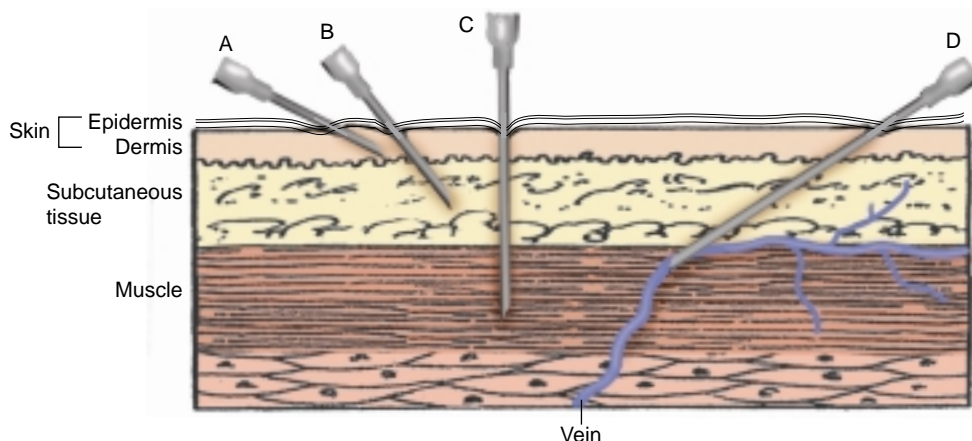
- Place the patient in an upright position. It is difficult, as well as dangerous, to swallow a solid or liquid when lying down.
- Make sure that a full glass of water is readily available.
- Assess the patient's need for assistance in removing the tablet or capsule from the container, holding the container, holding a medicine cup, or holding a glass of water. Some patients with physical disabilities cannot handle or hold these objects and may require assistance.
- Advise the patient to take a few sips of water before placing a tablet or capsule in the mouth.
- Instruct the patient to place the pill or capsule on the back of the tongue and tilt the head back to swallow a tablet or slightly forward to swallow a capsule. Encourage the patient first to take a few sips of water to move the drug down the esophagus and into the stomach, and then to finish the whole glass.
- Give the patient any special instructions, such as drinking extra fluids or remaining in bed, that are pertinent to the drug being administered.
- Never leave a drug at the patient's bedside to be taken later unless there is a specific order by the

primary care provider to do so. A few drugs (eg, antacids and nitroglycerin tablets) may be ordered to be left at the bedside.

- Patients with a nasogastric feeding tube may be given their oral drugs through the tube. Dilute and flush liquid drugs through the tube. However, crush tablets and dissolve them in water before administering them through the tube. Before administration, check the tube for placement. Flush the tube with water after the drugs are placed in the tube to completely clear the tubing.
- Instruct the patient to place **buccal** drugs against the mucous membranes of the cheek in either the upper or lower jaw. These drugs are given for a local, rather than systemic, effect. They are absorbed slowly from the mucous membranes of the mouth. Examples of drugs given buccally are lozenges and troches.
- Certain drugs are also given by the **sublingual** (placed under the tongue) route. These drugs must not be swallowed or chewed and must be dissolved completely before the patient eats or drinks. Nitroglycerin is commonly given sublingually.

## ADMINISTRATION OF DRUGS BY THE PARENTERAL ROUTE

**Parenteral** drug administration means the giving of a drug by the subcutaneous (SC), intramuscular (IM), intravenous (IV), or intradermal route (Fig. 2-5). Other routes of parenteral administration that may be used by the primary care provider are intralesional (into a lesion), intra-arterial (into an artery), intracardiac (into the heart), and intra-articular (into a joint). In some instances, intra-arterial drugs are administered by a nurse. However, administration is not by direct arterial injection but by means of a catheter that has been placed in an artery.



**FIGURE 2-5.** Needle insertion for parenteral drug: (A) Intradermal injection: a 26-gauge,  $\frac{3}{8}$ -inch long needle is inserted at a 10-degree angle. (B) Subcutaneous injection: a 25-gauge,  $\frac{1}{2}$ -inch long needle is inserted at an angle that depends on the size of the patient. (C) Intramuscular injection: a 20-gauge to 23-gauge, 1-inch to 3-inch long needle is inserted into the relaxed muscle at a 90-degree angle with a dart-throwing type of hand movement. (D) Intravenous injection: the diameter and length of the needle used depend on the substance to be injected and on the site of injection.

## Nursing Responsibilities

The nurse should observe the following points when giving a drug by the parenteral route:

- Wear gloves for protection from the potential of a blood spill when giving parenteral drugs. The risk of exposure to infected blood is increasing for all health care workers. The Centers for Disease Control and Prevention (CDC) recommends that gloves be worn when touching blood or body fluids, mucous membranes, or any broken skin area. This recommendation is referred to as **Standard Precautions**, which combine the Universal Precautions for Blood and Body Fluids with Body Substance Isolation guidelines.
- After selecting the site for injection, cleanse the skin. Most hospitals have a policy regarding the type of skin antiseptic used for cleansing the skin before parenteral drug administration. Cleanse the skin with a circular motion, starting at an inner point and moving outward.
- After inserting the needle for IM administration, pull back the syringe barrel to aspirate the drug. If blood appears in the syringe, remove the needle so the drug is not injected. Discard the drug, needle, and syringe and prepare another injection. If no blood appears in the syringe, inject the drug. Aspiration is not necessary when giving an intradermal or SC injection.
- After inserting a needle into a vein for IV drug administration, pull back the syringe barrel. Blood should flow back into the syringe. After a backflow of blood is obtained, it is safe to inject the drug.
- After removing the needle from an IM, SC, or IV injection site, place pressure on the area. Patients with bleeding tendencies often require prolonged pressure on the area.
- Do not recap syringes and dispose of them according to agency policy. Discard needles and syringes into clearly marked, appropriate containers. Most agencies have a “sharp” container located in each room for immediate disposal of needles and syringes after use.
- Most hospitals use needles designed to prevent sticks. This needle has a plastic guard that slips over the needle as it is withdrawn from the injection site. The guard locks in place and eliminates the need to recap. Other models are available as well. These newer types of methods for administering parenteral fluids provide a greater margin of safety for nurses. (See OSHA Guidelines below.)

## Occupational Safety and Health Administration Guidelines

Each year between 600,000 and 1 million health care workers experience sticks from conventional needles and sharps. Needle exposures can transmit hepatitis B,

hepatitis C, and human immunodeficiency virus. Other infections, such as tuberculosis, syphilis, and malaria, also can be transmitted through needle sticks. More than 80% of needle stick injuries could be prevented with the use of safer needle devices. Nurses working at the bedside are the largest group of health care workers sustaining needle stick and sharps injuries.

Effective April 2001, the Occupational Safety and Health Administration (OSHA) announced new guidelines on needle stick prevention. Under the theory that “prevention is the best medicine,” revisions were made in the Bloodborne Pathogens Standard. The revisions clarify the need for employers to select safer needle devices as they become available and to involve employees in identifying and choosing the devices. Employers with 11 or more employees must also maintain a Sharps Injury Log to include (at least) the following components:

- Type and brand of device involved in the incident (if known)
- Location of the incident
- Description of the incident

The needle stick log will help both employees and employers track all needle sticks to help identify problem areas. The log must be maintained to protect the confidentiality of the injured employee. In addition, employers must have a written Exposure Control Plan that is updated annually. During the annual review, inquiries must be made about new or prospective safer options. If new safer devices are available, they should be adopted for use in the agency. The new guidelines will help reduce needle stick injuries among health care workers and others who handle medical sharps. Safety engineered devices such as self-sheathing needles and needleless systems can be used.

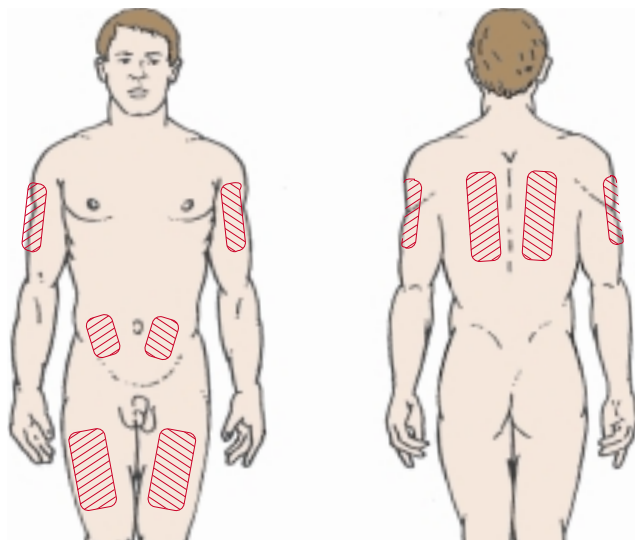
## Administration of Drugs by the Subcutaneous Route

A **subcutaneous** (SC) injection places the drug into the tissues between the skin and the muscle (see Fig. 2-5B). Drugs administered in this manner are absorbed more slowly than are intramuscular injections. Heparin and insulin are two drugs most commonly given by the SC route.

## Nursing Responsibilities

The nurse should observe the following points when giving a drug by the SC route:

- A volume of 0.5 to 1 mL is used for SC injection. Larger volumes (eg, >1 mL) are best given as IM



**FIGURE 2-6.** Sites on the body at which subcutaneous injections can be given.

injections. If a volume larger than 1 mL is ordered through the SC route, the injection is given in two sites, with separate needles and syringes.

- The sites for SC injection are the upper arms, the upper abdomen, and the upper back (Fig. 2-6). Rotate injection sites to ensure proper absorption and to minimize tissue damage.
- When giving a drug by the SC route, insert the needle at a 45-degree angle. However, to place the drug in the SC tissue, select the needle length and angle of insertion based on the patient's body weight. Obese patients have excess SC tissue, and it may be necessary to give the injection at a 90-degree angle. If the patient is thin or cachectic, there usually is less SC tissue. For such patients, the upper abdomen is the best site for injection. Generally, a syringe with a 23- to 25-gauge needle that is  $\frac{1}{2}$  to  $\frac{5}{8}$  inches in length is most suitable for an SC injection.

## Administration of Drugs by the Intramuscular Route

An **intramuscular** (IM) injection is the administration of a drug into a muscle (see Fig. 2-5C). Drugs that are irritating to SC tissue can be given via IM injection. Drugs given by this route are absorbed more rapidly than drugs given by the SC route because of the rich blood supply in the muscle. In addition, a larger volume (1–3 mL) can be given at one site.

## Nursing Responsibilities

The nurse should observe the following points when giving a drug by the IM route:

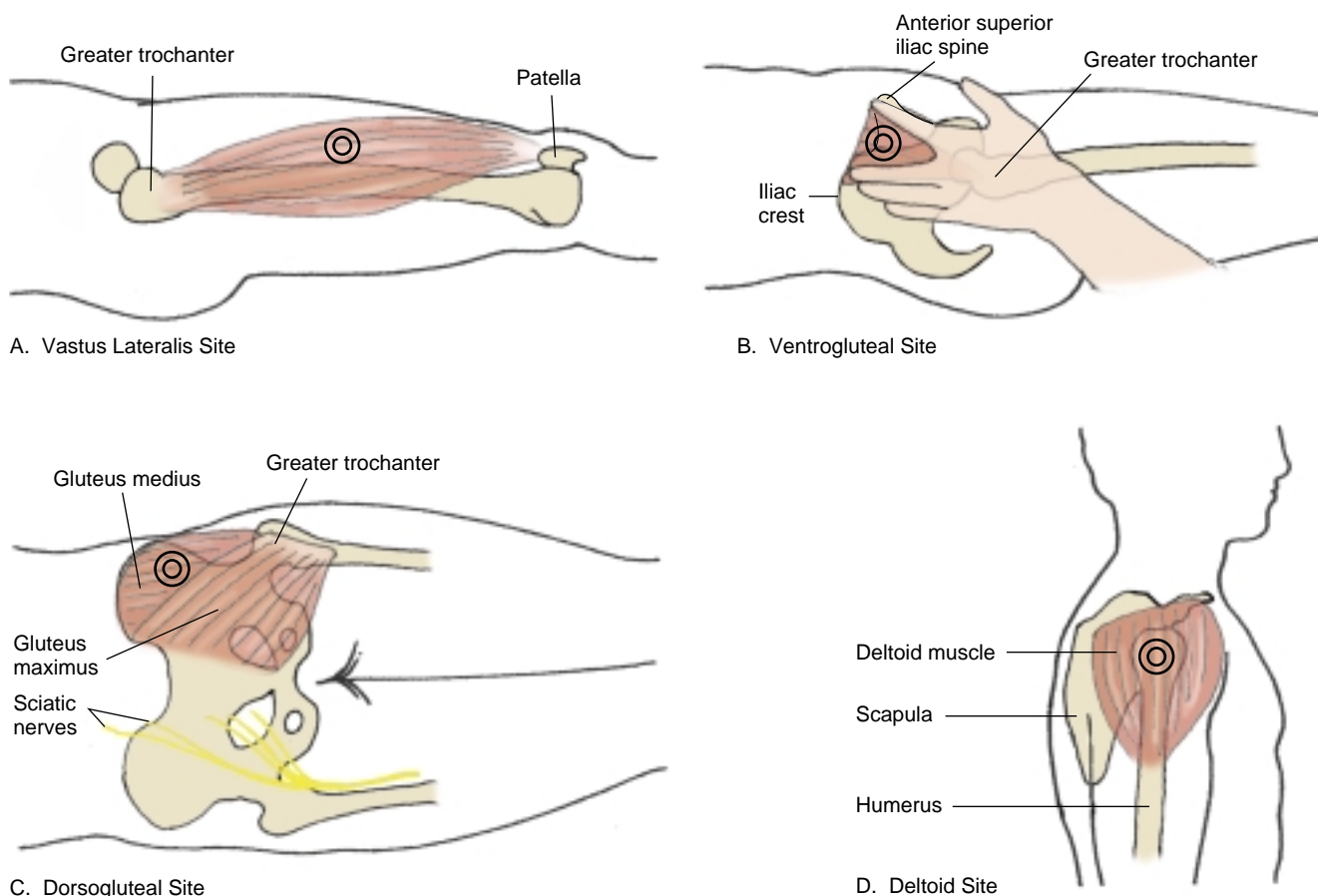
- If an injection is more than 3 mL, divide the drug and give it as two separate injections. Volumes larger than 3 mL will not be absorbed properly.
- A 22-gauge needle that is  $1\frac{1}{2}$  inches in length is most often used for IM injections.
- The sites for IM administration are the deltoid muscle (upper arm), the ventrogluteal or dorso-gluteal sites (hip), and the vastus lateralis (thigh; Fig. 2-7). The vastus lateralis site is frequently used for infants and small children because it is more developed than the gluteal or deltoid sites. In children who have been ambulating for more than 2 years the ventrogluteal site may be used.
- When giving a drug by the IM route, insert the needle at a 90-degree angle. When injecting a drug into the ventrogluteal or dorso-gluteal muscles, it is a good idea to place the patient in a comfortable position, preferably in a prone position with the toes pointing inward. When injecting the drug into the deltoid, a sitting or lying down position may be used. Place the patient in a recumbent position for injection of a drug into the vastus lateralis.

## Z-Track Technique

The **Z-track** method of IM injection is used when a drug is highly irritating to SC tissues or has the ability to permanently stain the skin. The nurse should adhere to the following procedure when using the Z-track technique (Fig. 2-8):

- Draw the drug up into the syringe.
- Discard the needle and place a new needle on the syringe. This prevents any solution that may remain in the needle (that was used to draw the drug into the syringe) from contacting tissues as the needle is put into the muscle.
- Pull the plunger down to draw approximately 0.1 to 0.2 mL of air into the syringe. The air bubble in the syringe follows the drug into the tissues and seals off the area where the drug was injected, thereby preventing oozing of the drug up through the extremely small pathway created by the needle.
- Place the patient in the correct position for administration of an IM injection.
- Cleanse the skin.
- Pull the skin, SC tissues, and fat (that are over the injection site) laterally, displacing the tissue to the side.
- While holding the tissues in the lateral position, insert the needle and inject the drug.





**FIGURE 2-7.** Sites for intramuscular administration. **(A)** Vastus lateralis site: the patient is supine or sitting. **(B)** Ventrogluteal site: the nurse's palm is placed on the greater trochanter and the index finger is placed on the anterior superior iliac spine; the injection is made into the middle of the triangle formed by the nurse's fingers and the iliac crest. **(C)** Dorsogluteal site: to avoid the sciatic nerve and accompanying blood vessels, an injection site is chosen above and lateral to a line drawn from the greater trochanter to the posterior superior iliac spine. **(D)** Deltoid site: the mid-deltoid area is located by forming a rectangle, the top of which is at the level of the lower edge of the acromion, and the bottom of which is at the level of the axilla; the sides are one third and two thirds of the way around the outer aspect of the patient's arm.

- After the drug is injected, release the tissues and withdraw the needle. This technique prevents the backflow of drug into the SC tissue.

## Administration of Drugs by the Intravenous Route

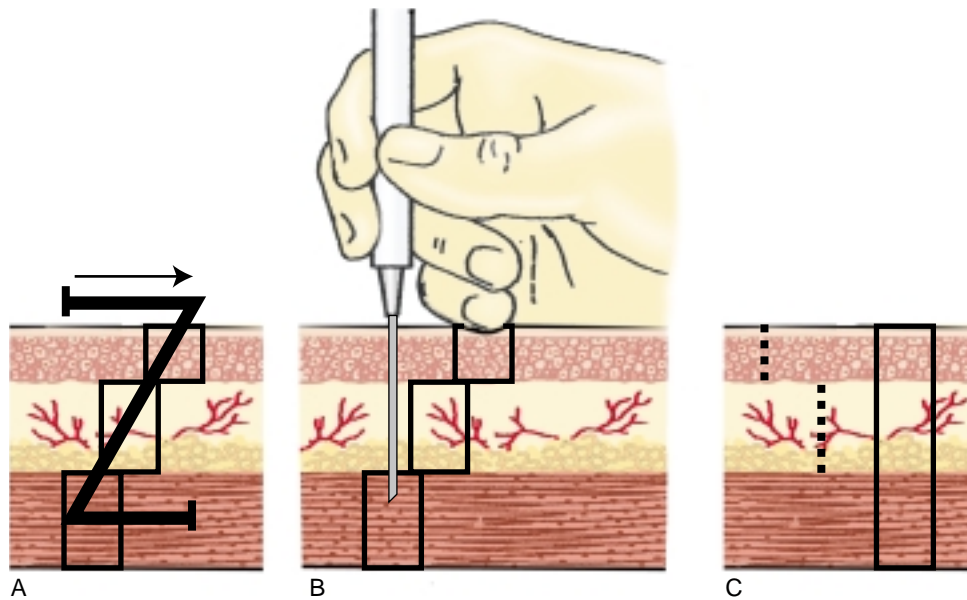
A drug administered by the **intravenous** (IV) route is given directly into the blood by a needle inserted into a vein. Drug action occurs almost immediately.

Drugs administered via the IV route may be given:

- Slowly, over 1 or more minutes
- Rapidly (IV push)
- By piggyback infusions (drugs are mixed with 50–100 mL of compatible IV fluid and administered during a period of 30–60 minutes piggybacked onto the primary IV line)
- Into an existing IV line (the IV port)
- Into an intermittent venous access device called a heparin lock (a small IV catheter in the patient's vein connected to a small fluid reservoir with a rubber cap through which the needle is inserted to administer the drug)
- By being added to an IV solution and allowed to infuse into the vein over a longer period

When administering a drug into a vein by a venipuncture, the nurse should place a tourniquet above the selected vein. It is important to tighten the tourniquet so that venous blood flow is blocked but arterial blood flow is not. The nurse should allow the veins to fill (distend) and then should pull the skin taut (to anchor the vein and the skin) and insert the needle into the vein, bevel up, and at a short angle to the skin. Blood should immediately flow into the syringe if the needle is properly inserted into the vein.

Performing a venipuncture requires practice. A suitable vein for venipuncture may be hard to find, and some



**FIGURE 2-8.** Z-track injection: **(A)** The tissue is tensed laterally at the injection site before the needle is inserted. This pulls the skin, subcutaneous tissue, and fat planes into a Z formation. **(B)** After the tissue has been displaced, the needle is thrust straight into the muscular tissue. **(C)** After injection, tissues are released while the needle is withdrawn. As each tissue plane slides by the other, the track is sealed.

veins are difficult to enter. The nurse should never repeatedly and unsuccessfully attempt a venipuncture. Depending on clinical judgment, three unsuccessful attempts on the same patient warrant having a more skilled individual attempt the procedure.

Some drugs are added to an IV solution, such as 1000 mL of dextrose 5% and water. The drug is usually added to the IV fluid container immediately before adding the fluid to the IV line. Whenever a drug is added to an IV fluid, the bottle must have a label attached indicating the drug and drug dose added to the IV fluid. In some hospitals, a pharmacist is responsible for adding specific drugs to IV fluids.

### Intravenous Infusion Controllers and Pumps

Electronic infusion devices are classified as either infusion controllers or infusion pumps. The primary difference between the two is that an infusion pump adds pressure to the infusion, whereas an infusion controller does not. An infusion pump may be used to deliver the desired number of drops per minute. An alarm is set to sound if the IV is more than or less than the preset rate.

Controllers and pumps have detectors and alarms that alert the nurse to various problems, such as air in the line, an occlusion, low battery, completion of an infusion, or an inability to deliver the preset rate. When any problem is detected by the device, an alarm is activated to alert the nurse. Potential complications in IV therapy are the same as those with peripheral line.

### Nursing Responsibilities

After the start of an IV infusion, the nurse records on the patient's chart the type of IV fluid and, when applicable, the drug added to the IV solution. It is important to check the infusion rate every 15 to 30 minutes. At this time, the nurse also inspects the needle site for signs of redness, swelling, or other problems. Swelling around the needle may indicate one of two things: extravasation or infiltration. **Extravasation** refers to the escape of fluid from a blood vessel into surrounding tissues while the needle or catheter is in the vein. **Infiltration** is the collection of fluid in tissues (usually SC tissue) when the needle or catheter is out of the vein. Both events necessitate discontinuation of the infusion and insertion of an IV line in another vein. Some drugs are capable of causing severe tissue damage if extravasation or infiltration occurs.

If extravasation or infiltration occurs, the IV must be stopped and restarted in another vein. The primary

### Nursing Alert

Use of an infusion pump or controller still requires nursing supervision and frequent monitoring of the IV infusion. Infiltration can progress rapidly because the increased pressure will not slow the infusion until considerable edema has occurred. Therefore, it is important to monitor frequently for signs of infiltration, such as edema or redness at the site. Careful monitoring of the pump or controller is also necessary to make sure the flow rate is correct.

care provider should be contacted if a drug capable of causing tissue damage (eg, norepinephrine [Levophed]) has escaped into the tissues surrounding the needle insertion site.

### Administration of Drugs by the Intradermal Route

Drugs given by the intradermal route are usually those for sensitivity tests (eg, the tuberculin test or allergy skin testing) (see Fig. 2-5A). Absorption is slow and allows for good results when testing for allergies or administering local anesthetics.

#### Nursing Responsibilities

The nurse observes the following points when administering drugs by the intradermal route:

- The inner part of the forearm and the upper back may be used for intradermal injections. The area should be hairless; areas near moles, scars, or pigmented skin areas should be avoided. The nurse should cleanse the area in the same manner as for SC and IM injections.
- A 1-mL syringe with a 25- to 27-gauge needle that is  $\frac{1}{4}$  to  $\frac{5}{8}$  inch long is best suited for intradermal injections. Small volumes (usually  $<0.1$  mL) are used for intradermal injections and administered with the bevel up.
- The nurse should insert the needle at a 15-degree angle between the upper layers of the skin. The nurse should not aspirate the syringe or massage the area. Injection produces a small wheal (raised area) on the outer surface of the skin. If a wheal does not appear on the outer surface of the skin, there is a good possibility that the drug entered the SC tissue, and any test results would be inaccurate.

### Other Parenteral Routes of Drug Administration

The primary care provider may administer a drug by the intracardial, intralesional, intra-arterial, or intra-articular routes. The nurse may be responsible for preparing the drug for administration. The nurse should ask the primary care provider what special materials will be required for administration.

Venous access ports are totally implanted ports with a self-sealing septum that is attached to a catheter leading to a large vessel, usually the vena cava. These devices are most commonly used for chemotherapy or other long-term therapy and require surgical insertion and removal. Drugs are administered through injections made into the portal through the skin. These drugs are administered by the primary care provider or a registered nurse.

## ADMINISTRATION OF DRUGS THROUGH THE SKIN AND MUCOUS MEMBRANES

Drugs may be applied to the skin and mucous membranes using several routes: topically (on the outer layers of skin), transdermally through a patch on which the drug has been implanted, or inhaled through the membranes of the upper respiratory tract.

### Administration of Drugs by the Topical Route

Most topical drugs act on the skin but are not absorbed through the skin. These drugs are used to soften, disinfect, or lubricate the skin. A few topical drugs are enzymes that have the ability to remove the superficial debris, such as the dead skin and purulent matter present in skin ulcerations. Other topical drugs are used to treat minor, superficial skin infections. The various forms of topical applications and locations of use are described in Display 2-2.

#### Nursing Responsibilities

The nurse considers the following points when administering drugs by the topical route:

- The primary care provider may write special instructions for the application of a topical drug. For example, to apply the drug in a thin, even layer or to cover the area after application of the drug to the skin.
- Other drugs may have special instructions provided by the manufacturer, such as to apply the drug to a

#### DISPLAY 2-2 • Topical Applications and Locations of Use

- Creams, lotions, or ointments applied to the skin with a tongue blade, gloved fingers, or gauze
- Sprays applied to the skin or into the nose or oral cavity
- Liquids inserted into body cavities, such as fistulas
- Liquids inserted into the bladder or urethra
- Solids (eg, suppositories) or jellies inserted into the urethra
- Liquids dropped into the eyes, ears, or nose
- Ophthalmic ointments applied to the eyelids or dropped into the lower conjunctival sac
- Solids (eg, suppositories, tablets), foams, liquids, and creams inserted into the vagina
- Continuous or intermittent wet dressings applied to skin surfaces
- Solids (eg, tablets, lozenges) dissolved in the mouth
- Sprays or mists inhaled into the lungs
- Liquids, creams, or ointments applied to the scalp
- Solids (eg, suppositories), liquids, or foams inserted into the rectum

clean, hairless area or to let the drug dissolve slowly in the mouth. All of these instructions are important because drug action may depend on correct administration of the drug.

## Administration of Drugs by the Transdermal Route

Drugs administered by the **transdermal** route are readily absorbed from the skin and provide systemic effects. This type of administration is called transdermal drug delivery system. The drug dosages are implanted in a small patch-type bandage. The backing is removed, and the patch is applied to the skin where the drug is gradually absorbed into the systemic circulation. This type of drug system maintains a relatively constant blood concentration and reduces the possibility of toxicity. In addition, the use of drugs transdermally causes fewer adverse reactions, and administration is less frequent than when the drugs are given by another route. Nitroglycerin (used to treat cardiac problems) and scopolamine (used to treat dizziness and nausea) are two drugs given frequently by the transdermal route.

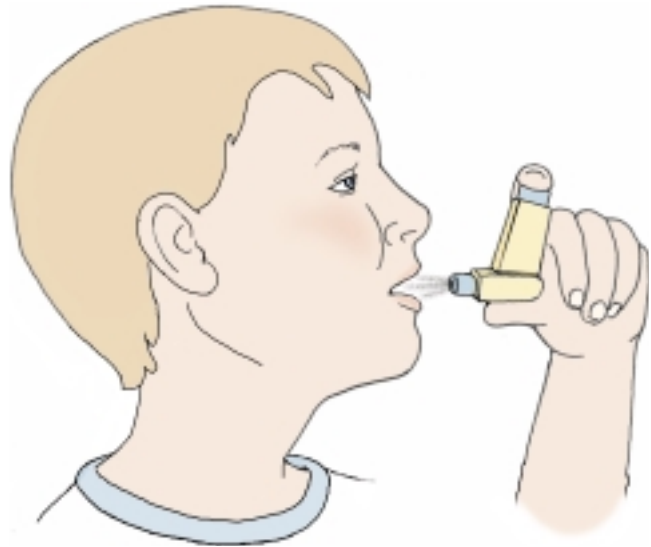
### Nursing Responsibilities

The nurse observes the following points when administering drugs by the transdermal route:

- Apply transdermal patches to clean, dry, nonhairy areas of intact skin.
- Remove the old patch when the next dose is applied in a new site.
- Rotate sites for transdermal patches to prevent skin irritation. The chest, flank, and upper arm are the most commonly used sites. Do not shave the area to apply the patch; shaving may cause skin irritation.
- Ointments are sometimes used and come with a special paper marked in inches. Measure the correct length (onto the paper), place the paper with the drug ointment side down on the skin, and secure it with tape. Before the next dose, remove the paper and tape and cleanse the skin.

## Administration of Drugs Through Inhalation

Drug droplets, vapor, or gas are administered through the mucous membranes of the respiratory tract with the use of a face mask, a nebulizer, or a positive-pressure breathing machine. Examples of drugs administered through **inhalation** include bronchodilators, mucolytics, and some anti-inflammatory drugs. These drugs produce, primarily, a local effect in the lungs.



**FIGURE 2-9.** A respiratory inhalant is used to deliver a drug directly into the lungs. To deliver a dose of the drug, the patient takes a slow, deep breath while depressing the top of the canister. (See Chapter 37 for more information on drugs given by inhalation.)

### Nursing Responsibilities

The primary nursing responsibility is to provide the patient with proper instructions for administering the drug. For example, many patients with asthma use a metered-dose inhaler to dilate the bronchi and make breathing easier. Without proper instruction on how to use the inhaler, much of the drug can be deposited on the tongue, rather than in the respiratory tract. This decreases the therapeutic effect of the drug. Instructions may vary with each inhaler. To be certain that the inhaler is used correctly, the patient is referred to the instructions accompanying each device. Figure 2-9 illustrates the proper use of one type of inhaler.

## NURSING RESPONSIBILITIES AFTER DRUG ADMINISTRATION

After the administration of any type of drug, the nurse is responsible for the following:









- Recording the administration of the drug. The nurse should complete this task as soon as possible. This is particularly important when PRN drugs (especially narcotics) are given.
- Recording (when necessary) any information concerning the administration of the drug. This includes information such as the IV flow rate, the site used for parenteral administration, problems



## Home Care Checklist

### ADMINISTERING DRUGS SAFELY IN THE HOME

For most patients, drugs will be prescribed after discharge to be taken at home. Because the home is not as controlled an environment as a health care facility, the nurse should assess the patient's home environment carefully to ensure complete safety. It is important to keep in mind the following when making a home safety assessment:

-  Does the home have a space that is relatively free of clutter and easily accessible to the patient or a caregiver?
-  Do any small children live in or visit the home? If so, is there a place where drugs can be stored safely out of their reach?
-  Does the drug require refrigeration? If so, does the refrigerator work?
-  Does the patient need special equipment, such as needles and syringes? If so, where and how can the equipment be stored for safety and convenience? Does the patient have an appropriate disposal container? Will the refuse be safe from children and pets?
-  If the patient needs several drugs, can the patient or caregiver identify which drugs are used and when? Do they know how to use them and why?
-  Suggest using plastic storage containers with snap-on lids or clean, dry glass jars with screw tops for needle disposal.
-  Advise the patient to use an impervious container with a properly fitting lid, such as a coffee can, for safe disposal of needles. A plastic milk jug with a lid or a heavy-duty, clean, cardboard milk or juice carton may be used if necessary.
-  Explain the importance of taking precautions to make sure discarded needles do not puncture the container.

with administration (if any), and vital signs taken immediately before administration.

- Evaluating and recording the patient's response to the drug (when applicable). Evaluation may include such facts as relief of pain, decrease in body temperature, relief of itching, and decrease in the number of stools passed.
- Observing the adverse reactions. The frequency of these observations will depend on the drug administered. The nurse must record all suspected adverse reactions and report them to the primary care provider. The nurse must immediately report serious adverse reactions to the primary care provider.

## ADMINISTRATION OF DRUGS IN THE HOME

Many times drugs are not administered by the nurse but in the home setting by the patient or family members serving as caregivers. When this is the case, it is important that the patient or caregivers understand the treatment regimen and are given an opportunity to ask questions concerning the drug therapy, such as why the drug was prescribed, how to administer the drug, and adverse

reactions of the drug (see Chap. 5 for information concerning patient and family education). The Home Care Checklist: Administering Drugs Safely in the Home gives some guidelines to follow when drugs are administered in the home by the patient or caregiver, rather than by the nurse.

### ● Critical Thinking Exercises

1. Ms. Benson, a nurse on your clinical unit, tells you that the head nurse is upset with her because she has not been recording the administration of narcotics immediately after they are given. Discuss the rationales you could give to Ms. Benson to stress the importance of recording the administration of narcotics immediately after they are given.
2. A nurse is to give an SC injection of heparin to a patient. Determine what information the nurse needs to know about the patient before preparing the injection. Discuss how this information would affect the preparation of the injection and the technique used to give the SC injection.
3. After administering a drug to a patient you find that the incorrect dosage was given. The dose that you administered was two times the correct dosage. Analyze what action, if any, you would take.



4. Discuss why the sixth right, right documentation, is important in drug administration.
5. Discuss the importance in participating in the MedWatch programs and the Medication Errors Reporting Program.

### ● Review Questions

1. The nurse correctly administers an intramuscular injection by \_\_\_\_\_.
  - A. displacing the skin to the side before making the injection
  - B. using a 1-inch needle
  - C. inserting the needle at a 90-degree angle
  - D. using a 25-gauge needle
2. When preparing a drug for SC administration, the nurse is aware that the usual volume of a drug injected by the SC route is \_\_\_\_\_.
  - A. 2 to 5 mL
  - B. 3 to 4 mL
  - C. 0.5 to 1 mL
  - D. <0.5 mL
3. The nurse explains to the patient receiving an IV injection that the action of the drug occurs \_\_\_\_\_.
  - A. in 5 to 10 minutes
  - B. in 15 to 20 minutes
  - C. within 30 minutes
  - D. almost immediately
4. When administering a drug the nurse \_\_\_\_\_.
  - A. checks the drug label two times before administration
  - B. is alert for any drugs with a similar name
  - C. may administer a drug prepared by another nurse
  - D. may crush any tablet that the patient is unable to swallow
5. When monitoring a patient with an IV, the nurse observes the area around the needle insertion site is swollen and red. The first action of the nurse is to \_\_\_\_\_.
  - A. check the patient's blood pressure and pulse
  - B. check further for possible extravasation
  - C. ask the patient if the IV site has been accidentally injured
  - D. immediately notify the primary health care provider