










Measuring Vital Signs

OBJECTIVES

- Define the key terms and key abbreviations listed in this chapter
- Explain why vital signs are measured
- List the factors affecting vital signs
- Identify the normal ranges for each temperature site
- Explain when to use each temperature site
- Identify the pulse sites
- Describe a normal pulse and normal respirations
- Describe the practices to follow when measuring blood pressure
- Know the normal vital signs for different age-groups
- Perform the procedures described in this chapter

PROCEDURES

-  Taking a Temperature With a Glass Thermometer
-  Taking a Temperature With an Electronic Thermometer
-  Taking a Radial Pulse
-  Taking an Apical Pulse
-  Taking an Apical-Radial Pulse
-  Counting Respirations
-  Measuring Blood Pressure

Procedures with this icon  are on the CDCompanion in this book; those with this icon  are on the Evolve Student Resources Website.

KEY TERMS

apical-radial pulse Taking the apical and radial pulses at the same time

blood pressure The amount of force exerted against the walls of an artery by the blood

body temperature The amount of heat in the body that is a balance between the amount of heat produced and the amount lost by the body

bradycardia A slow (*brady*) heart rate (*cardia*); less than 60 beats per minute

diastole The period of heart muscle relaxation; the period when the heart is at rest

diastolic pressure The pressure in the arteries when the heart is at rest

fever Elevated body temperature

hypertension Blood pressure measurements that remain above (*hyper*) a systolic pressure of 140 mm Hg or a diastolic pressure of 90 mm Hg

hypotension When the systolic blood pressure is below (*hypo*) 90 mm Hg and the diastolic pressure is below 60 mm Hg

pulse The beat of the heart felt at an artery as a wave of blood passes through the artery

pulse deficit The difference between the apical and radial pulse rates

pulse rate The number of heartbeats or pulses felt in 1 minute

respiration Breathing air into (*inhalation*) and out of (*exhalation*) the lungs

sphygmomanometer A cuff and measuring device used to measure blood pressure

stethoscope An instrument used to listen to sounds produced by the heart, lungs, and other body organs

systole The period of heart muscle contraction; the period when the heart is pumping blood

systolic pressure The amount of force needed to pump blood out of the heart into the arterial circulation

tachycardia A rapid (*tachy*) heart rate (*cardia*); more than 100 beats per minute

vital signs Temperature, pulse, respirations, and blood pressure

KEY ABBREVIATIONS

A Axillary

Ap Apical

BP Blood pressure

C Centigrade; Celsius

CPR Cardiopulmonary resuscitation

F Fahrenheit

Hg Mercury

IV Intravenous

mm Millimeters

mm Hg Millimeters of mercury

R Rectal

TPR Temperature, pulse, and respirations

Vital signs reflect the function of three body processes essential for life: regulation of body temperature, breathing, and heart function. The four vital signs of body function are:

- ▶ Temperature
- ▶ Pulse
- ▶ Respirations
- ▶ Blood pressure

Vital signs are often called TPR (temperature, pulse, and respiration) and BP (blood pressure). Some agencies consider "pain" to be a vital sign. See Chapter 27 for how to assist the nurse with pain assessment.

MEASURING AND REPORTING VITAL SIGNS

A person's vital signs vary within certain limits. They are affected by sleep, activity, eating, weather, noise, exercise, drugs, anger, fear, anxiety, pain, and illness.

Vital signs are measured to detect changes in normal body function. They tell about responses to treatment. They often signal life-threatening events. Vital signs are

part of the assessment step in the nursing process. Vital signs are measured:

- ▶ During physical exams
- ▶ When the person is admitted to a health care agency
- ▶ As often as required by the person's condition
- ▶ Before and after surgery
- ▶ Before and after complex procedures or diagnostic tests
- ▶ After some care measures, such as ambulation
- ▶ After a fall or other injury
- ▶ When drugs affect the respiratory or circulatory system
- ▶ When there are complaints of pain, dizziness, light-headedness, feeling faint, shortness of breath, a rapid heart rate, or not feeling well
- ▶ As stated on the care plan (usually daily or weekly in nursing centers)

Vital signs show even minor changes in the person's condition. Accuracy is essential when you measure, record, and report vital signs. If unsure of your measurements,

FOCUS ON CHILDREN AND OLDER PERSONS

Measuring and Reporting Vital Signs

OLDER PERSONS

Measuring vital signs on persons with dementia may be difficult. The person may move about, hit at you, and grab equipment. This is not safe for the person or for you. Two workers may be needed. One uses touch and a soothing voice to calm and distract the person. The other measures the vital signs.

You may need to try the procedure when the person is calmer. Or take the pulse and respirations at one time. Then take the temperature and blood pressure at another time.

Always approach the person calmly. Use a soothing voice. Tell the person what you are going to do. Do not rush the person. Follow the care plan. If you cannot measure vital signs, tell the nurse right away.

FOCUS ON COMMUNICATION

Measuring and Reporting Vital Signs

Patients and residents like to know their measurements. If agency policy allows, you can tell the person the measurements. Remember, this information is private and confidential. Roommates and visitors must not hear what you are saying.

A measurement may be abnormal. Or you may not be able to feel a pulse or hear a blood pressure. Do not alarm the person. You can say:

- "I'm not sure that I counted your pulse correctly. I want the nurse to take it too."
- "I'm not sure that I heard your blood pressure correctly. I'll ask the nurse to take it again."
- "Your pulse is a little slow (or fast). I'll ask the nurse to check it."
- "Your temperature is higher than normal. I'm going to check it with another thermometer. I'll also ask the nurse to check you."

promptly ask the nurse to take them again. Unless otherwise ordered, take vital signs with the person lying or sitting. The person is at rest when vital signs are measured. Report the following at once:

- ▶ Any vital sign that is changed from a prior measurement
 - ▶ Vital signs above the normal range
 - ▶ Vital signs below the normal range
- Vital signs are recorded in the person's medical record. If they are measured often, a flow sheet is used. The doctor or nurse compares current and previous measurements.

See *Focus on Children and Older Persons: Measuring and Reporting Vital Signs*.

See *Focus on Communication: Measuring and Reporting Vital Signs*.

BODY TEMPERATURE

Body temperature is the amount of heat in the body. It is a balance between the amount of heat produced and the amount lost by the body. Heat is produced as cells use

BOX 25-1 Temperature Sites

ORAL SITE

Oral temperatures are *not* taken if the person:

- Is under 4 or 5 years of age
- Is unconscious
- Has had surgery or an injury to the face, neck, nose, or mouth
- Is receiving oxygen
- Breathes through the mouth
- Has a nasogastric tube
- Is delirious, restless, confused, or disoriented
- Is paralyzed on one side of the body
- Has a sore mouth
- Has a convulsive (seizure) disorder

RECTAL SITE

The rectal site is used for infants and children under 3 years old. Rectal temperatures are taken when the oral site cannot be used.

Rectal temperatures are *not* taken if the person:

- Has diarrhea
- Has a rectal disorder or injury
- Has heart disease
- Had rectal surgery
- Is confused or agitated

TYMPANIC MEMBRANE SITE

The site has fewer microbes than the mouth or rectum. Therefore the risk of spreading infection is reduced. This site is *not* used if the person has:

- An ear disorder
- Ear drainage

TEMPORAL ARTERY SITE

Measures body temperature at the temporal artery in the forehead. The site is non-invasive.

AXILLARY SITE

Less reliable than the other sites. It is used when the other sites cannot be used.

food for energy. It is lost through the skin, breathing, urine, and feces. Body temperature stays fairly stable. It is lower in the morning and higher in the afternoon and evening. Body temperature is affected by age, weather, exercise, emotions, stress, and illness. Pregnancy and the menstrual cycle are other factors.

Thermometers are used to measure temperature. It is measured using the Fahrenheit (F) and centigrade or Celsius (C) scales.

Temperature Sites

Temperature sites are the mouth, rectum, axilla (underarm), tympanic membrane (ear), and temporal artery (forehead) (Box 25-1). Each site has a normal range (Table 25-1, p. 442). Fever means an elevated body temperature. Always report temperatures that are above or below the normal range.

See *Focus on Children and Older Persons: Temperature Sites*, p. 442.

See *Promoting Safety and Comfort: Temperature Sites*, p. 442.

TABLE 25-1 Normal Body Temperatures

Site	Baseline	Normal Range
Oral	98.6° F (37° C)	97.6° to 99.6° F (36.5° to 37.5° C)
Rectal	99.6° F (37.5° C)	98.6° to 100.6° F (37.0° to 38.1° C)
Axillary	97.6° F (36.5° C)	96.6° to 98.6° F (35.9° to 37.0° C)
Tympanic membrane	98.6° F (37° C)	98.6° F (37° C)
Temporal artery	99.6° F (37.5° C)	99.6° F (37.5° C)

FOCUS ON CHILDREN AND OLDER PERSONS**Temperature Sites****CHILDREN**

The oral site is not used for infants and children younger than 4 to 5 years. Other routes are used as directed by the nurse and the care plan. See Box 25-1.

OLDER PERSONS

Older persons have lower body temperatures than younger persons. An oral temperature of 98.6° F may signal fever in an older person.

PROMOTING SAFETY AND COMFORT: Temperature Sites**SAFETY**

Rectal temperatures are dangerous for persons with heart disease. The thermometer can stimulate the vagus nerve in the rectum. This nerve also affects the heart. Stimulation of the vagus nerve slows the heart rate. The heart rate can slow to dangerous levels in some persons.

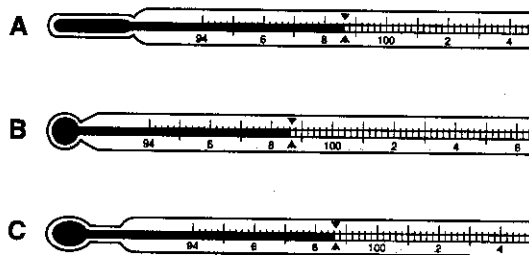


FIGURE 25-1 Types of glass thermometers. **A**, The long and slender tip. **B**, The stubby tip (rectal thermometer). **C**, The pear-shaped tip.

Glass Thermometers

The glass thermometer is a hollow glass tube (Fig. 25-1) with a bulb (tip) at the end. The device is filled with a substance—a mercury-free mixture or mercury. When heated, the substance expands and rises in the tube. When cooled, the substance contracts and moves down the tube.

Long- or slender-tip thermometers are used for oral and axillary temperatures. So are thermometers with stubby and pear-shaped tips. Rectal thermometers have stubby tips. Thermometers are color-coded:

- ▶ Blue—oral and axillary thermometers
- ▶ Red—rectal thermometers

Glass thermometers are reusable. However, the following are problems:

- ▶ They take a long time to register—3 to 10 minutes depending on the site (p. 444).
- ▶ They break easily. Broken thermometers can injure the rectum and colon.
- ▶ The person may bite down and break an oral thermometer. Cuts in the mouth are risks. Swallowed mercury can cause mercury poisoning.

See *Focus on Long-Term Care and Home Care: Glass Thermometers*.

See *Promoting Safety and Comfort: Glass Thermometers*.

Reading a Glass Thermometer

Fahrenheit thermometers have long and short lines. Every other long line is an even degree from 94° to 108° F. The short lines mean 0.2 (two tenths) of a degree (Fig. 25-2, A).

On a centigrade thermometer, each long line means 1 degree. Degrees range from 34° to 42° C. Each short line means 0.1 (one tenth) of a degree (Fig. 25-2, B).

To read a glass thermometer:

- ▶ Hold it at the stem (Fig. 25-3). Bring it to eye level.
- ▶ Turn it until you can see the numbers and the long and short lines.
- ▶ Turn it back and forth slowly until you can see the silver or red line.
- ▶ Read the nearest degree (long line).
- ▶ Read the nearest tenth of a degree (short line)—an even number on a Fahrenheit thermometer.

FOCUS ON LONG-TERM CARE AND HOME CARE**Glass Thermometers****HOME CARE**

Patients in home settings may have mercury-glass thermometers. If so, tell the nurse. Do not use a mercury-glass thermometer to measure a child's temperature.

PROMOTING SAFETY AND COMFORT: Glass Thermometers**SAFETY**

If a mercury-glass thermometer breaks, tell the nurse at once. Mercury is a hazardous substance. Do not touch the mercury. Do not let the person do so. The agency must follow special procedures for handling all hazardous materials. See Chapter 11.

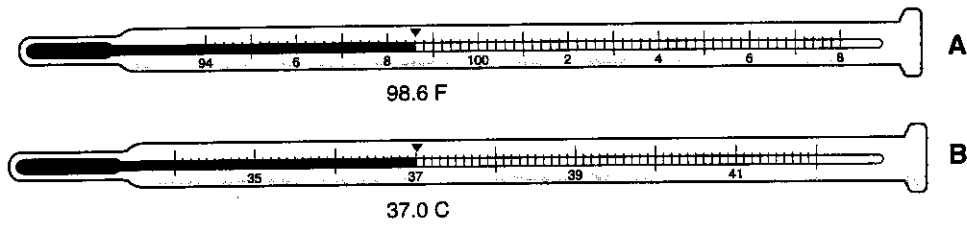


FIGURE 25-2 **A**, A Fahrenheit thermometer. The temperature measurement is 98.6° F. **B**, Centigrade thermometer. The temperature measurement is 37.0° C.

Using a Glass Thermometer

Do the following to prevent infection, promote safety, and obtain an accurate measurement:

- ▶ Use the person's thermometer.
- ▶ Use a rectal thermometer only for rectal temperatures.
- ▶ Rinse the thermometer under cold, running water if it was soaking in a disinfectant. Dry it from the stem to the bulb end with tissues.
- ▶ Check the thermometer for breaks, cracks, and chips. Discard it following agency policy if it is broken, cracked, or chipped.
- ▶ Shake down the thermometer to move the substance down in the tube. Hold it at the stem; stand away from walls, tables, or other hard surfaces. Flex and snap your wrist until the substance is below 94° F or 34° C. See Figure 25-4.
- ▶ Use plastic covers following agency policy (Fig. 25-5). To take a temperature, insert the thermometer into a cover. Remove the cover to read the thermometer. Discard the cover after use.
- ▶ Clean and store the thermometer following agency policy. Wipe it with tissues first to remove mucus, feces, or sweat. Do not use hot water. It causes the mercury or mercury-free mixture to expand so much that the thermometer could break. After cleaning, rinse the thermometer under cold, running water. Then store it in a container with a disinfectant solution.
- ▶ Practice medical asepsis.
- ▶ Follow Standard Precautions and the Bloodborne Pathogen Standard.

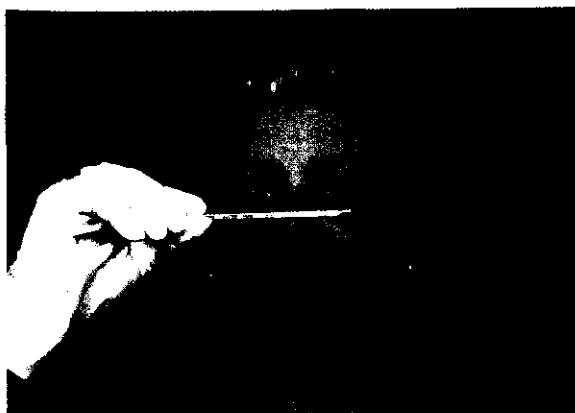


FIGURE 25-3 The thermometer is held at the stem. It is read at eye level.

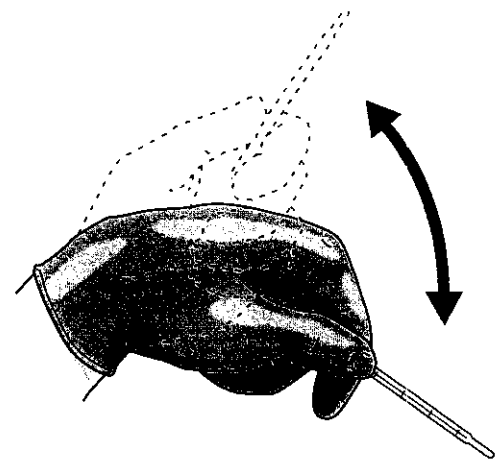


FIGURE 25-4 The wrist is snapped to shake down the thermometer.

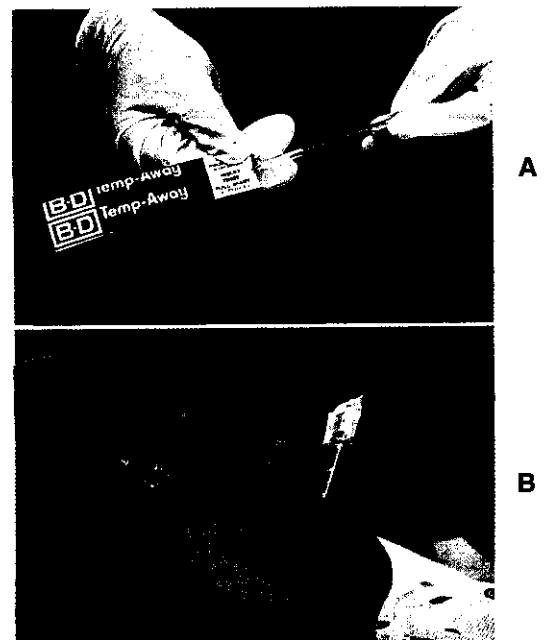


FIGURE 25-5 **A**, Thermometer inserted in a plastic cover. **B**, The person's temperature is taken with thermometer in a plastic cover.

4 Taking Temperatures

Glass thermometers are used for oral, rectal, and axillary temperatures. Special measures are needed for each site.

- ▶ *The oral site.* The glass thermometer remains in place 2 to 3 minutes or as required by agency policy.
- ▶ *The rectal site.* Lubricate the bulb end of the rectal thermometer for easy insertion and to prevent tissue injury. Hold the thermometer in place so it is not lost into the rectum or broken. A glass thermometer remains in the rectum for 2 minutes or as required by agency policy. Privacy is important. The buttocks and anus are exposed. The procedure embarrasses many people.
- ▶ *The axillary site.* The axilla (underarm) must be dry. Do not use this site right after bathing. The glass thermometer stays in place for 5 to 10 minutes or as required by agency policy.

See *Delegation Guidelines: Taking Temperatures.*

See *Promoting Safety and Comfort: Taking Temperatures.*

DELEGATION GUIDELINES: Taking Temperatures

The nurse may ask you to take temperatures. If so, you need this information from the nurse and the care plan:

- What site to use for each person—oral, rectal, axillary, tympanic membrane, or temporal artery
- What thermometer to use for each person—glass, electronic, or other type
- How long to leave a glass thermometer in place
- When to take temperatures
- Which persons are at risk for elevated temperatures
- What observations to report and record
 - A temperature that is changed from a prior measurement
 - A temperature above or below the normal range for the site used
- When to report observations
- What specific patient or resident concerns to report at once

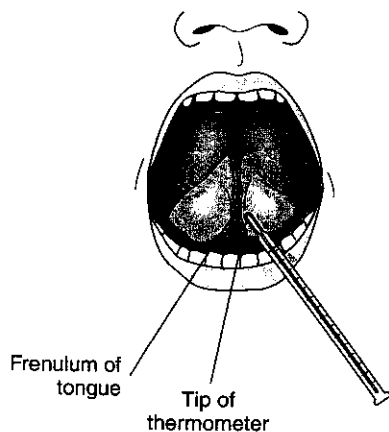


FIGURE 25-6 The thermometer is placed at the base of the tongue and to one side.

PROMOTING SAFETY AND COMFORT: Taking Temperatures

SAFETY

Thermometers are inserted into the mouth, rectum, axilla, and ear. Each area has many microbes. The area may contain blood. Therefore each person has his or her own glass thermometer. This prevents the spread of microbes and infection. Follow Standard Precautions and the Bloodborne Pathogen Standard when taking temperatures.

When taking a rectal temperature, your gloved hands may come in contact with feces. If so, remove the gloves and decontaminate your hands. Then note the temperature on your notepad or assignment sheet. Put on clean gloves to complete the procedure.

COMFORT

Remove the thermometer in a timely manner. Do not leave it in place longer than needed. This affects the person's comfort. For example, an oral thermometer is left in place for 2 to 3 minutes. Do not leave it in place longer than that.

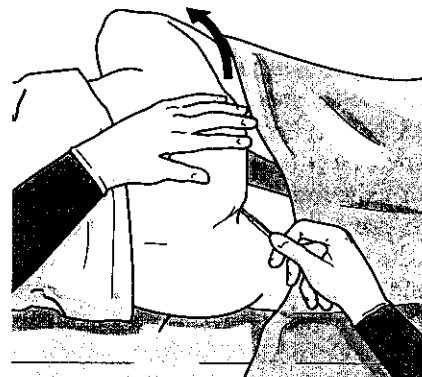


FIGURE 25-7 The rectal temperature is taken with the person in Sims' position. The buttock is raised to expose the anus.

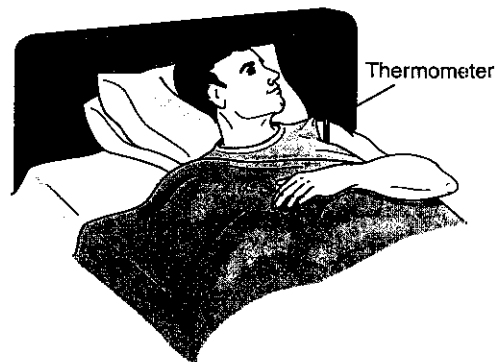


FIGURE 25-8 The thermometer is held in place in the axilla by bringing the person's arm over the chest.

TAKING A TEMPERATURE WITH A GLASS THERMOMETER

✓ Quality of Life Remember to:

- Knock before entering the person's room.
- Address the person by name.
- Introduce yourself by name and title.
- Explain the procedure to the person before beginning and during the procedure.
- Protect the person's rights during the procedure.
- Handle the person gently during the procedure.

PRE-PROCEDURE

- 1 Follow *Delegation Guidelines: Taking Temperatures*. See *Promoting Safety and Comfort*:
 - *Glass Thermometers*, p. 442
 - *Taking Temperatures*
- 2 For an oral temperature, ask the person not to eat, drink, smoke, or chew gum for at least 15 to 20 minutes before the measurement or as required by agency policy.
- 3 Practice hand hygiene.
- 4 Collect the following:
 - Oral or rectal thermometer and holder
 - Tissues
 - Plastic covers if used
 - Gloves
 - Toilet tissue (rectal temperature)
 - Water-soluble lubricant (rectal temperature)
 - Towel (axillary temperature)
- 5 Decontaminate your hands.
- 6 Identify the person. Check the ID bracelet against the assignment sheet. Also call the person by name.
- 7 Provide for privacy.

PROCEDURE

- 8 Put on the gloves.
- 9 Rinse the thermometer in cold water if it was soaking in a disinfectant. Dry it with tissues.
- 10 Check for breaks, cracks, or chips.
- 11 Shake down the thermometer below the lowest number. Hold the thermometer by the stem.
- 12 Insert it into a plastic cover if used.
- 13 For an oral temperature:
 - a Ask the person to moisten his or her lips.
 - b Place the bulb end of the thermometer under the tongue and to one side (Fig. 25-6).
 - c Ask the person to close the lips around the thermometer to hold it in place.
 - d Ask the person not to talk. Remind the person not to bite down on the thermometer.
 - e Leave it in place for 2 to 3 minutes or as required by agency policy. (NOTE: Some state competency tests require leaving the thermometer in place for 3 minutes.)
- 14 For a rectal temperature:
 - a Position the person in Sims' position.
 - b Put a small amount of lubricant on a tissue.
 - c Lubricate the bulb end of the thermometer.
 - d Fold back top linens to expose the anal area.
 - e Raise the upper buttock to expose the anus (Fig. 25-7).
 - f Insert the thermometer 1 inch into the rectum. Do not force the thermometer. Remember, glass thermometers can break.
 - g Hold the thermometer in place for 2 minutes or as required by agency policy. Do not let go of it while it is in the rectum.
- 15 For an axillary temperature:
 - a Help the person remove an arm from the gown. Do not expose the person.
 - b Dry the axilla with the towel.
 - c Place the bulb end of the thermometer in the center of the axilla.
 - d Ask the person to place the arm over the chest to hold the thermometer in place (Fig. 25-8). Hold it and the arm in place if he or she cannot help.
 - e Leave the thermometer in place for 5 to 10 minutes or as required by agency policy.
- 16 Remove the thermometer.
- 17 Use tissues to remove the plastic cover. Discard the cover and tissues. Wipe the thermometer with a tissue if no cover was used. Wipe from the stem to the bulb end. Discard the tissue.
- 18 Read the thermometer.
- 19 Note the person's name and temperature on your notepad or assignment sheet. Write R for a rectal temperature. Write A for an axillary temperature.
- 20 For a rectal temperature:
 - a Place used toilet tissue on several thicknesses of clean toilet tissue.
 - b Place the thermometer on clean toilet tissue.
 - c Wipe the anal area to remove lubricant and feces.
 - d Cover the person.
- 21 For an axillary temperature: Help the person put the gown back on.
- 22 Shake down the thermometer.
- 23 Clean the thermometer according to agency policy. Return it to the holder.
- 24 Discard tissues and dispose of toilet tissue.
- 25 Remove the gloves. Decontaminate your hands.

POST-PROCEDURE

- 26 Provide for comfort. (See the inside of the front book cover.)
- 27 Place the signal light within reach.
- 28 Unscreen the person.
- 29 Complete a safety check of the room. (See the inside of the front book cover.)
- 30 Decontaminate your hands.
- 31 Report and record the temperature. Note the temperature site when reporting and recording. Report an abnormal temperature at once.



FIGURE 25-9 The covered probe of the electronic thermometer is inserted under the tongue.



FIGURE 25-11 Temporal artery thermometer.



FIGURE 25-10 Tympanic membrane thermometer.

Electronic Thermometers

Electronic thermometers are battery-operated (Fig. 25-9). They measure temperature in a few seconds. The temperature is shown on the front of the device. Some contain batteries. Others are kept in battery chargers when not in use.

Some electronic thermometers have oral and rectal probes. A disposable cover (sheath) protects the probe. The probe cover is discarded after use. This helps prevent the spread of infection.

Tympanic Membrane Thermometers

Tympanic membrane thermometers measure temperature at the tympanic membrane in the ear (Fig. 25-10). The covered probe is gently inserted into the ear. The temperature is measured in 1 to 3 seconds.

Tympanic membrane thermometers are comfortable. They are not invasive like rectal thermometers and probes. There are fewer microbes in the ear than in the mouth or rectum. Therefore the risk of spreading infection is reduced. These thermometers are not used if there is ear drainage.

Temporal Artery Thermometers

Body temperature is measured at the temporal artery in the forehead (Fig. 25-11). The device is gently stroked across the forehead and across the temporal artery. It measures the temperature of the blood in the temporal artery—the same temperature of the blood coming from the heart.

These thermometers measure body temperature in 3 to 4 seconds. They are non-invasive. Nothing is inserted into the mouth, ear, or rectum. Follow the manufacturer's instructions for using, cleaning, and storing the device. Some devices have probe covers. To measure temperature:

- ▶ Choose the side of the head that is exposed. Do not use the side covered by hair, a dressing, hat, or other covering. If the person was in the side-lying position, do not use the side that was on a pillow.
- ▶ Place the thermometer at the side of forehead between the hairline and eyebrows.
- ▶ Slide the thermometer across the forehead.
- ▶ Read the temperature display.

See *Focus on Children and Older Persons: Electronic Thermometers*.

See *Teamwork and Time Management: Electronic Thermometers*.

FOCUS ON CHILDREN AND OLDER PERSONS

Electronic Thermometers

OLDER PERSONS

Tympanic membrane and temporal artery thermometers are used for persons who are confused and resist care. They are fast and comfortable. Oral and rectal glass and electronic thermometers are unsafe because:

- A glass thermometer can easily break if the person moves, resists care, or bites down on it. Serious injury can occur.
- An electronic thermometer can injure the mouth and teeth if the person bites down on it. It also can cause injury if the person moves quickly and without warning.

TEAMWORK AND TIME MANAGEMENT

Electronic Thermometers

Electronic, tympanic membrane, and temporal artery thermometers are shared with other nursing team members. When using these devices, tell your co-workers what thermometer you have. Work quickly, but carefully. Return the device to the charging unit in a timely manner.

TAKING A TEMPERATURE WITH AN ELECTRONIC THERMOMETER

✓ Quality of Life Remember to:

- Knock before entering the person's room.
- Address the person by name.
- Introduce yourself by name and title.
- Explain the procedure to the person before beginning and during the procedure.
- Protect the person's rights during the procedure.
- Handle the person gently during the procedure.

PRE-PROCEDURE

- 1 Follow *Delegation Guidelines: Taking Temperatures*, p. 444. See *Promoting Safety and Comfort: Taking Temperatures*, p. 444.
- 2 For an oral temperature, ask the person not to eat, drink, smoke, or chew gum for at least 15 to 20 minutes before the measurement or as required by agency policy.
- 3 Practice hand hygiene.
- 4 Collect the following:
 - Thermometer—electronic, tympanic membrane, temporal artery
 - Probe (Blue for an oral or axillary temperature. Red for a rectal temperature.)
 - Probe covers
 - Toilet tissue (rectal temperature)
 - Water-soluble lubricant (rectal temperature)
 - Gloves
 - Towel (axillary temperature)
- 5 Plug the probe into the thermometer. (This is not done for a tympanic membrane or temporal artery thermometer.)
- 6 Decontaminate your hands.
- 7 Identify the person. Check the ID bracelet against the assignment sheet. Also call the person by name.

PROCEDURE

- 8 Provide for privacy. Position the person for an oral, rectal, axillary, or tympanic membrane temperature.
- 9 Put on gloves if contact with blood, body fluids, secretions, or excretions is likely.
- 10 Insert the probe into a probe cover.
- 11 For an oral temperature:
 - a Ask the person to open the mouth and raise the tongue.
 - b Place the covered probe at the base of the tongue and to one side (see Fig. 25-9).
 - c Ask the person to lower the tongue and close the mouth.
- 12 For a rectal temperature:
 - a Place some lubricant on toilet tissue.
 - b Lubricate the end of the covered probe.
 - c Expose the anal area.
 - d Raise the upper buttock.
 - e Insert the probe ½ inch into the rectum.
 - f Hold the probe in place.
- 13 For an axillary temperature:
 - a Help the person remove an arm from the gown. Do not expose the person.
 - b Dry the axilla with the towel.
 - c Place the covered probe in the center of the axilla.
 - d Place the person's arm over the chest.
 - e Hold the probe in place.

Continued

TAKING A TEMPERATURE WITH AN ELECTRONIC THERMOMETER — cont'd

PROCEDURE—cont'd

- 14 For a tympanic membrane temperature:
 - a Ask the person to turn his or her head so the ear is in front of you.
 - b Pull up and back on the adult's ear to straighten the ear canal (Fig. 25-12).
 - c Insert the covered probe gently.
- 15 Start the thermometer.
- 16 Hold the probe in place until you hear a tone or see a flashing or steady light.
- 17 Read the temperature on the display.
- 18 Remove the probe. Press the eject button to discard the cover.
- 19 Note the person's name and temperature on your notepad or assignment sheet. Note the temperature site. Write *R* for a rectal temperature. Write *A* for an axillary temperature.
- 20 Return the probe to the holder.
- 21 Help the person put the gown back on (axillary temperature). For a rectal temperature:
 - a Wipe the anal area with toilet tissue to remove lubricant.
 - b Cover the person.
 - c Dispose of used toilet tissue.
 - d Remove the gloves. Decontaminate your hands.

POST-PROCEDURE

- 22 Provide for comfort. (See the inside of the front book cover.)
- 23 Place the signal light within reach.
- 24 Unscreen the person.
- 25 Complete a safety check of the room. (See the inside of the front book cover.)
- 26 Return the thermometer to the charging unit.
- 27 Decontaminate your hands.
- 28 Report and record the temperature. Note the temperature site when reporting and recording. Report an abnormal temperature at once.

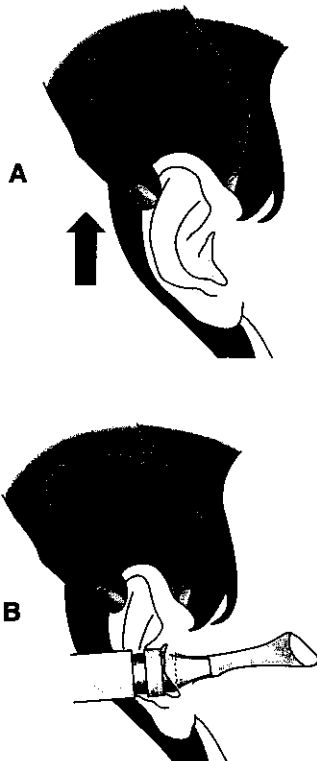


FIGURE 25-12 Using a tympanic membrane thermometer. **A**, The ear is pulled up and back. **B**, The probe is inserted into the ear canal.

Other Thermometers

Other thermometers are used. Follow the manufacturer's instructions.

- ▶ *Digital thermometers*—show the temperature on the front of the thermometer (Fig. 25-13). Depending on the type, they measure temperature in 6 to 60 seconds.
- ▶ *Disposable oral thermometers*—have small chemical dots (Fig. 25-14). The dots change color when heated. Each dot is heated to a certain temperature before it changes color. These thermometers are used once. They measure temperatures in 45 to 60 seconds.
- ▶ *Temperature-sensitive tape*—changes color in response to body heat (Fig. 25-15). The tape is applied to the forehead or abdomen. The measurement takes about 15 seconds.

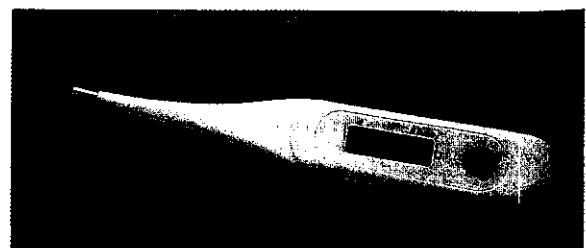


FIGURE 25-13 Digital thermometer.

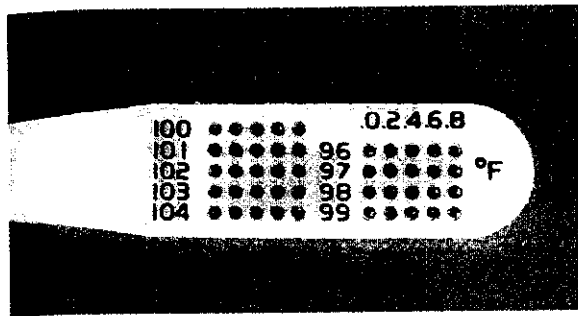


FIGURE 25-14 Disposable oral thermometer with chemical dots. The dots change color when heated by the body.



FIGURE 25-15 Temperature sensitive tape.

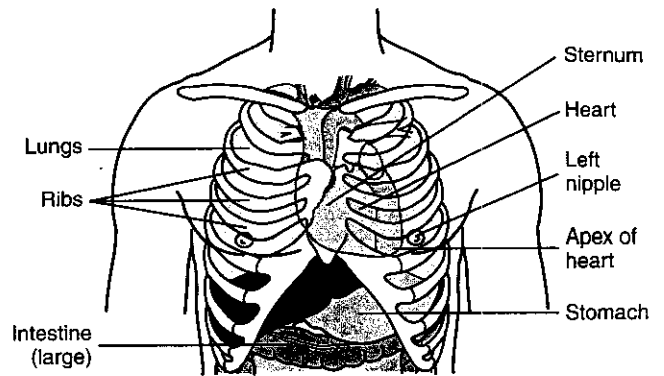


FIGURE 25-16 Location of the heart.

PULSE

Arteries carry blood from the heart to all body parts (Box 25-2). The pulse is the beat of the heart felt at an artery as a wave of blood passes through the artery. A pulse is felt every time the heart beats.

BOX 25-2 The Heart and Blood Vessels: Body Structure and Function

The heart is a muscle. It pumps blood through the blood vessels to the tissues and cells. The heart lies in the middle to lower part of the chest cavity toward the left side (Fig. 25-16).

The heart has four chambers (Chapter 8). Upper chambers receive blood and are called the *atria*. The *right atrium* receives blood from body tissues. The *left atrium* receives blood from the lungs. Lower chambers are called ventricles. Ventricles pump blood. The *right ventricle* pumps blood to the lungs for oxygen. The *left ventricle* pumps blood to all parts of the body.

There are two phases of heart action. *Diastole* is the resting phase. Heart chambers fill with blood. *Systole* is the working phase. The heart contracts. Blood is pumped through the blood vessels when the heart contracts.

Blood flows to body tissues and cells through the blood vessels. *Arteries* carry blood away from the heart. Arterial blood is rich in oxygen. The *aorta* is the largest artery. The aorta receives blood directly from the left ventricle. The aorta branches into other arteries that carry blood to all parts of the body (Fig. 25-17). *Veins* return blood to the heart.

See Chapter 8 for more detailed information.

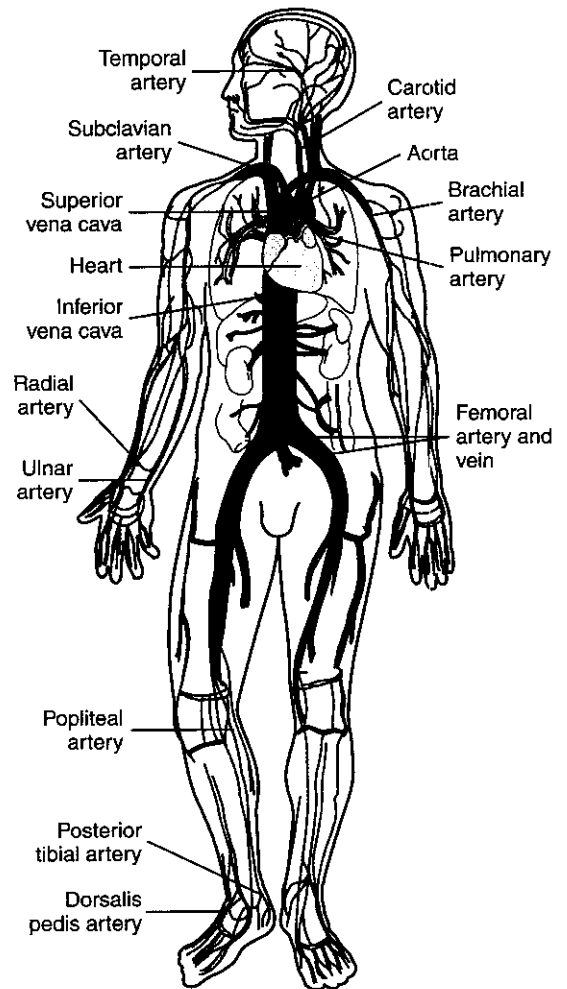


FIGURE 25-17 The arterial system.

FOCUS ON CHILDREN AND OLDER PERSONS

Pulse Sites

CHILDREN

The apical pulse is used for infants and children under 2 years. With the nurse's permission, you can use the radial site for children older than 2 years.

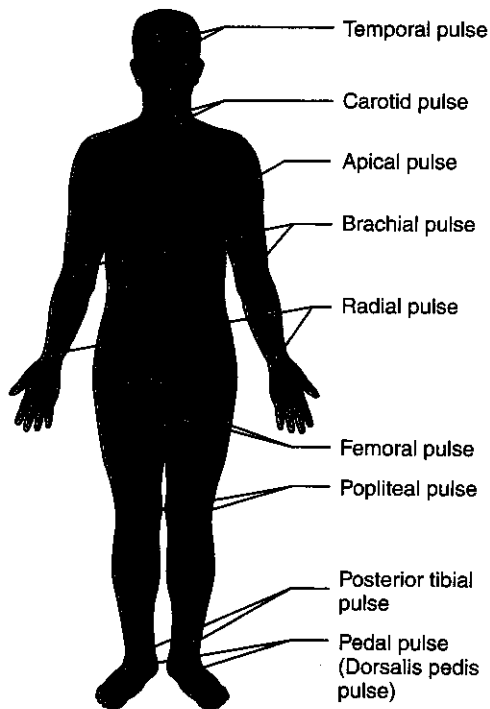


FIGURE 25-18 The pulse sites.

Pulse Sites

The temporal, carotid, brachial, radial, femoral, popliteal, posterior tibial, and dorsalis pedis (pedal) pulses are on each side of the body (Fig. 25-18). The arteries are close to the body surface and lie over a bone. Therefore they are easy to feel.

The radial pulse is used most often. It is easy to reach and find. You can take a radial pulse without disturbing or exposing the person. The carotid pulse is taken during CPR (cardiopulmonary resuscitation) and other emergencies (Chapter 49).

The apical pulse is felt over the heart. The apex (*apical*) of the heart is at the tip of the heart, just below the left nipple (p. 453). This pulse is taken with a stethoscope.

See *Focus on Children and Older Persons: Pulse Sites*.

Using a Stethoscope

A stethoscope is an instrument used to listen to the sounds produced by the heart, lungs, and other body organs (Fig. 25-19). It is used to take apical pulses and blood pressures. The device makes sounds louder for easy hearing.

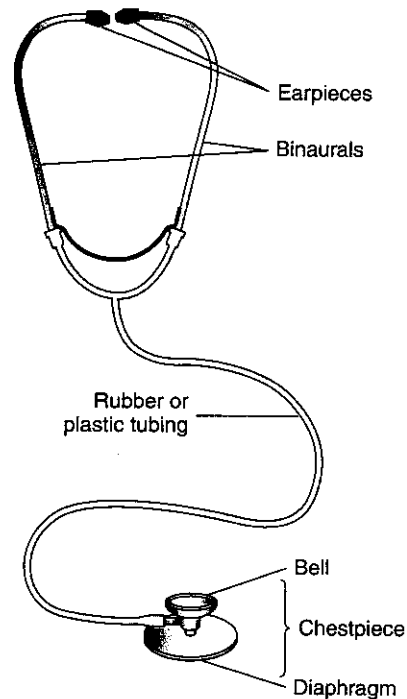


FIGURE 25-19 Parts of a stethoscope.



FIGURE 25-20 The stethoscope is held in place with the fingertips of the index and middle fingers.

To use a stethoscope:

- ▶ Wipe the earpieces and diaphragm with antiseptic wipes before and after use.
- ▶ Place the earpiece tips in your ears. The bend of the tips points forward. Earpieces should fit snugly to block out noises. They should not cause pain or ear discomfort.
- ▶ Tap the diaphragm gently. You should hear the tapping. If not, turn the chest piece at the tubing. Gently tap the diaphragm again. Proceed if you hear the tapping sound. Check with the nurse if you do not hear the tapping.
- ▶ Place the diaphragm over the artery. Hold it in place as in Figure 25-20.
- ▶ Prevent noise. Do not let anything touch the tubing. Ask the person to be silent.

See *Promoting Safety and Comfort: Using a Stethoscope*.

PROMOTING SAFETY AND COMFORT: Using a Stethoscope

SAFETY

Stethoscopes are in contact with many persons and staff. Therefore you must prevent infection. Wipe the earpieces and diaphragm with antiseptic wipes before and after use.

COMFORT

Stethoscope diaphragms tend to be cold. Warm the diaphragm in your hand before applying it to the person (Fig. 25-21). Cold diaphragms can startle the person.



FIGURE 25-21 The diaphragm of the stethoscope is warmed in the palm of the hand.

TABLE 25-2 Pulse Ranges by Age

Age	Pulse Rate (beats per minute)
Birth to 1 year	80-190
2 years	80-160
6 years	75-120
10 years	70-110
12 years and older	60-100

Pulse Rate

The pulse rate is the number of heartbeats or pulses felt in 1 minute. The rate varies for each age-group (Table 25-2). The pulse rate is affected by many factors. They include fever, exercise, fear, anger, anxiety, excitement, heat, position, and pain. These and other factors cause the heart to beat faster. Some drugs also increase the pulse rate. Other drugs slow down the pulse.

The adult pulse rate is between 60 and 100 beats per minute. A rate of less than 60 or more than 100 is considered abnormal. Report abnormal pulses to the nurse at once.

- ▶ Tachycardia is a rapid (*tachy*) heart rate (*cardia*). The heart rate is more than 100 beats per minute.
- ▶ Bradycardia is a slow (*brady*) heart rate (*cardia*). The heart rate is less than 60 beats per minute.

Rhythm and Force of the Pulse

The *rhythm* of the pulse should be regular. That is, pulses are felt in a pattern. The same time interval occurs between beats. An irregular pulse occurs when the beats are not evenly spaced or beats are skipped (Fig. 25-22).

Force relates to pulse strength. A forceful pulse is easy to feel. It is described as *strong, full, or bounding*. Hard-to-feel pulses are described as *weak, thready, or feeble*.

Electronic blood pressure equipment (p. 458) can also count pulses. The pulse rate and blood pressures are shown. Information is not given about pulse rhythm and force. You need to feel the pulse to determine rhythm and force.

Taking Pulses

You will take radial, apical, and apical-radial pulses. You must count accurately. And you must report and record the pulse rate accurately.

See *Delegation Guidelines: Taking Pulses*.

See *Promoting Safety and Comfort: Taking Pulses*, p. 452.

DELEGATION GUIDELINES: Taking Pulses

Before taking a pulse, you need this information from the nurse and the care plan:

- What pulse to take for each person—radial, apical, or apical-radial
- When to take the pulse
- What other vital signs to measure
- How long to count the pulse—30 seconds or 1 minute
- If the nurse has concerns about certain patients or residents
- What observations to report and record:
 - The pulse site
 - The pulse rate—report a pulse rate less than 60 (bradycardia) or more than 100 beats (tachycardia) per minute at once
 - Pulse deficit for an apical-radial pulse (p. 454)
 - If the pulse is regular or irregular
 - Pulse force—strong, full, bounding, weak, thready, or feeble
- When to report the pulse measurement
- What specific patient or resident concerns to report at once



FIGURE 25-22 A, The electrocardiogram shows a regular pulse. The beats occur at regular intervals. **B**, These beats are at irregular intervals.

PROMOTING SAFETY AND COMFORT: Taking Pulses**SAFETY**

Do not use your thumb to take a pulse. The thumb has a pulse. You could mistake the pulse in your thumb for the person's pulse. Reporting and recording the wrong pulse rate can harm the person.

4 Taking a Radial Pulse

The radial pulse is used for routine vital signs. Place the first 2 or 3 fingertips of one hand against the radial artery. The radial artery is on the thumb side of the wrist (Fig. 25-23). Count the pulse for 30 seconds. Then multiply the number by 2. This gives the number of beats per minute. If the pulse is irregular, count it for 1 minute.

In some agencies, all radial pulses are taken for 1 minute. Follow agency policy.



FIGURE 25-23 The middle three fingertips are used to take the radial pulse.

NNAAP™ Skill

TAKING A RADIAL PULSE**✓ Quality of Life Remember to:**

- Knock before entering the person's room.
- Address the person by name.
- Introduce yourself by name and title.
- Explain the procedure to the person before beginning and during the procedure.
- Protect the person's rights during the procedure.
- Handle the person gently during the procedure.

PRE-PROCEDURE

- 1 Follow *Delegation Guidelines: Taking Pulses*. See *Promoting Safety and Comfort: Taking Pulses*.
- 2 Practice hand hygiene.
- 3 Identify the person. Check the ID bracelet against the assignment sheet. Also call the person by name.
- 4 Provide for privacy.

PROCEDURE

- 5 Have the person sit or lie down.
- 6 Locate the radial pulse. Use your first 2 or 3 middle fingertips (see Fig. 25-23).
- 7 Note if the pulse is strong or weak, and regular or irregular.
- 8 Count the pulse for 30 seconds. Multiply the number of beats by 2. Or count the pulse for 1 minute if:
 - Directed by the nurse and care plan
 - Required by agency policy
- 9 Note the person's name and pulse on your notepad or assignment sheet. Note the strength of the pulse. Note if it was regular or irregular.
 - The pulse was irregular
 - Required for your state competency test

POST-PROCEDURE

- 10 Provide for comfort. (See the inside of the front book cover.)
- 11 Place the signal light within reach.
- 12 Unscreen the person.
- 13 Complete a safety check of the room. (See the inside of the front book cover.)
- 14 Decontaminate your hands.
- 15 Report and record pulse rate and your observations. Report an abnormal pulse at once.

◆ Taking an Apical Pulse

The apical pulse is on the left side of the chest slightly below the nipple (Fig. 25-24). It is taken with a stethoscope. Apical pulses are taken on:

- ▶ Infants and children up to about 2 years of age
- ▶ Persons who have heart disease
- ▶ Persons who have irregular heart rhythms
- ▶ Persons who take drugs that affect the heart

Count the apical pulse for 1 minute. The heartbeat normally sounds like a *lub-dub*. Count each *lub-dub* as one beat. Do not count the *lub* as one beat and the *dub* as another.

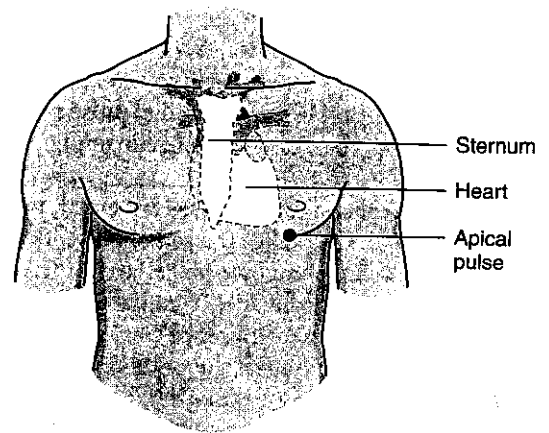


FIGURE 25-24 The apical pulse is located 2 to 3 inches to the left of the sternum (breastbone) and below the left nipple.

TAKING AN APICAL PULSE

✓ Quality of Life Remember to:

- Knock before entering the person's room.
- Address the person by name.
- Introduce yourself by name and title.
- Explain the procedure to the person before beginning and during the procedure.
- Protect the person's rights during the procedure.
- Handle the person gently during the procedure.

PRE-PROCEDURE

- 1 Follow *Delegation Guidelines: Taking Pulses*. See *Promoting Safety and Comfort: Using a Stethoscope*, p. 451.
- 2 Practice hand hygiene.
- 3 Collect a stethoscope and antiseptic wipes.
- 4 Decontaminate your hands.
- 5 Identify the person. Check the ID bracelet against the assignment sheet. Also call the person by name.
- 6 Provide for privacy.

PROCEDURE

- 7 Clean the earpieces and diaphragm with the wipes.
- 8 Have the person sit or lie down.
- 9 Expose the nipple area of the left chest. Limit exposure of a woman's breasts to the extent necessary.
- 10 Warm the diaphragm in your palm.
- 11 Place the earpieces in your ears.
- 12 Find the apical pulse. Place the diaphragm 2 to 3 inches to the left of the breastbone and below the left nipple (see Fig. 25-24).
- 13 Count the pulse for 1 minute. Note if it was regular or irregular.
- 14 Cover the person. Remove the earpieces.
- 15 Note the person's name and pulse on your notepad or assignment sheet. Note if the pulse was regular or irregular.

POST-PROCEDURE

- 16 Provide for comfort. (See the inside of the front book cover.)
- 17 Place the signal light within reach.
- 18 Unscreen the person.
- 19 Complete a safety check of the room. (See the inside of the front book cover.)
- 20 Clean the earpieces and diaphragm with the wipes.
- 21 Return the stethoscope to its proper place.
- 22 Decontaminate your hands.
- 23 Report and record your observations. Record the pulse rate with Ap for apical. Report an abnormal pulse rate at once.

◆ Taking an Apical-Radial Pulse

The apical pulse and radial pulse should be equal. Sometimes heart contractions are not strong enough to create pulses in the radial artery. Then the radial pulse rate is less than the apical pulse rate. This may occur in people with heart disease.

To see if the apical and radial pulses are equal, two staff members are needed. One takes the radial pulse; the other takes the apical pulse. Taking the apical and radial pulses at the same time is called the apical-radial pulse.

The pulse deficit is the difference between the apical and radial pulse rates. To obtain the pulse deficit, subtract the radial rate from the apical rate. (The apical pulse rate is never less than the radial pulse rate.) For example:

- ▶ The apical pulse rate is 84 beats per minute. The radial pulse rate is 84 beats per minute. The pulse deficit is zero (0).
- ▶ The apical pulse rate is 90 beats per minute. The radial pulse rate is 86 beats per minute. The pulse deficit is 4.



FIGURE 25-25 Taking an apical-radial pulse. One worker takes the apical pulse. The other takes the radial pulse.

TAKING AN APICAL-RADIAL PULSE

✓ Quality of Life Remember to:

- Knock before entering the person's room.
- Address the person by name.
- Introduce yourself by name and title.
- Explain the procedure to the person before beginning and during the procedure.
- Protect the person's rights during the procedure.
- Handle the person gently during the procedure.

PRE-PROCEDURE

- 1 Follow *Delegation Guidelines: Taking Pulses*, p. 452. See *Promoting Safety and Comfort*:
 - a Using a Stethoscope, p. 451
 - b Taking Pulses, p. 452
- 2 Ask a nursing team member to help you.
- 3 Practice hand hygiene.
- 4 Collect a stethoscope and antiseptic wipes.
- 5 Decontaminate your hands.
- 6 Identify the person. Check the ID bracelet against the assignment sheet. Also call the person by name.
- 7 Provide for privacy.

PROCEDURE

- 8 Clean the earpieces and diaphragm with the wipes.
- 9 Have the person sit or lie down.
- 10 Expose the nipple area of the left chest. Limit exposure of a woman's breasts to the extent necessary.
- 11 Warm the diaphragm in your palm.
- 12 Place the earpieces in your ears.
- 13 Find the apical pulse. Your helper finds the radial pulse (Fig. 25-25).
- 14 Give the signal to begin counting.
- 15 Count the pulse for 1 minute.
- 16 Give the signal to stop counting.
- 17 Cover the person. Remove the stethoscope earpieces.
- 18 Note the person's name and the apical and radial pulses on your notepad or assignment sheet. Subtract the radial pulse from the apical pulse for the pulse deficit. Note whether the pulse was regular or irregular.

POST-PROCEDURE

- 19 Provide for comfort. (See the inside of the front book cover.)
- 20 Place the signal light within reach.
- 21 Unscreen the person.
- 22 Complete a safety check of the room. (See the inside of the front book cover.)
- 23 Clean the earpieces and diaphragm with the wipes.
- 24 Return the stethoscope to its proper place.
- 25 Decontaminate your hands.
- 26 Report and record your observations. (Report an abnormal pulse at once.) Include:
 - The apical and radial pulse rates
 - The pulse deficit

RESPIRATIONS

Respiration means breathing air into (*inhalation*) and out of (*exhalation*) the lungs. Oxygen enters the lungs during inhalation. Carbon dioxide leaves the lungs during exhalation. Each respiration involves one inhalation and one exhalation. The chest rises during inhalation. It falls during exhalation. See Box 25-3 for a review of the respiratory system.

The healthy adult has 12 to 20 respirations per minute. The respiratory rate is affected by the factors that affect temperature and pulse. Heart and respiratory diseases usually increase the respiratory rate.

Respirations are normally quiet, effortless, and regular. Both sides of the chest rise and fall equally. See Chapter 34 for abnormal respiratory patterns.

Count respirations when the person is at rest. Position the person so you can see the chest rise and fall. To a certain extent, a person can control the rate and depth of breathing. People tend to change their breathing patterns when they know their respirations are being counted. Therefore the person should not know that you are counting them.

BOX 25-3 The Respiratory System: Body Structure and Function

Oxygen is needed for life. Every cell needs oxygen. The respiratory system (Fig. 25-26) brings oxygen into the lungs and rids the body of carbon dioxide. *Respiration* is the process of supplying the cells with oxygen and removing carbon dioxide from them. Respiration involves *inhalation* (breathing in) and *exhalation* (breathing out). The terms *inspiration* (breathing in) and *expiration* (breathing out) are also used.

Air enters the body through the *nose*. The air then passes into the *pharynx* (throat), a tube-shaped passageway for both air and food. Air passes from the pharynx into the *larynx* (the voice box). Air passes from the larynx into the *trachea* (the windpipe). The trachea divides at its lower end into the *right bronchus* and *left bronchus*. Each bronchus enters a lung.

On entering the lungs, the bronchi divide many times into smaller branches called *bronchioles*. Eventually the bronchioles further divide. They end in tiny one-celled air sacs called *alveoli*. They are supplied by capillaries.

Oxygen and carbon dioxide are exchanged between the alveoli and capillaries. Blood in the capillaries picks up oxygen from the alveoli. Then the blood returns to the left side of the heart and is pumped to the rest of the body. Alveoli pick up carbon dioxide from the capillaries for exhalation.

Each lung is divided into lobes. The right lung has three lobes; the left lung has two. The lungs are separated from the abdominal cavity by a muscle called the *diaphragm*. A bony framework made up of the ribs, sternum, and vertebrae protects the lungs.

See Chapter 8 for more detailed information.

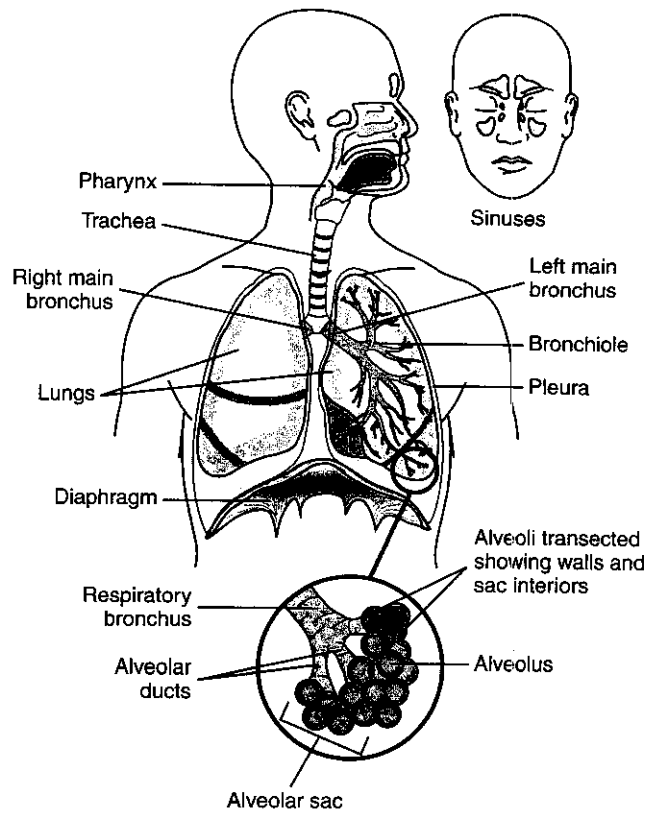


FIGURE 25-26 The respiratory system.

Count respirations right after taking a pulse. Keep your fingers or stethoscope over the pulse site. (The person assumes you are taking the pulse). To count respirations, watch the chest rise and fall. Count them for 30 seconds. Multiply the number by 2 for the number of respirations in 1 minute. If an abnormal pattern is noted, count the respirations for 1 minute.

In some agencies, respirations are counted for 1 minute. Follow agency policy.

See *Focus on Children and Older Persons: Respirations*.

See *Delegation Guidelines: Respirations*, p. 456.

FOCUS ON CHILDREN AND OLDER PERSONS

Respirations

CHILDREN

Infants and children have higher respiratory rates than adults (Table 25-3, p. 456). Count an infant's respirations for 1 minute.

DELEGATION GUIDELINES: Respirations

Before counting respirations, you need this information from the nurse and the care plan:

- How long to count respirations for each person—30 seconds or 1 minute
- When to count respirations
- If the nurse has concerns about certain patients or residents
- What other vital signs to measure
- What observations to report and record:
 - The respiratory rate
 - Equality and depth of respirations
 - If the respirations were regular or irregular
 - If the person has pain or difficulty breathing
 - Any respiratory noises
 - An abnormal respiratory pattern (Chapter 34)
- When to report observations
- What specific patient or resident concerns to report at once

TABLE 25-3 Normal Respiratory Rates for Children

Age	Respirations per Minute
Newborn	35
1 year	30
2 years	25
4 years	23
6 years	21
8 years	20
10 years	19
12 years	19
14 years	18
16 years	17
18 years	16-18

Modified from Hockenberry MJ and Wilson D: *Wong's nursing care of infants and children*, ed 8, St Louis, 2007, Mosby.

NNAAP™ Skill

COUNTING RESPIRATIONS**PROCEDURE**

- 1 Follow *Delegation Guidelines: Respirations*.
- 2 Keep your fingers or stethoscope over the pulse site.
- 3 Do not tell the person you are counting respirations.
- 4 Begin counting when the chest rises. Count each rise and fall of the chest as 1 respiration.
- 5 Note the following:
 - If respirations are regular
 - If both sides of the chest rise equally
 - The depth of respirations
 - If the person has any pain or difficulty breathing
 - An abnormal respiratory pattern
- 6 Count respirations for 30 seconds. Multiply the number by 2. Count respirations for 1 minute if:
 - Directed by the nurse and care plan
 - Required by agency policy
 - They are abnormal or irregular
 - Required for your state competency test
- 7 Note the person's name, respiratory rate, and other observations on your notepad or assignment sheet.

POST-PROCEDURE

- 8 Provide for comfort. (See the inside of the front book cover.)
- 9 Place the signal light within reach.
- 10 Unscreen the person.
- 11 Complete a safety check of the room. (See the inside of the front book cover.)
- 12 Decontaminate your hands.
- 13 Report and record the respiratory rate and your observations. Report abnormal respirations at once.



BLC

Bloo

walls

trolle

▶ TI

▶ TI

▶ H

ve

T

The

relax

Sy

syste

bloo

the H

sure

lowe

B

merc

diaste

(mill

80 m

Nor

Bloo

tors

B

rang

▶ Sy

▶ D

T

▶ H

m

a

m

di

▶ H

b

b

9

6

p

th

S

Abn

BLOOD PRESSURE

Blood pressure is the amount of force exerted against the walls of an artery by the blood. Blood pressure is controlled by:

- ▶ The force of heart contractions
- ▶ The amount of blood pumped with each heartbeat
- ▶ How easily the blood flows through the blood vessels

The period of heart muscle contraction is called systole. The heart is pumping blood. The period of heart muscle relaxation is called diastole. The heart is at rest.

Systolic and diastolic pressures are measured. The systolic pressure is the amount of force needed to pump blood out of the heart into the arterial circulation. It is the higher pressure. The diastolic pressure is the pressure in the arteries when the heart is at rest. It is the lower pressure.

Blood pressure is measured in millimeters (mm) of mercury (Hg). The systolic pressure is recorded over the diastolic pressure. A systolic pressure of 120 mm Hg (millimeters of mercury) and a diastolic pressure of 80 mm Hg is written as 120/80 mm Hg.

Normal and Abnormal Blood Pressures

Blood pressure can change from minute to minute. Factors affecting blood pressure are listed in Box 25-4.

Because it can vary so easily, blood pressure has normal ranges:

- ▶ *Systolic pressure*—less than 120 mm Hg
 - ▶ *Diastolic pressure*—less than 80 mm Hg
- Treatment is indicated for:
- ▶ **Hypertension**—blood pressure measurements that remain above (*hyper*) a systolic pressure of 140 mm Hg or a diastolic pressure of 90 mm Hg. Report any systolic measurement at or above 120 mm Hg. Also report a diastolic pressure at or above 80 mm Hg.
 - ▶ **Hypotension**—when the systolic blood pressure is below (*hypo*) 90 mm Hg and the diastolic pressure is below 60 mm Hg. Report a systolic pressure below 90 mm Hg. Also report a diastolic pressure below 60 mm Hg. Some people normally have low blood pressures. However, hypotension can signal a life-threatening problem.

See *Focus on Children and Older Persons: Normal and Abnormal Blood Pressures*.

BOX 25-4 Factors Affecting Blood Pressure

- **Age.** Blood pressure increases with age. It is lowest in infancy and childhood. It is highest in adulthood.
- **Gender (male or female).** Women usually have lower blood pressures than men do. Blood pressures rise in women after menopause.
- **Blood volume.** This is the amount of blood in the system. Severe bleeding lowers the blood volume. Therefore blood pressure lowers. Giving IV (intravenous) fluids rapidly increases the blood volume. The blood pressure rises.
- **Stress.** Stress includes anxiety, fear, and emotions. Blood pressure increases as the body responds to stress.
- **Pain.** Pain generally increases blood pressure. However, severe pain can cause shock. Blood pressure is seriously low in the state of shock (Chapter 49).
- **Exercise.** Blood pressure increases. Do not measure blood pressure right after exercise.
- **Weight.** Blood pressure is higher in overweight persons. It lowers with weight loss.
- **Race.** Black persons generally have higher blood pressures than white persons do.
- **Diet.** A high-sodium diet increases the amount of water in the body. The extra fluid volume increases blood pressure.
- **Drugs.** Drugs can be given to raise or lower blood pressure. Other drugs have the side effects of high or low blood pressure.
- **Position.** Blood pressure is lower when lying down. It is higher in the standing position. Sudden changes in position can cause a sudden drop in blood pressure (orthostatic hypotension). When standing suddenly, the person may have a sudden drop in blood pressure. Dizziness and fainting can occur (Chapter 26).
- **Smoking.** Blood pressure increases. Nicotine in cigarettes causes blood vessels to narrow. The heart must work harder to pump blood through narrowed vessels.
- **Alcohol.** Excessive alcohol intake can raise blood pressure.

FOCUS ON CHILDREN AND OLDER PERSONS

Normal and Abnormal Blood Pressures

CHILDREN

Age, sex, and height are used to determine what a child's normal blood pressure should be. Young children can have high blood pressure. Overweight children usually have higher blood pressures than do children with a normal weight. Children 3 years of age and older are screened for high blood pressure.

OLDER PERSONS

Older persons also are at risk for orthostatic hypotension (Chapter 26).

Equipment

A stethoscope and a sphygmomanometer are used to measure blood pressure. The sphygmomanometer has a cuff and a measuring device.

- ▶ The *aneroid type* has a round dial and a needle that points to the numbers (Fig. 25-27, *A*).
- ▶ The *mercury type* has a column of mercury within a calibrated tube (Fig. 25-27, *B*).
- ▶ The *electronic type* shows the systolic and diastolic blood pressures on the front of the device (Fig. 25-27, *C*). It also shows the pulse rate. To use the device, follow the manufacturer's instructions.

The blood pressure cuff is wrapped around the upper arm. Tubing connects the cuff to the manometer. Another tube connects the cuff to a small, hand-held bulb. A valve on the bulb is turned clockwise to close the valve so the cuff inflates as the bulb is squeezed. The inflated cuff causes pressure over the brachial artery. The valve is turned counter-clockwise to open the valve to deflate the cuff. Blood pressure is measured as the cuff is deflated.

Sounds are produced as the blood flows through the arteries. The stethoscope is used to listen to the sounds in the brachial artery as the cuff is deflated. Stethoscopes are not needed with electronic manometers.

See *Focus on Children and Older Persons: Equipment*.

See *Promoting Safety and Comfort: Equipment*.

FOCUS ON CHILDREN AND OLDER PERSONS

Equipment

CHILDREN

Pediatric blood pressure cuffs are used for children. Infant and child sizes are available. The nurse tells you what size to use.

PROMOTING SAFETY AND COMFORT: Equipment

SAFETY

Mercury is a hazardous substance. Mercury thermometers are being phased out of health care although some agencies may still use them. Handle mercury thermometers carefully. If one breaks, call for the nurse at once. Do not touch the mercury. Do not let the person touch it. The agency must follow special procedures for handling all hazardous substances. See Chapter 11.

COMFORT

Inflate the cuff only to the extent necessary (see procedure *Measuring Blood Pressure*). The inflated cuff causes discomfort. The higher the inflation, the greater the discomfort.

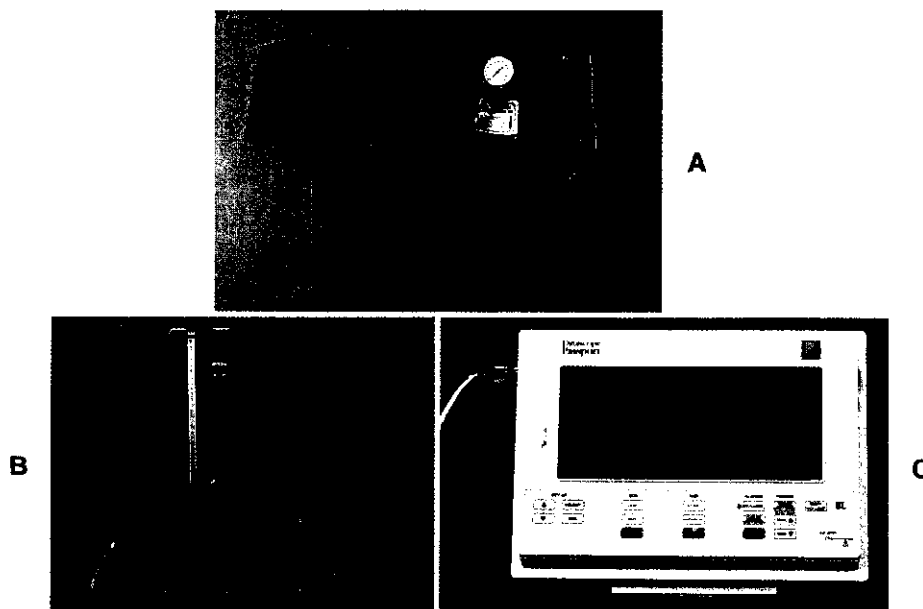


FIGURE 25-27 Blood pressure equipment. **A**, Aneroid manometer and cuff. **B**, Mercury manometer and cuff. **C**, Electronic sphygmomanometer.

Measuring Blood Pressure

Blood pressure is normally measured in the brachial artery. Box 25-5 lists the guidelines for measuring blood pressure.

See *Delegation Guidelines: Measuring Blood Pressure*.

DELEGATION GUIDELINES: Measuring Blood Pressure

Before measuring blood pressure, you need this information from the nurse and the care plan:

- When to measure blood pressure
- What arm to use
- The person's normal blood pressure range
- If the nurse has concerns about certain patients or residents
- If the person needs to be lying down, sitting, or standing
- What size cuff to use—regular, child-size, or extra large
- What observations to report and record
- When to report the blood pressure measurement
- What specific patient or resident concerns to report at once

BOX 25-5 Guidelines For Measuring Blood Pressure

- Do not take blood pressure on an arm with an IV infusion, a cast, or a dialysis access site. If a person had breast surgery, do not take blood pressure on that side. Avoid taking blood pressure on an injured arm.
- Let the person rest for 10 to 20 minutes before measuring blood pressure.
- Measure blood pressure with the person sitting or lying. Sometimes the doctor orders blood pressure measured in the standing position.
- Apply the cuff to the bare upper arm. Clothing can affect the measurement.
- Make sure the cuff is snug. Loose cuffs can cause inaccurate readings.
- Use a larger cuff if the person is obese or has a large arm. Use a small cuff if the person has a very small arm. Ask the nurse what size to use. Also check the care plan.
- Place the diaphragm of the stethoscope firmly over the brachial artery. The entire diaphragm must have contact with the skin.
- Make sure the room is quiet. Talking, TV, radio, and sounds from the hallway can affect an accurate measurement.
- Have the sphygmomanometer where you can clearly see it.
- Measure the systolic and diastolic pressures.
 - Expect to hear the first blood pressure sound at the point where you last felt the radial or brachial pulse. The first sound is the systolic pressure.
 - The point where the sound disappears is the diastolic pressure.
- Take the blood pressure again if you are not sure of an accurate measurement. Wait 30 to 60 seconds before repeating the measurement. Ask the nurse to take the blood pressure if you are unsure of the measurement.
- Tell the nurse at once if you cannot hear the blood pressure.

NNAAP™ Skill

MEASURING BLOOD PRESSURE

✓ Quality of Life Remember to:

- Knock before entering the person's room.
- Address the person by name.
- Introduce yourself by name and title.
- Explain the procedure to the person before beginning and during the procedure.
- Protect the person's rights during the procedure.
- Handle the person gently during the procedure.

PRE-PROCEDURE

- 1 Follow *Delegation Guidelines: Measuring Blood Pressure*. See *Promoting Safety and Comfort*:
 - *Using a Stethoscope*, p. 451
 - *Equipment*
- 2 Practice hand hygiene.
- 3 Collect the following:
 - Sphygmomanometer
 - Stethoscope
 - Antiseptic wipes
- 4 Decontaminate your hands.
- 5 Identify the person. Check the ID bracelet against the assignment sheet. Also call the person by name.
- 6 Provide for privacy.

Continued

MEASURING BLOOD PRESSURE—cont'd

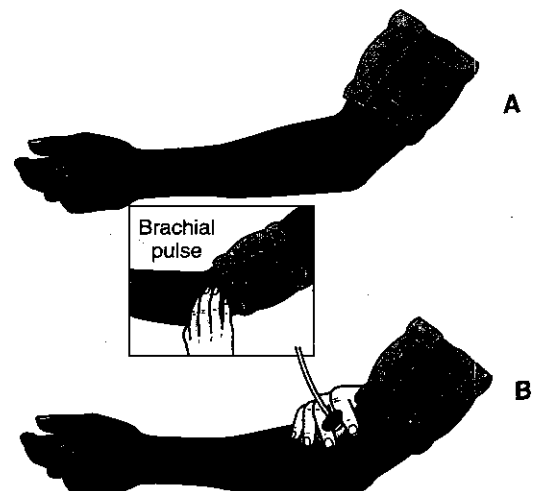
PROCEDURE

- 7 Wipe the stethoscope earpieces and diaphragm with the wipes. Warm the diaphragm in your palm.
- 8 Have the person sit or lie down.
- 9 Position the person's arm level with the heart. The palm is up.
- 10 Stand no more than 3 feet away from the manometer. The mercury type is vertical, on a flat surface, and at eye level. The aneroid type is directly in front of you.
- 11 Expose the upper arm.
- 12 Squeeze the cuff to expel any remaining air. Close the valve on the bulb.
- 13 Find the brachial artery at the inner aspect of the elbow. (The brachial artery is on the little finger side of the arm.) Use your fingertips.
- 14 Place the arrow on the cuff over the brachial artery (Fig. 25-28, A). Wrap the cuff around the upper arm at least 1 inch above the elbow. It is even and snug.
- 15 *Method one:*
 - a Place the stethoscope earpieces in your ears.
 - b Find the radial or brachial artery.
 - c Inflate the cuff until you can no longer feel the pulse. Note this point.
 - d Inflate the cuff 30 mm Hg beyond the point where you last felt the pulse.
- 16 *Method two:*
 - a Find the radial or brachial artery.
 - b Inflate the cuff until you can no longer feel the pulse. Note this point.
- c Inflate the cuff 30 mm Hg beyond the point where you last felt the pulse.
- d Deflate the cuff slowly. Note the point when you feel the pulse.
- e Wait 30 seconds.
- f Place the stethoscope earpieces in your ears.
- g Inflate the cuff again, 30 mm Hg beyond the point where you felt the pulse return.
- 17 Place the diaphragm of the stethoscope over the brachial artery (Fig. 25-28, B). Do not place it under the cuff.
- 18 Deflate the cuff at an even rate of 2 to 4 millimeters per second. Turn the valve counter-clockwise to deflate the cuff.
- 19 Note the point where you hear the first sound. This is the systolic reading. It is near the point where the radial pulse disappeared.
- 20 Continue to deflate the cuff. Note the point where the sound disappears. This is the diastolic reading.
- 21 Deflate the cuff completely. Remove it from the person's arm. Remove the stethoscope earpieces from your ears.
- 22 Note the person's name and blood pressure on your notepad or assignment sheet.
- 23 Return the cuff to the case or wall holder.

POST-PROCEDURE

- 24 Provide for comfort. (See the inside of the front book cover.)
- 25 Place the signal light within reach.
- 26 Unscreen the person.
- 27 Complete a safety check of the room. (See the inside of the front book cover.)
- 28 Clean the earpieces and diaphragm with the wipes.
- 29 Return the equipment to its proper place.
- 30 Decontaminate your hands.
- 31 Report and record the blood pressure (Fig. 25-29). Report an abnormal blood pressure at once.

FIGURE 25-28 Measuring blood pressure. **A**, The cuff is over the brachial artery. **B**, The diaphragm of the stethoscope is over the brachial artery.



Date	Time	Weight	T	P	R	BP			Signatures
10/19	0700	126	98.4	72	20	142/84			Mary Smith CNA
10/26	0715	125	98.6	72	18	140/84			Jane Doe CNA
11/2	0715	126	98.6	70	18	144/82			Mary Smith CNA

FIGURE 25-29 Charting sample.

REVIEW QUESTIONS

Circle the BEST answer.

- Which statement is *false*?
 - The vital signs are temperature, pulse, respirations, and blood pressure.
 - Vital signs detect changes in body function.
 - Vital signs change only during illness.
 - Sleep, exercise, drugs, emotions, and noise affect vital signs.
- Which should you report at once?
 - An oral temperature of 98.4° F
 - A rectal temperature of 101.6° F
 - An axillary temperature of 97.6° F
 - An oral temperature of 99.0° F
- A rectal temperature is taken when the person
 - Is unconscious
 - Has heart disease
 - Is confused
 - Has diarrhea
- Which gives the *least* accurate measurement of body temperature?
 - Oral site
 - Rectal site
 - Axillary site
 - Tympanic membrane site
- Which site is used to take an infant's temperature?
 - Oral site
 - Rectal site
 - Axillary site
 - Tympanic membrane site
- Which is usually used to take an adult's pulse?
 - The radial pulse
 - The apical pulse
 - The apical-radial pulse
 - The brachial pulse
- Which is reported to the nurse at once?
 - An adult has a pulse of 120 beats per minute.
 - An infant has a pulse of 130 beats per minute.
 - An adult has a pulse of 80 beats per minute.
 - An adult has a pulse of 64 beats per minute.
- Which statement about the apical-radial pulse is *true*?
 - The radial pulse can be greater than the apical pulse.
 - The apical pulse can be greater than the radial pulse.
 - The apical and radial pulses are always equal.
 - The pulse deficit is 0.
- In an adult, normal respirations are
 - 10 to 18 per minute
 - 12 to 20 per minute
 - Less than 20 per minute
 - More than 20 per minute
- Normal respirations
 - Are heard as the person inhales
 - Are heard as the person exhales
 - Are quiet
 - Sound like wheezing with inhalation and exhalation
- Respirations are usually counted
 - After taking the temperature
 - After taking the pulse
 - Before taking the pulse
 - After taking the blood pressure
- Which blood pressure is normal for an adult?
 - 88/54 mm Hg
 - 140/90 mm Hg
 - 100/60 mm Hg
 - 112/78 mm Hg
- When measuring blood pressure, you should do the following *except*
 - Use the arm with an IV infusion
 - Apply the cuff to a bare upper arm
 - Turn off the TV
 - Locate the brachial artery
- The systolic pressure is the point
 - Where the pulse is no longer felt
 - Where the first sound is heard
 - Where the last sound is heard
 - 30 mm Hg above where the pulse was felt

Answers for these questions are on p. 781.