

# Chapter 16

## Vital Signs, Height, and Weight

### Lesson 16.1

Temperature

### Lesson 16.2

Pulse and Respiration

### Lesson 16.3

Blood Pressure

### Lesson 16.4

Height and Weight



### READING AND NOTETAKING

Throughout this chapter, you will read detailed procedures for measuring vital signs, height, and weight. Specific terminology will help you picture and understand these procedures. Before you read the chapter, list the key terms for each lesson and create a list of any key terms with which you are not familiar. Look up these terms in a dictionary or online. Write down the definitions in your own words. As you listen to your instructor present the chapter, revise your definitions as needed. Ask your instructor questions if terms are still unclear to you.



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## HOSA EVENT PREP

### Personal Care

HOSA has events for any student who is interested in health science. This includes students with disabilities or other learning challenges. Some events are accessible to students with disabilities. One of these events is *Personal Care*. The skills required for the event are the same as nursing assisting, but there is no test required. Giving students opportunities to compete in skills events helps students build confidence in performing skills used for the various events.

Go to the HOSA website to learn more about the HOSA *Personal Care* event. Find out the

purpose of the event, what is involved in the event, and what knowledge is demonstrated in the event.

As you prepare for HOSA competitive events, be sure to check the website and talk with your HOSA advisor for the most up-to-date guidelines and procedures. Once you have learned about the *Personal Care* event, answer the following questions:

1. How might participating in this event benefit you personally and your future career? Explain.
2. Are you interested in participating in this event? Why or why not?

# Temperature



## ESSENTIAL QUESTION

*Why is body temperature an important vital sign and in what ways can you measure it?*

## Learning Outcomes

After studying this lesson, you will be able to

- 16.1–1** Discuss the importance and purpose of taking vital signs.
- 16.1–2** Demonstrate the procedures for measuring temperature.
- 16.1–3** Identify the locations for measuring temperature and when it is appropriate to use each.
- 16.1–4** Identify the types of thermometers for measuring temperature and when it is appropriate to use each.

## Terms to Know

anus	digital	probe
aural	Fahrenheit (°F)	temporal artery temperature
axillary temperature	hypothermia	tympanic temperature
Celsius (°C)		

**V**ital signs are a patient's body temperature, pulse, respirations, and blood pressure. These signs are considered *vital* because they are required for the body to function effectively. When vital signs are taken, a patient's height and weight may also be measured and recorded (**Figure 16.1**). If vital signs are not within the normal range, they give health-care providers information about a patient's health and may be a sign that there is disease, infection, or injury.

## Profile: Medical Professionals Today



### Dr. Nieca Goldberg, MD

Dr. Nieca Goldberg, MD, is a cardiologist and a nationally recognized pioneer in women's heart health. Dr. Goldberg received a Bachelor of Arts degree from Barnard College and her medical doctor degree from the State University of New York Health Science Center, Brooklyn. She completed her medical residency at St. Luke's-Roosevelt Hospital Center and a cardiology fellowship at SUNY Downstate.

Her research and publications focus on exercise, exercise imaging, and cardiovascular disease in women. Dr. Goldberg is a national spokesperson for the American Heart Association and helped start the "Go Red for Women" campaign. Before joining Atria New York City as medical director, she was medical director of NYU Women's Heart Program, Senior Advisor of Women's Health Strategy NYU Langone Health, and the founder and Medical Director of the Joan H. Tisch Center for Women's Health at the NYU Langone Medical Center. She is the author of *Dr. Nieca Goldberg's Complete Guide to Women's Health* and the award-winning and highly-acclaimed book, *The Women's Healthy Heart Program—Lifesaving Strategies for Preventing and Healing Heart Disease*.



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**Figure 16.1** Healthcare providers measure vital signs to help them understand a patient's health status and identify the possible occurrence of a disease, disorder, or injury. *Why are these measurements "vital"?*

**THINK CRITICALLY**

Why is it important to measure a patient's vital signs?

## 16.1–1 Understanding Vital Signs

Understanding and learning how to take vital signs—body temperature, pulse, respirations, and blood pressure—are important skills for a healthcare provider to learn. Vital signs can help doctors diagnose diseases, determine treatments and medications, and evaluate how well these treatments and medications are working. For example, a high temperature is one way of knowing if someone has an infection. Once treatment starts, if the temperature starts to lower, it typically means the body is fighting the infection and the patient is beginning to get better.

Taking vital signs is basically the same process for children and adults; however, the method and normal ranges are different. For example, you would use a rectal thermometer for a newborn but an oral thermometer for an adult. With children, there is the additional challenge of keeping them still long enough to obtain an accurate measurement.

Vital signs are usually taken when you visit a doctor's office or once a day in long-term care facilities (or more frequently when necessary). However, a patient who is very ill in the hospital may have them taken hourly. Vital signs may also be taken if there is a complaint of dizziness, nausea, or pain. Each vital sign has a well-established guideline for adults and children to identify whether they are in a normal range.

**THINK CRITICALLY**

When was the last time you had your temperature taken? What location was used to take your temperature and was it appropriate?

## 16.1–2 Temperature

Taking a patient's temperature means that you are measuring their body heat. A temperature is shown in degrees ( $^{\circ}$ ). While a patient's body temperature can change during the day due to the dilation and expansion of blood vessels, pyrexia (*fever*) is caused by the body heating up to try to protect itself. Finding out that a temperature is above the normal range gives healthcare providers important information about whether there may be an infection, some other disease process, an injury, or a possible reaction to a medication.

Body temperature is regulated by the hypothalamus, which is located in the brain. It is the body's control center, or internal thermostat. The hypothalamus sets the body to a higher temperature when it becomes aware an infection or illness is present. The heat generated is one of the defenses used by the body against toxins causing the infection or illness.

Temperature is measured using a **Fahrenheit** scale, shown by using an *F*, or by the **Celsius**, or *centigrade* scale, shown by using a *C* (**Figure 16.2**). Chapter 9: *Medical Math Skills* explains how to convert between these two types of measurement.

**Fahrenheit ( $^{\circ}\text{F}$ )**

the English system of measurement used for temperature; the freezing point of water is  $32^{\circ}\text{F}$  and the boiling point is  $212^{\circ}\text{F}$

**Celsius ( $^{\circ}\text{C}$ )**

the metric measurement used for temperature; the freezing point of water is  $0^{\circ}$  and the boiling point is  $100^{\circ}$



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**Figure 16.2** Manual thermometers may feature both a Fahrenheit ( $^{\circ}\text{F}$ ) and Celsius ( $^{\circ}\text{C}$ ) scale.



### 16.1–3 Where to Take a Temperature

There are several different locations where body temperature can be taken:

- oral (taken under the tongue, or *sublingually*)
- rectal (taken in the **anus**)
- axillary (taken under the armpit)
- tympanic (taken in the ear)
- temporal arteries (taken on the forehead)

Oral temperatures are the most common method, but this method is not appropriate for a patient receiving oxygen, for some patients who may be agitated or comatose, or children younger than four years of age.

Taking the temperature of infants and small children is often done rectally or at the temporal arteries. When taken rectally, the thermometer is inserted one inch or less into the anus and held in place for three to five minutes (**Figure 16.3**). Rectal temperatures should not be taken if the patient has diarrhea, rectal bleeding, and certain heart conditions, or if the patient cannot follow directions or hold still.

When taking an oral temperature, be aware of whether a patient has recently eaten or had something to drink. If this has occurred, wait at least 15 minutes (or follow your facility policy) before inserting the oral thermometer.

Rectal and **temporal artery temperatures** provide more accurate measurements than other temperature sites. As a result, temporal artery temperatures are used more frequently in medical offices. They are also often used for babies and children, as they can be easier to take than rectal temperatures.



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**Figure 16.3** Rectal temperatures are most commonly used with infants.

#### **anus**

the opening at the end of the gastrointestinal (GI) tract, where solid waste leaves the body

#### **temporal artery temperature**

temperature taken on either side of the head, where the temporal arteries are located

### Extend Your Knowledge >>>>

#### Taking Vital Signs Should Be a Positive Experience

Taking vital signs should always be a positive experience for the patient. Be aware that, for some patients, it may be a new or even upsetting experience. For example, people from different cultures or generations may feel frightened and wonder what is being done. They may also be worried about the results. Move slowly and patiently and provide thorough and accurate explanations about what you are doing. If the patient does not speak English, ask someone to interpret, if possible.

#### Apply It

1. What can you do to be sure that taking vital signs is a positive experience for a patient rather than one that may be frightening or worrisome?
2. After you have completed this chapter, make a list of vital signs procedure steps that might frighten or concern patients.

**axillary temperature**  
temperature taken in the axilla,  
or armpit

**tympanic temperature**  
temperature taken in the ear

**hypothermia**  
a body temperature below 95°F

When taking an **axillary temperature**, ask if the patient has recently washed under their arms or put on deodorant. Doing so can affect the reading. If this has happened, make sure the deodorant is washed off. If this needs to be done, be sure the armpit is totally dry by waiting approximately 15 minutes.

**Tympanic temperatures** are more difficult to measure because the thermometer must be properly placed in the ear to receive an accurate reading. Always check that you are using the best and safest location to take a temperature for each patient.

A patient’s temperature may change slightly (by 1°F) during the day due to exercise or activity, how much is consumed (food and beverage), or the external temperature. The normal, or average, temperature for an adult is 98.6°F (37°C), although the average range is 97.0°F (36.5°C) to 99°F (37.2°C). The average rectal temperature is approximately 1° higher than an oral temperature, and axillary and temporal artery temperatures can be 1° lower. **Hypothermia**, while not seen often, is a body temperature below 95°F.

Average temperature ranges also vary based on the patient’s age and the type of thermometer used (Figure 16.4).

**Did You Know?**

**A Child’s Temperature Is Usually Higher and More Variable**

The following temperatures represent the top end of the “normal” range for children, by location:

- measured orally (mouth): 99°F (37.2°C)
- measured rectally (anus): 100.4°F (38°C)
- measured in an axillary position (armpit): 99°F (37.2°C)
- measured in the ear (tympanic) or on the temporal artery (forehead): 99.6°F (37.56°C)

Average Ranges of Body Temperature			
Thermometer	Birth to Two Years	Three to Eleven Years	Twelve Years and Older
Oral	Should not be taken	97.0°F–99.5°F* (36.1°C–37.5°C)	97.6°F–99.6°F (36.4°C–37.5°C)
Rectal	97.0°F–100.4°F (36.1°C–38.0°C)	97.9°F–100.4°F (36.6°C–38.0°C)	98.6°F–100.6°F (37.0°C–38.1°C)
Tympanic	Should not be taken	98.0°F–99.6°F (36.7°C–37.5°C)	98.6°F–100.4°F (37.0°C–38.0°C)
Axillary	97.5°F–99.3°F (36.4°C–37.4°C)	96.6°F–99.0°F (36.0°C–37.2°C)	96.6°F–98.6°F (35.9°C–37.0°C)
Temporal Artery	98.3°F–100.3°F (36.8°C–37.9°C)	97.8°F–100.1°F (36.5°C–37.8°C)	97.2°F–100.1°F (36.2°C–37.8°C)

\*Oral temperature should not be taken when children are younger than four years old.

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**Figure 16.4** Temperature ranges, used to determine a patient’s health status, vary according to a patient’s age and the thermometer used.

## 16.1–4 Types of Thermometers

The type of thermometer you use when working in healthcare will depend on what is available at your healthcare facility. Several different types of thermometers are used today. Some are filled with a liquid, which is usually colored alcohol. These are considered non-digital, or *manual*, thermometers. Some have liquid crystals on a plastic strip (usually disposable) that change color to indicate different temperatures. Others are electronic and use digital displays. Healthcare facilities may use any one of these types of temperature devices. No matter what device is used, all types of thermometers have the same purpose. Therefore, it is best to learn them all.

### Did You Know?

#### Mercury Thermometers—a Thing of the Past

The first type of clinical thermometer was the mercury thermometer, invented in Amsterdam in the early eighteenth century by physicist Daniel Gabriel Fahrenheit. The thermometer was originally made of glass with a small bulb at its base filled with pressurized liquid mercury. The stem of the thermometer was a hollow tube with a calibrated temperature scale. Mercury was used because it is a chemical element that rises and falls in response to temperature changes.

When using the thermometer and reading the calibrated temperature scale, one could then determine how hot or cold a person was. This type of thermometer was used for many years. However, in recent years, it has been replaced by mercury-free thermometers because mercury is a toxic substance. Should a mercury thermometer break, releasing its mercury, it could have significant negative effects on a person's health, possibly causing blindness, memory loss, and deafness, among other symptoms.

#### Non-Digital Thermometers

Non-digital thermometers can be used for oral, rectal, or axillary temperatures. Figure 16.2 shows a non-digital thermometer. These thermometers are tubes filled with a liquid (colored alcohol) that expands and moves up or down when exposed to heat. The bulb at the end of the thermometer is the part inserted into the body. The bulb on the rectal thermometer is different from the oral thermometer—it is thicker and broader. Each thermometer is marked with a colored dot—blue for oral or axillary, and red for rectal.

It is important to correctly place the thermometer and leave it in for the prescribed amount of time. Use the following guidelines based on your thermometer:

- oral temperatures: insert the thermometer under the tongue, close the patient's mouth completely, and leave the thermometer in for three minutes
- rectal temperatures: place the thermometer one inch or less into the anus for three to five minutes
- axillary temperatures: place the thermometer in the center of the armpit, lower the patient's arm completely, and leave the thermometer under the armpit for five minutes or more



Do not shake the thermometer when removing it. A non-digital thermometer is read by looking at the thermometer's scale. Be sure the scale is visible so you can determine where on the scale the liquid ended up, thus showing the patient's temperature.

### Digital Thermometers

**Digital** thermometers are used for oral, rectal, or axillary temperatures. They are handheld, have a digital display, and are connected to an electronic unit (**Figure 16.5**). Instead of a bulb, they have a **probe**. Place a fresh probe cover on the probe and discard after each use (**Figure 16.6**). Once the probe is inserted, a digital display of the temperature reading will usually appear within 20 to 60 seconds. These probes are often marked by color—blue for oral or axillary, and red for rectal.

You will follow a specific procedure for taking, measuring, and recording a temperature. When recording a temperature, identify the type of thermometer used and report any irregularities to the appropriate provider.

### Disposable Oral Thermometers

There are also disposable oral thermometers (**Figure 16.7**). These thermometers may be used to reduce the risk of cross- or re-infection. They are plastic or paper and are discarded once used. The dots found on the thermometer change color to show the change in body temperature.

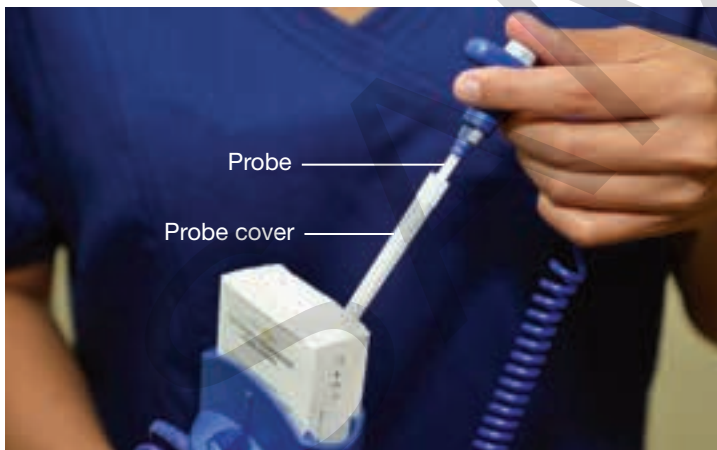
**digital**  
an electronic readout of numbers

**probe**  
a long, thin medical instrument with a blunt end used for exploration into body cavities



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**Figure 16.5** Commonly used in both healthcare facilities and homes, digital thermometers such as this one record oral, rectal, or axillary temperatures. *When is it appropriate to measure temperature at each of these locations?*



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**Figure 16.6** Place a disposable probe cover on the thermometer before every use.



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**Figure 16.7** Disposable oral thermometers are considered to be more sanitary than traditional thermometers.

Note: All procedures are to be practiced in a simulated laboratory setting under your instructor's supervision. Only perform procedures after they have been observed by an instructor and they have determined that your demonstration is competent.

## Procedure 16.1

## Using a Digital Oral Thermometer

### Rationale

Body temperature outside the normal range can be a sign of a disease or condition or the result of an injury. The decision to use an oral thermometer is based on the need for accuracy and the age and condition of the patient. An oral thermometer is accurate for adults, as long as the adult keeps their mouth closed during the reading. Always follow the thermometer manufacturer's instructions and facility policy.

### Preparation

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.

8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a digital thermometer
  - the appropriate probe attachment (the *blue* probe for an oral temperature)
  - disposable probe covers
  - disposable gloves, if appropriate
  - pen and pad, form, or digital device for documenting the temperature
9. Be sure the patient has not eaten, had something to drink, smoked, or chewed gum for at least 15 minutes prior to taking the oral temperature.

### The Procedure

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.
2. If the patient is in bed, lock the bed wheels and then raise the bed to hip level.
3. Maintain safety during the procedure. If the patient is in a bed with side rails, raise and lock the rails on the opposite side of the bed from where you will be working. Lower the rail on the side where you are working.
4. Position the patient comfortably.  
*Best Practice:* Let the patient know how long the thermometer will be in place. Ask the patient not to talk while the reading is being taken.
5. Place a disposable probe cover over the *blue* probe. Start the thermometer and wait until it shows it is ready.  
*Best Practice:* Wear disposable gloves only if required for infection prevention and control.

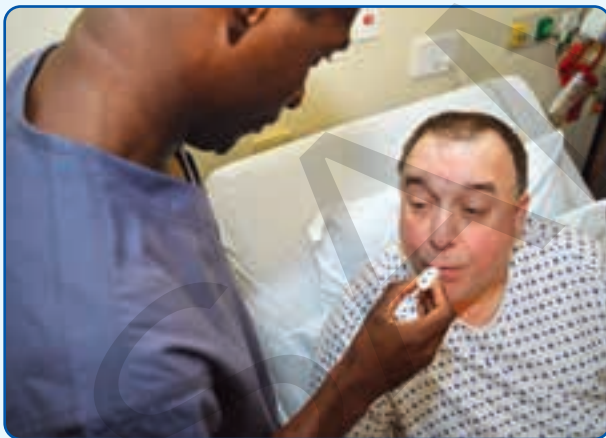
6. Have the patient open their mouth and lift their tongue. Slowly insert the covered probe into the mouth until the tip of the probe touches the base of the mouth under the tongue and to one side (**Figure 16.8**). Have the patient lower their tongue and close their mouth.



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**Figure 16.8**

7. Hold the probe in place in the mouth until you hear or see the signal that the reading is complete (**Figure 16.9**).



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**Figure 16.9**

8. Remove the thermometer from the patient's mouth and read the temperature on the display screen.
9. Do not touch the used probe cover with your bare hands. Dispose of the probe cover safely in a waste container or per facility policy.
10. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
11. Follow the plan of care to determine if the side rails should be raised or lowered.
12. Clean the probe according to facility policy and return the probe to its storage compartment on the thermometer.
13. Wash your hands or use hand sanitizer to ensure infection control.
14. Document the temperature on a pad, on a form, or in the electronic record according to facility policy.
15. Return the thermometer to a charging location per facility policy, if appropriate.

### Follow-up

1. Make sure the patient is comfortable and place the call light and personal items within reach.
2. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
3. Wash your hands or use hand sanitizer before leaving the room.

### Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

## Procedure 16.2

## Using a Digital Rectal Thermometer

**Rationale**

Body temperature outside the normal range can be a sign of a disease or condition or the result of an injury. The decision to use a rectal thermometer is based on the need for accuracy and the age and condition of the patient. Always follow the thermometer manufacturer's instructions and facility policy.

**Preparation**

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.
8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a digital thermometer
  - the appropriate probe attachment (the *red* probe for a rectal temperature)
  - disposable probe covers
  - disposable gloves
  - water-soluble (dissolves in water) lubricating gel
  - tissues or toilet paper
  - pen and pad, form, or digital device for documenting the temperature
  - sheet or drape
2. If the patient is in bed, lock the wheels and then raise the bed to hip level.
3. Maintain safety during the procedure. If the patient is in a bed with side rails, raise and lock the rails on the opposite side of the bed from where you will be working. Lower the rail on the side where you are working.
4. Wash your hands or use hand sanitizer to ensure infection control.
5. Put on disposable gloves.
6. Place a disposable cover over the *red* probe. Start the thermometer and wait until it shows it is ready.
7. Assist the patient into a side-lying or lateral position. Have the patient bend the upper leg up to their stomach as far as possible. Help, if needed.
8. If the patient is covered by a drape or top sheet, fold it back to expose the buttocks. Expose only the area necessary for the procedure. Keep the rest of the patient covered to protect privacy.
9. Apply enough water-soluble lubricating gel (about the size of a quarter) for comfortable entry.  
*Best Practice:* To lubricate the end of the covered probe, you may put the gel directly on the probe or you may use tissue or toilet paper to apply the lubricant.
10. With one hand, gently raise the upper buttock to expose the anal area.
11. With the other hand, gently insert the rectal probe one inch or less into the anus.
12. Hold the probe in place until you hear or see the signal that the reading is complete.
13. Remove the thermometer and read the temperature on the display screen.
14. Dispose of the probe cover safely in a waste container or per facility policy.
15. Wipe the lubricant off with a tissue or toilet paper and discard.
16. Clean the probe with alcohol according to facility policy. Return the probe to its storage compartment on the thermometer.
17. Remove and discard your gloves and wash your hands or use hand sanitizer to ensure infection control.

**The Procedure**

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.

18. Document the temperature on a pad, on a form, or in the electronic record according to facility policy.
19. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
20. Follow the plan of care to determine if the side rails should be raised or lowered.
21. Return the thermometer to a charging location per facility policy.

### Follow-up

1. Make sure the patient is comfortable and place the call light and personal items within reach.

2. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
3. Wash your hands or use hand sanitizer before leaving the room.

### Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

## Procedure 16.3

## Using a Digital Axillary Thermometer

### Rationale

While axillary temperature is not as accurate as other temperatures, the axilla (*armpit*) can often be more easily reached than other locations. Always follow the thermometer manufacturer's instructions and facility policy.

### Preparation

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.

8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a digital thermometer
  - the appropriate probe attachment (the *blue* probe for an axillary temperature)
  - disposable probe covers
  - disposable gloves, if appropriate
  - a towel
  - pen and pad, form, or digital device for documenting the temperature

### The Procedure

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.
2. If the patient is in bed, lock the wheels and then raise the bed to hip level.
3. Maintain safety during the procedure. If the patient is in a bed with side rails, raise and lock the rails on the opposite side of the bed from where you will be working. Lower the rail on the side where you are working.
 

*Best Practice:* Wear disposable gloves only if required for infection prevention and control.
4. Help the patient remove any clothing to expose the upper arm area.
5. Dry the axilla with the towel.



6. Place the disposable probe cover over the *blue* probe. Start the thermometer and wait until it shows it is ready.
7. Place the covered probe in the center of the axilla.
8. Place the patient's arm across the chest while holding the probe in place (**Figure 16.10**).



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**Figure 16.10**

9. Hold the probe in place in the axilla until you hear or see the signal that the reading is complete.
10. Remove the thermometer from the axilla and read the temperature on the display screen.  
*Best Practice:* Do not touch the probe cover.
11. Dispose of the probe cover safely in a waste container or per facility policy.

12. Clean the probe with alcohol according to facility policy. Return the probe to its storage compartment on the thermometer.
13. Wash your hands or use hand sanitizer to ensure infection control.
14. Document the temperature on a pad, on a form, or in the electronic record.
15. Assist the patient in replacing and securing their clothing.
16. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
17. Follow the plan of care to determine if the side rails should be raised or lowered.
18. Return the thermometer to a charging location per facility policy.

### Follow-up

1. Make sure the patient is comfortable and place the call light and personal items within reach.
2. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
3. Wash your hands or use hand sanitizer before leaving the room.

### Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

## Tympanic Thermometers

A tympanic thermometer measures the temperature of **aural** blood vessels. It determines whether a patient has a fever by measuring the temperature on the tympanic membrane, or *eardrum*. Tympanic thermometers are usually battery-operated and handheld with a digital display found on the handle (**Figure 16.11**).

Placement of the thermometer is very important to get an accurate reading. Be aware if there is too much wax in the ears, as excess wax can interfere with the reading. Do not use this type of thermometer if the patient has a sore ear or ear infection, or if they have had ear surgery.

### aural

of or relating to the ear or the sense of hearing



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**Figure 16.11** A tympanic thermometer is inserted into the ear and measures the temperature of the tympanic membrane, or *eardrum*.

## Procedure 16.4 Using a Digital Tympanic Thermometer

### Rationale

Tympanic (*ear*) thermometers are another choice for taking temperatures. Placement is most important for an accurate reading. Always follow the thermometer manufacturer's instructions and facility policy.

### Preparation

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.
8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a digital tympanic thermometer
  - disposable plastic tympanic covers
  - disposable gloves, if appropriate
  - pen and pad, form, or digital device for documenting the temperature

### The Procedure

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.
2. If the patient is in bed, lock the wheels and then raise the bed to hip level.
3. Maintain safety during the procedure. If the patient is in a bed with side rails, raise and lock the rails on the opposite side of the bed from where you will be working. Lower the rail on the side where you are working.

*Best Practice:* Wear disposable gloves only if required for infection prevention and control.

4. Check the lens of the tympanic thermometer to make sure it is clean and intact.
5. Position the patient's head so that the ear being used for the procedure is directly in front of you.
6. Place the disposable plastic cover on the tympanic thermometer.
7. Pull the outer ear up and back to open the ear canal (**Figure 16.12**).



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**Figure 16.12**

8. Gently insert the covered tympanic thermometer into the ear until it seals the ear canal (**Figure 16.13**).



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**Figure 16.13**

9. Start the thermometer.

10. Hold the probe in place in the ear until you hear or see the signal that the reading is complete.
11. Remove the thermometer and read the temperature on the digital screen.  
*Best Practice:* Do not touch the plastic tympanic cover.
12. Dispose of the plastic tympanic cover safely in a waste container or per facility policy.
13. Clean the tympanic thermometer according to the facility policy.
14. Wash your hands or use hand sanitizer to ensure infection control.
15. Document the temperature on a pad, on a form, or in the electronic record.
16. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
17. Follow the plan of care to determine if the side rails should be raised or lowered.
18. Return the thermometer to a charging location per facility policy.

### Follow-up

1. Make sure the patient is comfortable and place the call light and personal items within reach.
2. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
3. Wash your hands or use hand sanitizer before leaving the room.

### Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

### Temporal Artery Thermometers

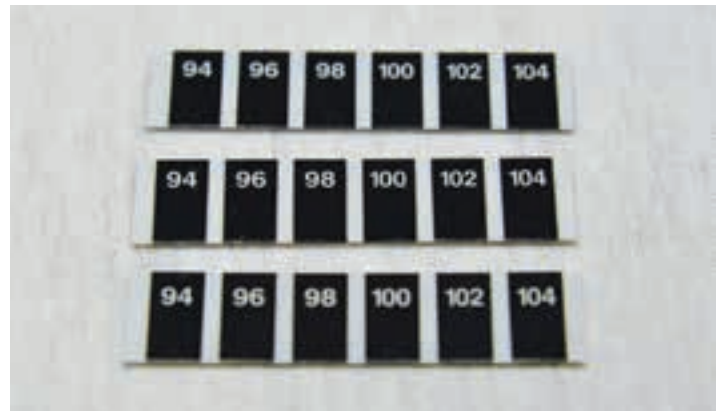
Temporal artery thermometers use the surface temperature of the temporal artery to determine the presence of a fever. This type of temperature is often more accurate than an oral temperature because it is not affected by what a patient eats or drinks. Temporal artery thermometers measure the temperature of arteries on either side of the head using a handheld, infrared scanner with a digital display (**Figure 16.14**). The device is swept across the forehead to read the patient's temperature.

A forehead thermometer strip is sometimes used to measure a patient's temperature at this location (**Figure 16.15**). The strips contain heat-sensitive liquid crystals that change color to show different temperatures.



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**Figure 16.14** Due to their accuracy and ease of use, temporal artery thermometers are often used on infants and other young patients.



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**Figure 16.15** Forehead thermometer strips are a disposable alternative to a temporal artery thermometer.

## Procedure 16.5

## Using a Digital Temporal Artery Thermometer

**Rationale**

The temporal artery thermometer, used on the forehead, is less invasive than other methods because it does not need to enter a body cavity. Always follow the thermometer manufacturer's instructions and facility policy.

**Preparation**

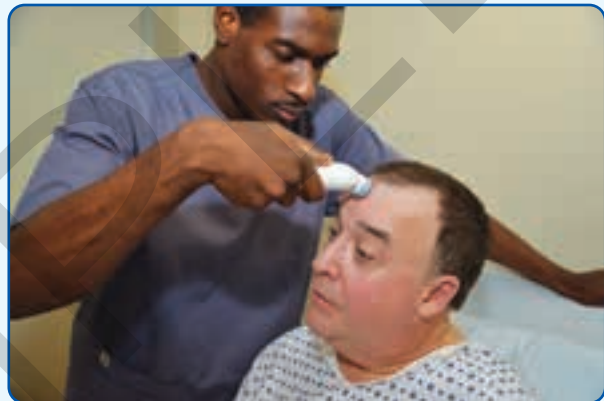
1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.
8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a temporal artery thermometer
  - pen and pad, form, or digital device for documenting the temperature

**The Procedure**

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.
2. If the patient is in bed, lock the bed wheels and then raise the bed to hip level.
3. Ensure safety during the procedure. If the patient is in a bed with side rails, raise and secure the rails on the opposite side of the bed from where you will be working. Lower the rail on the side where you are working.
 

*Best Practice:* Wear disposable gloves only if required for infection prevention and control.

4. Position the patient comfortably.
5. Help or have the patient turn so their forehead faces you.
6. Start the thermometer and wait until it shows it is ready.
7. Place the probe in the middle of the patient's forehead (**Figure 16.16A**). Then, keeping the button on the thermometer pressed, slowly move the thermometer across the forehead toward the ear, stopping in front of the ear (**Figure 16.16B**).



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**Figure 16.16A**

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**Figure 16.16B**

8. Wait until you see or hear the signal that the temperature is complete.
9. Wash your hands or use hand sanitizer to ensure infection control.
10. Document the temperature on a pad, on a form, or in the electronic record.



11. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
12. Follow the plan of care to determine if the side rails should be raised or lowered.
13. Clean and store the temporal artery thermometer according to the facility policy.
2. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
3. Wash your hands or use hand sanitizer before leaving the room.

### Follow-up

1. Make sure the patient is comfortable and place the call light and personal items within reach.

### Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

## LESSON 16.1 REVIEW

### Multiple Choice

Select the letter that corresponds to the correct answer.

1. Which of the following is *not* a vital sign? (16.1–1)
 

A. Body temperature	C. Pulse and respirations
B. Height and weight	D. Blood pressure
2. Body temperature is regulated by the \_\_\_\_\_, which is located in the brain. (16.1–2)
 

A. hippocampus	C. cerebellum
B. hypothalamus	D. pituitary gland
3. An axillary temperature measurement is taken \_\_\_\_\_. (16.1–3)
 

A. under the tongue	C. under the armpit
B. in the anus	D. on the forehead
4. Which type of thermometer may be used to reduce the risk of cross- or re-infection? (16.1–4)
 

A. Disposable oral	C. Rectal
B. Tympanic	D. Axillary
5. Too much \_\_\_\_\_ can interfere with the reading of a tympanic thermometer. (16.1–4)
 

A. movement	C. ear wax
B. heat	D. hair



# Pulse and Respiration



## ESSENTIAL QUESTION

*What type of information can you collect by measuring pulse and respirations?*

## Learning Outcomes

After studying this lesson, you will be able to

- 16.2–1** Identify the locations where a pulse can be taken.
- 16.2–2** Discuss the important considerations and guidelines for taking, measuring, and recording a pulse.
- 16.2–3** Discuss the important considerations and guidelines for taking, measuring, and recording rate of respiration.

## Terms to Know

apical pulse	exhalation	pulse oximeter
apnea	hyperventilation	radial pulse
bradycardia	hypoventilation	stertorous breathing
bradypnea	hypoxia	stethoscope
carotid pulse	inhalation	tachycardia
dyspnea	intravenous (IV)	tachypnea

## THINK CRITICALLY

What factors can affect a patient's resting pulse measurement?

## 16.2–1 Pulse

When you take a pulse, you are feeling the pressure of the blood against the wall of an artery as the heart beats (contracts and relaxes). The pulse is very important to know because it tells you the patient's heart rate and how well the cardiovascular system is working. It is particularly important if a patient has a heart or respiratory condition.

## Pulse Locations

There are several locations where an artery comes close enough to the surface of the skin for a pulse to be felt (**Figure 16.17**). These arteries are the temporal; carotid; apical; brachial; radial; femoral; popliteal; and dorsalis pedis, which is found on the top of the foot on the dorsalis pedis artery.

There are three pulse locations that are most commonly used:

- **radial pulse**
- **apical pulse**
- **carotid pulse**

Of these three, radial and apical pulses are used most often. The radial pulse is located on the radial artery at the wrist (thumb side of the hand). Two fingers (index and middle) are gently placed on the radial artery to take the pulse. If the patient has an **intravenous (IV)** catheter in one arm, do not use that arm when taking the pulse.

### radial pulse

the pulse located on the thumb side of the wrist

### apical pulse

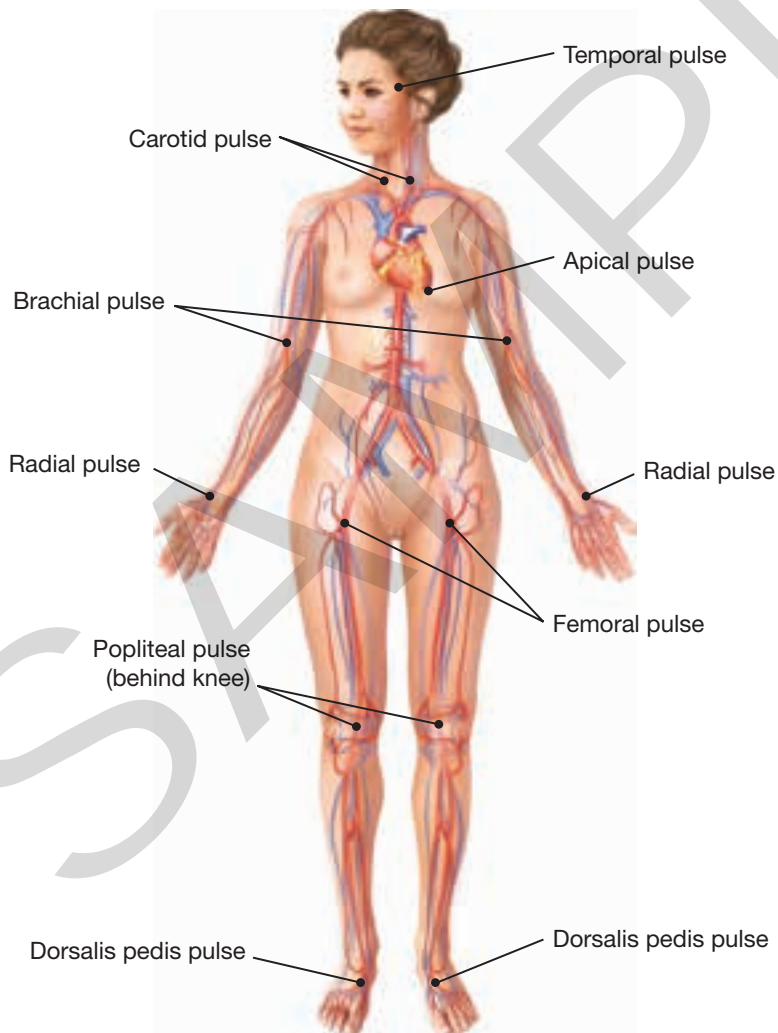
the pulse located at the bottom left portion of the heart

### carotid pulse

a pulse taken at either of the two main arteries located on each side of the neck

### intravenous (IV)

existing or taking place within, or administered into, a vein or veins



©Body Scientific International

**Figure 16.17** Although radial and apical pulses are most commonly taken, there are several locations throughout the body where a pulse can be felt and recorded. *What are other locations at which the pulse can be recorded?*

**stethoscope**

a medical device used to listen to body sounds such as breathing, heartbeats, and lung and bowel sounds; composed of two earpieces connected by flexible tubing with a diaphragm and bell at its end

The apical pulse is located at the bottom left of the heart and is usually taken at this location when it is difficult to count a radial pulse and if a patient is unconscious. This pulse is taken by using a **stethoscope**. The carotid pulse may also be used when a patient is unconscious, such as during CPR.

**Parts of a Stethoscope**

A stethoscope is composed of two earpieces; rubber or plastic tubing; a brace, which connects the tubing to the earpieces; a diaphragm, which magnifies the sound; and a bell, which can detect fainter sounds (**Figure 16.18**). Always disinfect the earpieces, diaphragm, and bell before use by rubbing them lightly with antiseptic or alcohol wipes. Also, wipe the tubing if it has come in contact with the patient or bed linen.

**Using the Stethoscope**

Before using the stethoscope, be sure the earpieces are firmly in place in your ear canals. They should fit snugly and block out any outside sounds. Once the earpieces are in place, tap lightly on the diaphragm. You must be able to hear these sounds clearly to use the stethoscope. If you do not, rotate the diaphragm and try again. If it still does not work, try this process again with a different stethoscope.

**16.2–2 Pulse Rate Measurements**

Pulse rate is measured by “feeling” or “hearing” the pulse and counting the number of beats in one minute using a watch with a second hand. Pulse rate is reported per minute such as a pulse of *72 beats per minute* or *72 bpm*.



Alex Hinds/Hemera/Thinkstock and Goodheart-Willcox Publisher

**Figure 16.18** The parts of a stethoscope include the earpiece, braces, tubing, diaphragm, and bell.

## Real Life Scenario

### A Young Athlete Gets His Pulse Checked

Your friend Joe likes to participate in sports. Last week he went to the doctor for a physical and found out that his pulse was at 56 beats per minute. The doctor told Joe that he should have his pulse checked again in a month.

#### Apply It

1. Is Joe's pulse considered in the normal range for an athlete? Why or why not?
2. What term is used to describe Joe's pulse rate?
3. Why do you think the doctor will want Joe to have his pulse checked again?

A pulse is taken when a patient is breathing normally and resting (sitting in a chair or bed). The average range or normal resting pulse rates are found in **Figure 16.19**.

Pulse rate can be affected by activity, medication, sleep patterns, and diseases or health conditions. For instance, during exercise, the average person's pulse rate can range from 90 to 120 beats per minute. In contrast, if the person is an athlete, the resting pulse can be as low as 40 to 60 beats per minute. This is because an athlete's body is healthy and in condition, so the heart does not have to work as hard to pump blood.

When a pulse is slow (less than 60 beats per minute), it is called **bradycardia**. When a pulse is fast (100 beats or more per minute), it is called **tachycardia**.

When taking a pulse, it is important to remember that you are not only counting the number of beats felt, but also determining the rhythm (pause between beats felt) and the quality of the pulse. A pulse can be strong; weak; or thready, which means it is hard to feel. For example, a pulse may be reported as *82 bpm and strong*.

The pulse is recorded using a form provided by the healthcare facility. Any irregularities of the pulse must be reported to the appropriate provider.

#### **bradycardia**

a slow pulse of less than 60 beats per minute

#### **tachycardia**

a fast pulse of over 100 beats per minute

Average Resting Pulse Rates Per Minute	
Age Group	Pulse Rate
Adults	60–100 bpm
Teenagers	60–100 bpm
Children	70–120 bpm
Infants	120–160 bpm

Goodheart-Willcox Publisher

**Figure 16.19** Average resting pulse rates vary by age.

## Procedure 16.6

## Measuring a Radial Pulse

## Rationale

Counting a radial pulse is the most common method of measuring heart rate and its quality. A pulse that falls outside the normal range may be a sign of a health issue, disease, or condition.

## Preparation

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.
8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a watch or clock with a second hand (not a digital watch)
  - pen and pad, form, or digital device for documenting the pulse

## The Procedure

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.
2. If the patient is in bed, lock the bed wheels and then raise the bed to hip level.
3. Maintain safety during the procedure. If the patient is in a bed with side rails, raise and lock the rails on the opposite side of the bed from where you will be working. Lower the rail on the side where you are working.
4. Have the patient sit or lie down. Select the hand and arm you will use to take the pulse.
 

*Best Practice:* If the patient has an IV in one arm, do not use that arm to take the pulse. Also, do not take the pulse on a weak arm. Some patients may have an arm that has been weakened by a stroke.
5. Position the hand and arm so they are well supported and rest comfortably.
6. Locate the radial pulse by placing your middle finger and index finger toward the inside of the patient's wrist on thumb side (**Figure 16.20**).
 

*Best Practice:* Do not use your thumb to feel for the pulse. The thumb has its own pulse, which can be confused with the pulse you are taking.
7. Press your fingers gently on bare skin until you feel the pulse. Also, note the rhythm and quality of the pulse.



Tyler Olson/Shutterstock.com

Figure 16.20



8. Start taking the pulse when you note the position of the second hand on your watch (**Figure 16.21**). Count pulse beats for one full minute or for 30 seconds and multiply the result by 2. Follow the facility policy. Counting for one full minute is more accurate and should be done if the pulse rhythm seems weak or irregular.
9. Document the pulse on a pad, on a form, or in the electronic record.
10. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
11. Follow the plan of care to determine if the side rails should be raised or lowered.



*Lisa F. Young/Shutterstock.com*

**Figure 16.21**

### Follow-up

1. Wash your hands to ensure infection control.
2. Make sure the patient is comfortable and place the call light and personal items within reach.
3. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
4. Wash your hands or use hand sanitizer before leaving the room.

### Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

## Procedure 16.7

## Measuring an Apical Pulse

### Rationale

Apical pulse is usually taken if you want more information than a radial pulse can provide or if it is not possible to take a radial pulse. A pulse outside the normal range may be a sign of a health issue, medical disease, or condition.

### Preparation

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.
8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a stethoscope
  - antiseptic wipes
  - a watch or clock with a second hand (not a digital watch)
  - pen and pad, form, or digital device for documenting the pulse rate

### The Procedure

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.

2. If the patient is in bed, lock the bed wheels and then raise the bed to hip level.
3. Maintain safety during the procedure. If the patient is in a bed with side rails, raise and lock the rails on the opposite side of the bed from where you will be working. Lower the rail on the side where you are working.
4. Have the patient sit or lie down.
5. Clean the earpieces and diaphragm of the stethoscope with an antiseptic wipe.
6. Warm the diaphragm of the stethoscope by rubbing it in the palms of your hands.
7. Place the earpieces of the stethoscope in your ears.
8. Uncover the left side of the patient's chest. Avoid any overexposure.
9. Place the diaphragm on the left side of the chest, under the breast, or just below the left nipple (Figure 16.22).



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Figure 16.22

- Best Practice:* If the heartbeat is difficult to hear, have the patient turn slightly to the left or sit upright.
10. Note the position of the second hand on your watch. Count the heartbeats for one full minute. Note the rhythm and quality.
  11. Cover the patient's chest.
  12. Document the pulse on a pad, on a form, or in the electronic record.
  13. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
  14. Follow the plan of care to determine if the side rails should be raised or lowered.

### Follow-up

1. Wash your hands to ensure infection control.
2. Make sure the patient is comfortable and place the call light and personal items within reach.
3. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
4. Wash your hands or use hand sanitizer before leaving the room.

### Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

#### THINK CRITICALLY

Why is it important to measure the rate of respirations as well as their quality?

#### inhalation

breathing in; also called *inspiration*

#### exhalation

breathing out; also called *expiration*

## 16.2–3 Respiration

The rate of respiration is the measurement of a patient's breathing cycle, which is **inhalation** followed by **exhalation**. Respiration rate helps determine the level of the blood oxygenation, or how well oxygen is being supplied to the body cells. Knowing a patient's respiration rate helps determine if they are breathing in a normal range. This provides information about conditions such as asthma, heart disease, and even infections.

### Measuring Respirations

The method used to determine rate of respiration is to record the number of full breaths (the breathing cycle) taken in one minute (Figure 16.23).



Fuse/Thinkstock

**Figure 16.23** Observe the rise and fall of a patient's chest while taking the pulse to get an accurate measurement of the patient's respiration rate.

This is typically done by counting respirations for 15 seconds and multiplying by four, starting when the chest rises. Some healthcare facilities require the healthcare provider to count for 30 seconds and then multiply by two. This is done using a watch with a second hand.

It is best to count the respiration rate immediately after the pulse is taken, so the patient is breathing normally. Switch from taking the pulse to counting respirations without mentioning the change to your patient. A patient who knows respirations are being counted may subconsciously change their breathing, giving the healthcare provider an inaccurate result.

## Understanding Respiratory Rates

A normal adult respiratory rate is 12 to 20 breaths per minute. Infants and children breathe much faster. Infants can breathe from 30 to 60 breaths per minute, and children, 18 to 30 breaths per minute.

Observing how well the patient is breathing (regularity, expansion of the chest, and depth of respiration) is just as important as the rate (counting breaths). Observe for the following:

- Is the breathing regular or irregular?
- Is the patient experiencing **hyperventilation** (breathing too quickly) or **hypoventilation** (breathing too slowly)?
- Is the breathing rapid and shallow (called **tachypnea**), deep and labored (called **dyspnea**), or unusually slow (called **bradypnea**)?
- Is the breathing noisy like snoring (called **stertorous breathing**)?
- Are there periods of no breathing at all (called **apnea**)?

**hyperventilation**  
breathing too quickly

**hypoventilation**  
breathing too slowly

**tachypnea**  
rapid, shallow breathing due to the lungs only partially filling

**dyspnea**  
difficult breathing usually described as shortness of breath

**bradypnea**  
an unusually slow rate of breathing, typically under 12 breaths per minute

**stertorous breathing**  
breathing that sounds like snoring

**apnea**  
lack of breathing

**pulse oximeter**

a medical device usually applied to the fingertip to indirectly measure the amount of oxygen saturation in the blood

**hypoxia**

a lack of adequate oxygen



©iStock.com/praisaeng

**Figure 16.24** Pulse oximeters are often used to monitor the patient's oxygen levels. *Why is it important to measure a patient's oxygen levels?*

## Using a Pulse Oximeter

Another way to measure how well oxygen is being used in the body is to determine the oxygen's saturation in the blood, or how well it is being carried to the body tissues. This is done with a device called a **pulse oximeter**. This device is often used when a patient is receiving oxygen to measure the oxygen's effectiveness.

A pulse oximeter is applied to the finger (or sometimes the earlobe or toe). It uses infrared light that passes through the body tissue of the finger. A pulse oximeter's digital display will show the amount of oxygen in the blood as a percentage (**Figure 16.24**). A normal reading is 95 percent to 100 percent oxygen in the blood. A reading below 85 percent is considered too low and is called **hypoxia**. The notation used for recording a pulse oximeter's reading is  $SpO_2$  for the saturation level of oxygen in the blood.

There are minimal risks using a pulse oximeter. If the device is not properly placed, it may result in an inaccurate reading. The skin around and under the device may also become irritated.

Respirations (rate, regularity, and depth) and pulse oximeter percentages are recorded using a form provided by the healthcare facility. Report any irregularities to the appropriate provider.

### Procedure 16.8

## Counting Respirations

### Rationale

Counting respirations involves measuring the number of inhalations and exhalations in one minute. A respiration rate outside the normal range may be a sign of a health issue, medical disease, or condition.

### Preparation

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.

7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.
8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a watch or clock with a second hand (not a digital watch)
  - a pen and pad, form, or digital device for documenting the respiration rate

### The Procedure

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.
2. If the patient is in bed, lock the bed wheels and then raise the bed to hip level.
3. Maintain safety during the procedure. If the patient is in a bed with side rails, raise and lock the rails on the opposite side of the bed from where you will be working. Lower the rail on the side where you are working.
4. Have the patient sit or lie down.
5. The best time to count respirations is immediately after counting pulse rate. It is best not to tell



patients you are counting respirations. When patients know their breathing is being observed, they may change their breathing patterns.

*Best Practice:* Depending on which pulse was taken, keep your fingers on the wrist or keep the stethoscope on the chest while counting respirations.

6. Begin counting respirations when the chest rises. Each rise and fall of the chest counts as one respiration. Note the regularity and depth of respirations, the expansion of the chest, and any pain or difficulty breathing.
7. Note the position of the second hand on your watch and count respirations for one full minute. You may also count respirations for 15 seconds and multiply the result by 4 or count respirations for 30 seconds and multiply the result by 2. Follow the facility policy. Counting respirations for one full minute should be done if the respiration is irregular.
8. Let the appropriate provider know immediately if the patient complains of pain or difficulty breathing.
9. Document the respiration rate on a pad, on a form, or in the electronic record.
10. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
11. Follow the plan of care to determine if the side rails should be raised or lowered.

### Follow-up

1. Wash your hands to ensure infection control.
2. Make sure the patient is comfortable and place the call light and personal items within reach.
3. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
4. Wash your hands or use hand sanitizer before leaving the room.

### Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

## LESSON 16.2 REVIEW

### Multiple Choice

Select the letter that corresponds to the correct answer.

1. Pulse is usually taken at which location when it is difficult to count a radial pulse and if a patient is unconscious? (16.2–1)
 

A. Brachial	C. Carotid
B. Apical	D. Dorsalis pedis
2. Which part of the stethoscope magnifies the sound? (16.2–1)
 

A. Earpiece	C. Diaphragm
B. Brace	D. Bell
3. Pulse rate is reported in beats per \_\_\_\_\_. (16.2–2)
 

A. minute	C. second
B. hour	D. day
4. Which term describes a patient breathing shallow? (16.2–3)
 

A. Hypoventilation	C. Stertorous breathing
B. Dyspnea	D. Tachypnea
5. Which device is used to determine the oxygen's saturation in the blood? (16.2–3)
 

A. Pulse oximeter	C. Thermometer
B. Stethoscope	D. None are correct.



# Blood Pressure



## ESSENTIAL QUESTION

*What is considered to be an average range for blood pressure?*

## Learning Outcomes

*After studying this lesson, you will be able to*

- 16.3–1** Identify normal and abnormal ranges for blood pressure.
- 16.3–2** Discuss how various factors can affect blood pressure.
- 16.3–3** Demonstrate the procedure for measuring blood pressure.

## Terms to Know

diastolic pressure  
hypertension

hypotension  
sphygmomanometer

systolic pressure

### hypotension

a condition in which blood pressure is too low

### hypertension

a condition in which blood pressure is too high

**B**lood pressure is a measure of the force of the blood pushing against the body's arterial walls. Measuring blood pressure is important. If a patient has blood pressure that is too low, called **hypotension**, it can mean the body is not getting enough oxygen and nutrients. Conversely, **hypertension** (blood pressure that is too high) may place too much pressure on the walls of the arteries. This pressure may cause a stroke or other circulatory problems. High or low blood pressure can also be a sign or cause of certain diseases or conditions such as coronary heart disease, kidney damage or failure, various injuries, or dizziness.

## Did You Know?

### High Blood Pressure by the Numbers

The Centers for Disease Control and Prevention recently reported that 45 percent of the adults in the US (108 million) have hypertension. This is defined by having a systolic blood pressure equal to or greater than 130 mm Hg, having a diastolic blood pressure equal to or greater than 80 mm Hg, or taking medication for hypertension. Only about 24 percent with hypertension have their condition under control.

### THINK CRITICALLY

As a future healthcare provider, why is it important to understand the difference between systolic pressure and diastolic pressure?

## 16.3–1 Measuring Blood Pressure

There are two pressure levels measured as the heart beats. The first is the **systolic pressure**, in which the heart muscle contracts and pushes blood through the artery. The second is the **diastolic pressure**, which occurs when the heart muscle immediately relaxes. These are measured using a stethoscope and a **sphygmomanometer**. (To break down this term: *sphygmo* = pulse; *mano* = pressure; *meter* = measure.)

Both pressures are measured and recorded in millimeters of mercury (mmHg) as a fraction, such as 120/80. The systolic pressure, which is the higher number, is the first beat heard and measured (120 in the example). The diastolic pressure is the lower number and is the last beat heard and measured (80 in the example). The average range of normal blood pressure for adults, children, and infants can be found in **Figure 16.25**.

### systolic pressure

part of a blood pressure reading that is taken when the heart muscle contracts and pushes blood through the artery

### diastolic pressure

part of a blood pressure reading that is taken when the heart muscle relaxes

### sphygmomanometer

a specialized manual or digital medical device used to measure blood pressure

## 16.3–2 Factors Affecting Blood Pressure

Blood pressure can vary for several reasons:

- **Diet.** Diets high in salt and fat may lead to higher blood pressure.
- **Weight.** Being affected by overweight can lead to higher blood pressure.
- **Exercise.** Systolic pressure may be higher if you do not exercise or if you exercised right before it was taken.
- **Race.** African American individuals tend to have high blood pressure more often, and at an earlier age, than people of Caucasian or Hispanic descent.
- **When the reading is taken.** Blood pressure may be lower in the morning than later in the day. If blood pressure is taken after a meal, it may be higher than if it was taken before the patient ate.

### THINK CRITICALLY

Do you think your blood pressure might be affected by any of the factors discussed in this section? Explain.

Average Blood Pressure Measurements		
Age	Systolic Pressure	Diastolic Pressure
Adult	100–130	60–90
Teenager	94–134	64–84
Children	100–120	60–74
Infant	70–90	50–64

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**Figure 16.25** Average blood pressure measurements vary by age.

- **Position.** Blood pressure may be higher if a patient is lying down, and lower when the patient is standing up. If people stand up too quickly, they may experience orthostatic hypotension, in which the blood pressure can drop too quickly, causing the patient to feel dizzy or faint.
- **Cigarettes and alcohol.** These substances can increase blood pressure.
- **Drugs or medications.** Some drugs (both prescription and illegal drugs) will affect blood pressure and may make it higher or lower than it otherwise would be.
- **Stress, fear, or pain.** Blood pressure may be higher if a patient is experiencing any of these feelings.

### THINK CRITICALLY

Why is it important to know how to take a manual blood pressure measurement when electronic devices that take blood pressure measurements are available?

## 16.3–3 Taking a Patient's Blood Pressure

Blood pressure can be taken manually or electronically, depending on the equipment available. Both ways are considered accurate; however, the use of an electronic device reduces potential human error as long as the device is regularly checked for accuracy. The equipment may be movable, on a wall mount, or part of a vital sign machine. Taking blood pressure manually may be required for certification exams.

When taking a patient's blood pressure, there are several important factors to consider, including equipment checks, making sure your patient is relaxed, and whether you feel prepared to perform the procedure. It is important to recheck a blood pressure reading if you are not sure the measure is accurate due to your own skill, possible faulty equipment, a change in the patient's normal blood pressure, or the first occurrence of a high or low blood pressure for that patient.

When taking a manual blood pressure measurement, you will need a stethoscope and a sphygmomanometer. Before beginning, check that your stethoscope is in working order.

There are three main types of devices used to measure blood pressure (Figure 16.26):

- **Manual aneroid sphygmomanometer:** has a round dial and a needle that points to the numbers and is movable. You will need a stethoscope when using this device.
- **Manual mercury sphygmomanometer:** has a column of mercury that rises and falls; these can stand alone or be mounted on a wall. You will need a stethoscope when using this device.
- **Electronic sphygmomanometer:** has a digital display and is found in many healthcare facilities. You will not need a stethoscope when using this device.

No matter what type of device you are using, be sure it is in working order before taking a blood pressure measurement.

A sphygmomanometer has two parts: the measuring device and the cuff. When applying a blood pressure cuff, check that it is the right size. Cuffs come in various sizes—pediatric, small adult, adult, and large adult (Figure 16.27). If the cuff is too small or too large, the blood pressure reading



**Figure 16.26** A stethoscope must be used with the aneroid sphygmomanometer (A) and mercury sphygmomanometer (B), but not with an electronic sphygmomanometer (C).

will not be accurate. The inflatable part of the cuff should cover two-thirds of the distance from the elbow to the shoulder.

Have patients relax or rest for a few minutes before taking their blood pressure. This helps you get a reading that is most normal for that patient. The blood pressure reading may not be accurate if the patient has just been exercising, is in pain, is feeling anxious, or has recently had physical therapy. If possible, wait at least 30 minutes before taking a routine blood pressure measurement.

Taking blood pressures can be most challenging when you first start to do them early in your healthcare career. Practice helps build confidence and will improve your ability to hear through the stethoscope and take accurate readings.



**Figure 16.27** When taking an adult blood pressure, various cuff sizes are available—pediatric, small adult, adult, and large adult.

## Procedure 16.9 Taking Blood Pressure

### Rationale

Blood pressure measures the force of blood pushing against the body's arterial walls. A blood pressure reading outside the normal range may be a sign of a disease or health issue.

### Preparation: Manual Device

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific

instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.

2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.

5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.
8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a sphygmomanometer
  - an appropriately sized cuff
  - a stethoscope, if using a manual sphygmomanometer
  - antiseptic wipe(s)
  - disposable paper cover, if needed
  - a pen and pad, form, or digital device for documenting the blood pressure

### The Procedure: Manual Device

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.
2. Clean the cuff with an antiseptic wipe or cover it with a disposable paper cover.
3. Have the patient rest quietly and lie comfortably on the bed or sit in a chair. Make sure the room is quiet.
4. When appropriate, let the patient choose which arm they want you to use for taking blood pressure and whether they want to sit up or lie down.
 

*Best Practice:* Do not take a patient's blood pressure using an arm that is injured, painful, or has an I.V.
5. If the patient is in bed, lock the bed wheels and then raise the bed to hip level. If they are on an examining table, stand next to them or sit in a chair in front of them so you can get a clear view of the dial.
6. Clean the earpieces of the stethoscope with an antiseptic wipe and warm the diaphragm with your hands before cleaning it with antiseptic wipes.

7. Position the patient's arm so it rests level with the heart with the palm turned upward. Provide support, if needed (**Figure 16.28**).

*Best Practice:* Expose the upper arm so that you can place the cuff on bare skin.



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**Figure 16.28**

8. Clean the earpieces and the diaphragm of the stethoscope with antiseptic wipes.
9. Unroll the blood pressure cuff and loosen the valve on the bulb of the sphygmomanometer by turning it counterclockwise (**Figure 16.29**).



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**Figure 16.29**

10. Squeeze the cuff to expel any remaining air.



- With your fingertips, locate the brachial artery at the inner aspect of the elbow (**Figure 16.30**).



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**Figure 16.30**

- Place the center of the cuff, usually marked with an arrow, above the brachial artery. (**Figure 16.31**).



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**Figure 16.31**

- Wrap the cuff smoothly and snugly around the exposed arm about one inch above the elbow. Do not wrap the cuff around clothing. Make sure the cuff is not too snug (**Figure 16.32**).



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**Figure 16.32**

- Close the valve on the bulb of the sphygmomanometer by turning it clockwise. Be careful not to turn it too tightly.
- Place the earpieces of the stethoscope in your ears.
- Find the brachial pulse.
- Place the warmed diaphragm of the stethoscope over the brachial artery.
- Keep the measuring scale level with your eyes.
- Inflate the cuff to 180 mmHg. You should not be able to hear the patient's pulse. If you do, inflate the cuff to 200 mmHg.  
*Best Practice:* The stethoscope diaphragm should be held firmly against the skin close to the cuff, but should not be placed under the cuff (**Figure 16.33**).



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**Figure 16.33**

- Deflate the cuff by slowly turning the valve on the bulb of the sphygmomanometer counterclockwise at an even rate of 2–4 millimeters per second.
- Listen carefully while the cuff is deflating. Note the dial reading when you hear the first sound (beat). This is the systolic blood pressure.
- Continue deflating the cuff slowly and evenly. Note the dial reading when the sound (beat) disappears. This is the diastolic blood pressure.
- Remove the stethoscope earpieces from your ears. Completely deflate the cuff and remove it from the arm.
- Document the blood pressure on a pad, on a form, or in the electronic record.
- Report abnormal results to the appropriate provider immediately.
- Return the cuff to its case or wall mount.

27. Clean the earpieces and diaphragm of the stethoscope with antiseptic wipes. Discard the disposable cover, if used.
28. Return the stethoscope and cuff case (if appropriate) to their storage locations.
29. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
30. Follow the plan of care to determine if the side rails should be raised or lowered.

### The Procedure: Electronic Device

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.
2. Bring the electronic blood pressure unit near the patient and plug it into a source of electricity.
3. Clean the cuff with an antiseptic wipe or cover it with a disposable paper cover.
4. Have the patient rest quietly and lie comfortably on the bed or sit in a chair.
5. If the patient is in bed, lock the bed wheels and then raise the bed to hip level. If they are on an examining table, stand next to them or sit in a chair in front of them so you can get a clear view of the digital display.
6. Remove any restrictive clothing from the patient's arm. Ask the patient which arm they would prefer, if appropriate.
7. Locate the *Power* switch and turn on the machine.
8. Squeeze any excess air out of the blood pressure cuff.
9. Connect the cuff to the connector hose.
10. Wrap the cuff smoothly and snugly around the patient's exposed arm. Do not wrap the cuff around clothing. Make sure the cuff is not too snug.
11. Make sure the arrow marked on the outside of the cuff is correctly placed over the brachial artery.
12. Make sure the connector hose between the cuff and the machine is not kinked.
13. Press the *Start* button. The cuff should begin to inflate and then deflate as the reading is being taken.

14. You will see or hear a signal when the reading is complete.
15. If you are taking periodic, automatic measurements, set the machine for the designated frequency of blood pressure measurements. The upper and lower alarm limits for systolic, diastolic, and mean blood pressure readings are set according to facility policy.
16. Document the blood pressure on a pad, on a form, or in the electronic record.
17. Report abnormal results to the appropriate provider immediately.
18. Clean the tubing and cuff with an antiseptic wipe. Discard the disposable cover, if used.
19. Remove the machine and place it in its appropriate storage location.
20. If the cuff is to remain on the arm between blood pressure readings, loosen it. Remove the cuff at least every two hours and rotate to the other arm, if possible. Evaluate the skin for redness or irritation. Report any abnormal observations to the appropriate provider.
21. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
22. Follow the plan of care to determine if the side rails should be raised or lowered.

### Follow-up

1. Wash your hands to ensure infection control.
2. Make sure the patient is comfortable and place the call light and personal items within reach.
3. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
4. Wash your hands or use hand sanitizer before leaving the room.

### Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

## Real Life Scenario

### Checking Blood Pressure

Aaliyah has been asked to perform a blood pressure check on a patient who has been complaining of a headache this morning. She checks the last blood pressure reading taken and finds that it was 124/78 yesterday morning. She uses an electronic device to measure the patient's blood pressure and now finds that it is 162/98.

### Apply It

1. Should Aaliyah take the blood pressure again? Why or why not?
2. Should Aaliyah use different equipment to take the blood pressure? Why or why not?
3. What might be causing the high blood pressure reading?
4. This patient's high blood pressure could be a symptom of what problems or diseases?

## LESSON 16.3 REVIEW

### Multiple Choice

Select the letter that corresponds to the correct answer.

1. \_\_\_\_\_ pressure is measured when the heart muscle relaxes. (16.3–1)
 

A. Diastolic	C. Systolic
B. Tympanic	D. Orthostatic
2. When may a blood pressure reading be lower than normal? (16.3–2)
 

A. In the morning	C. When standing
B. After a meal	D. After exercise
3. Diets high in salt and \_\_\_\_\_ may lead to higher blood pressure. (16.3–2)
 

A. protein	C. fat
B. calcium	D. sugar
4. Which blood pressure measurement device has a round dial and movable needle that points to the numbers? (16.3–3)
 

A. Electronic sphygmomanometer	C. Manual aneroid sphygmomanometer
B. Manual mercury sphygmomanometer	D. None are correct.
5. Which cuff size would be best to use when measuring the blood pressure of an older adult patient? (16.3–3)
 

A. Medium adult	C. Pediatric
B. Geriatric	D. Adult

# Height and Weight



## ESSENTIAL QUESTION

*What skills do you need to learn in order to properly measure a patient's height and weight?*

## Learning Outcomes

*After studying this lesson, you will be able to*

- 16.4–1** Demonstrate the procedure for measuring height.
- 16.4–2** Demonstrate the procedure for measuring weight.
- 16.4–3** Identify safety concerns when measuring height and weight.

## Terms to Know

balance scale  
bed scale

hydraulic patient lift scale  
edema

ideal body weight (IBW)

### edema

excess build-up or retention of fluid in the bodily tissues that causes swelling, usually in the legs and feet

**H**eight and weight are usually measured upon admission to a healthcare facility and may be done during a patient's stay. These measurements are also taken during a patient visit to a doctor's office. How often (daily, weekly, or monthly) these measurements are taken depends on the doctor's orders for a health condition or disease. For example, a patient with kidney disease or a heart condition may need daily weights to help determine if they have **edema**. If the patient is admitted to a healthcare facility, the facility's policy may also determine how often these measurements are taken.

## Extend Your Knowledge >>>>

### Body Mass Index

The Centers for Disease Control and Prevention (CDC) uses body mass index (BMI) to define when a person is affected by underweight, overweight, or obesity. BMI is the measurement of body fat based on height and weight that applies to both males and females between the ages of 18 and 65 years.

BMI is generally a good measure of body fat for most adults. It is not so reliable for athletes or the elderly. A BMI between 18.5 and 24.9 is considered at a healthy weight. You can determine your BMI by going to the CDC website and finding the BMI Calculator.

#### Apply It

1. Visit the CDC's website and calculate your BMI using either the adult calculator (if you are over the age of 18) or the child and teen calculator (if you are younger than 18).
2. Review your results. Is your BMI within the healthy range? If not, what can you do to change your BMI?

The purpose of keeping track of height and weight is to check nutritional status and medication dosage and to monitor health. The relationship between height and weight is also important because it can provide a sign of a patient's overall health status. Height and weight are used to calculate **ideal body weight (IBW)** and body mass index (BMI). These calculations help determine whether a patient is affected by underweight or overweight so a doctor can plan calorie intake, protein, and fluid needs.

## 16.4–1 Measuring Height

Height can be measured one of two ways. When a patient is able to walk, you can use an upright, **balance scale** to measure their height and weight (**Figure 16.34**). If the patient is bedridden, you will need to use a tape measure to measure height. Measure height in feet (') and inches (") or in centimeters (cm), depending on facility policy.



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**Figure 16.34** When using an upright, balance scale to measure height, lower the bar until it rests on the top of the patient's head. *How would you measure the height of a patient who is bedridden?*

**ideal body weight (IBW)**  
the healthiest weight for an individual; determined primarily by height, but also takes gender, age, build, and muscular development into account, using adjusted statistical tables

### THINK CRITICALLY

What situations may indicate the need to measure height more frequently than at each healthcare visit?

**balance scale**  
a device that uses sliding weights to measure weight and a rod to measure height



## Procedure 16.10 Measuring the Height and Weight of Ambulatory Patients

### Rationale

Height and weight measurements are used to calculate medication dosages and determine nutritional needs. Therefore, it is important to measure and document height and weight accurately and according to facility policy.

### Preparation

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.
8. Ambulatory patients can walk to a scale placed in a central location within the facility. Bring the following items to the scale:
  - paper towel
  - a pen and pad, form, or digital device for documenting the height and weight

### The Procedure

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.
2. Place a paper towel on the scale platform.
3. Raise the height bar above the level of the patient's head.
4. Help the patient remove their shoes or slippers and stand on the scale platform.
5. Ask the patient to stand up straight on the center of the scale with arms and hands down at the sides.

6. Lift the height bar, extend the arm, and then lower the arm until it rests on top of the patient's head (Figure 16.35).



michaeljung/Shutterstock.com

Figure 16.35

7. Read the height at the movable part of the ruler (Figure 16.36).



Paolo\_Toffanin/Signature collection via Getty Images

Figure 16.36

8. Document the height on a pad, on a form, or in the electronic record.
9. Raise the height bar above the level of the patient's head. When it reaches a safe height, lower the arm and then return the height bar to its starting point.
10. Ask the patient to stand straight again with arms and hands at the sides.
11. Move the weights on the balanced scale bar to zero.
12. Move the lower and upper weights until the balance pointer is in the middle.  
*Best Practice:* Move the large weight 50 pounds at a time until the weight bar falls. Then back the large weight up 50 pounds. Finally, move the small weight until the scale is balanced.
13. Add the amounts shown on the two bars together to determine the patient's weight (**Figure 16.37**).
14. Document the weight on a pad, on a form, or in the electronic record.
15. Help the patient step off the scale platform.
16. Assist the patient in putting on shoes or slippers.
17. Remove and discard the paper towel from the scale platform.
18. Assist the patient safely back to his room or bed.
19. If the patient is in bed, check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
20. Follow the plan of care to determine if the side rails should be raised or lowered.



*inhauscreative/Signature collection via Getty Images*

**Figure 16.37**

### Follow-up

1. Wash your hands to ensure infection control.
2. Make sure the patient is comfortable and place the call light and personal items within reach.
3. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
4. Wash your hands or use hand sanitizer before leaving the room.

### Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

## Procedure 16.11

**Measuring the Height of Bedridden Patients****Rationale**

Height measurements must be accurate for bedridden patients. The height measurement may be used when calculating medication dosages and patients' nutritional needs.

**Preparation**

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.
8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a tape measure
  - a pen and pad, form, or digital device for documenting the height
9. You will need another person to assist in this measurement. Ask a coworker to help.

**The Procedure**

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.

2. Lock the bed wheels and then raise the bed to hip level.
3. Maintain safety during the procedure. If there are side rails, raise and lock the rails on the opposite side of the bed from where you will be working. Lower the rail on the side where you are working.
4. If allowed, have the patient lie on their back, as straight as possible, with the arms straight against the sides.  
*Best Practice:* Straighten and tighten the bedsheet.
5. Extend the tape measure along the side of the patient from the top of the head to the bottom of the heel.
6. Measure the distance between the two points.
7. Document the height on a pad, on a form, or in the electronic record.
8. Check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
9. Follow the plan of care to determine if the side rails should be raised or lowered.

**Follow-up**

1. Wash your hands to ensure infection control.
2. Make sure the patient is comfortable and place the call light and personal items within reach.
3. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
4. Wash your hands or use hand sanitizer before leaving the room.

**Reporting and Documentation**

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.

## 16.4–2 Measuring Weight

A patient's weight is often used to calculate medication dosage, so accurate measurement is important. Weight can also be a sign of certain conditions, such as malnutrition (poor nourishment) or edema. There are different ways of measuring weight. This measurement can be taken using a balance or digital scale, or by using a **hydraulic patient lift scale** or **bed scales** if the patient is bedridden.

Measure weight at the same time each day in the same or similar clothing and use the same scale, if possible. Be sure the patient has urinated before measurement. Always calculate additional items that may add weight, such as shoes, casts, catheters, colostomy bags, or other bodily devices. Weight can be measured standing, sitting, or in bed. Measure weight in pounds (lbs) or in kilograms (kg), depending on facility policy.

If using a lift or bed scale, follow the facility policy and instructions for the equipment. You will need another healthcare provider to assist in this procedure.

### THINK CRITICALLY

What situations may indicate the need to measure weight more frequently than at each healthcare visit?

#### hydraulic patient lift scale

a device that determines the weight of a patient by suspending them above the bed using a sling with a scale

#### bed scale

a device used for bedridden patients; may be portable and brought to the bed, fixed to the floor under the bed, or built-into the bed

### Procedure 16.12

## Weighing Bedridden Patients Using a Hydraulic Patient Lift Scale

### Rationale

Weight measurements must be accurate for bedridden patients. The weight measurement may be used to calculate medication dosages and patients' nutritional needs.

### Preparation

1. Ask the appropriate provider if there are doctor's orders for the procedure, if there are any specific instructions listed in the plan of care, and if the patient can be moved into the positions required for this procedure.
2. Wash your hands or use hand sanitizer before entering the room.
3. Knock before entering the room.
4. Introduce yourself using your first or preferred name and title. Explain that you will be providing care.
5. Greet the patient and ask the patient to state their full name, if able. Then check the patient's identification bracelet.
6. Use Mr., Mrs., or Ms. and the patient's last name when conversing.
7. Explain the procedure in simple terms, even if the patient is not able to communicate or is disoriented. Ask permission to perform the procedure.
8. Bring the necessary equipment into the room. Place the following items in an easy-to-reach place:
  - a bed scale with the appropriate sling and attachments
  - a pen and pad, form, or digital device for documenting the weight
9. You will need another person to assist in this measurement. Ask a coworker to help.

## The Procedure

1. Provide privacy by closing the curtains, using a screen, or closing the door to the room.
2. Lock the bed wheels and then raise the bed to hip level.
3. Maintain safety during the procedure. If there are side rails, raise and lock the rails on the opposite side of the bed from where you will be working. Lower the rail on the side where you are working.
4. To be sure the measurement is accurate, balance the bed scale with the sling attached following the manufacturer's instructions.
5. Help the patient roll to one side. Position the sling beneath the patient's body lengthwise behind the shoulders, thighs, and buttocks. Be sure the sling is smooth.
6. Roll the patient back onto the sling and ensure that the sling is correctly positioned under the shoulders, thighs, and buttocks.
7. Center the bed scale over the bed. Carefully lower the arms of the scale and attach them securely to the sling bars.
8. Instruct the patient to keep their arms to the sides while they are being weighed.
9. Raise the sling so the patient's body and the sling hang freely over the bed.
10. Adjust the weights until the balance bar hangs freely on the end or read the digital display screen (**Figure 16.38**).



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**Figure 16.38.**

11. Document the weight on a pad, on a form, or in the electronic record.
12. Lower the patient back onto the bed and remove the sling.
13. Check to be sure the bed wheels are locked, then reposition the patient and lower the bed.
14. Follow the plan of care to determine if the side rails should be raised or lowered.

## Follow-up

1. Wash your hands to ensure infection control.
2. Make sure the patient is comfortable and place the call light and personal items within reach.
3. Conduct a safety check before leaving the room. The room should be clean and free from clutter or spills.
4. Wash your hands or use hand sanitizer before leaving the room.

## Reporting and Documentation

Report any specific observations, complications, or unusual responses to the appropriate provider. Document this information in the chart or EMR.



### 16.4–3 Safety Concerns When Measuring Height and Weight

Always be aware of safety issues when measuring a patient's height and weight, particularly if a patient is frail or has problems with fainting or dizziness. If the patient faints, slowly lower the patient to the floor using your body to support their weight. Check their breathing and pulse, and call for help. Do not leave the patient or let them get up for at least five minutes after fainting.

Pay attention to infection control by washing your hands or using hand sanitizer before and after these procedures and document them accurately and in a timely fashion. Notify the appropriate provider if there are any changes in height or weight.

#### THINK CRITICALLY

Imagine you are measuring a patient's height and weight at the beginning of their visit. Before you can take their measurements, the patient tells you that they are feeling dizzy. What would you do to ensure the patient's safety while taking their height and weight measurements?

## LESSON 16.4 REVIEW

### Multiple Choice

Select the letter that corresponds to the correct answer.

- If a patient is bedridden, measure height using a(n) \_\_\_\_\_. (16.4–1)
 

A. hydraulic patient lift scale	C. tape measure
B. bed scale	D. upright, balance scale
- For which type of scale will you need the assistance of another healthcare provider? (16.4–2)
 

A. Bed scale	C. Balance scale
B. Digital scale	D. All are correct.
- A person's \_\_\_\_\_ is often used to calculate medication dosage. (16.4–2)
 

A. age	C. height
B. weight	D. All are correct.
- If using a balance scale, move the weights on the balanced scale bar to \_\_\_\_\_. (16.4–2)
 

A. 0	C. 50
B. 10	D. 100
- Pay particular attention to safety issues for measuring a patient's height and weight when the patient is \_\_\_\_\_. (16.4–3)
 

A. young	C. sick
B. frail	D. elderly

# Chapter 16

## Review and Assessment Summary

### Lesson 16.1 Temperature

- 16.1–1** Vital signs, including temperature, pulse, rate of respirations, and blood pressure, provide important information needed to determine whether someone is well or ill.
- 16.1–2** Body temperature measures a patient's body heat in degrees. Body temperature can change throughout the day.
- 16.1–3** Oral, rectal, axillary, tympanic, or temporal artery temperatures can be taken using thermometers designed for each location.
- 16.1–4** Different types of thermometers include non-digital, digital, disposable oral, tympanic, and temporal artery thermometers.

### Lesson 16.2 Pulse and Respiration

- 16.2–1** Pulse is the rate of the heart which measures the pressure of the blood against the wall of an artery as the heart beats. It is an important indicator of how well the cardiovascular system is working. The two common pulse locations are radial (located on the thumb side of the wrist) and apical (found at the bottom left portion of the heart). When appropriate, a carotid pulse can also be used.
- 16.2–2** Pulse is taken by counting the number of beats for a set period of time and is reported per minute.
- 16.2–3** The rate of respiration is a measurement of breathing and how well oxygen is being supplied to the body cells. Rate of respiration can be determined by counting full breaths. Oxygen saturation in the blood is measured by using a pulse oximeter.

### Lesson 16.3 Blood Pressure

- 16.3–1** Blood pressure is the force of blood pushing against the body's arterial walls. Blood pressure measurements can indicate if there is too much pressure on the walls of the arteries or the possibility of a specific disease. Two pressure levels are measured—systolic pressure and diastolic pressure.
- 16.3–2** Factors affecting blood pressure include diet; weight; exercise; race; when the reading is taken; position; cigarettes and alcohol; drugs or medication; and stress, fear, or pain.
- 16.3–3** Blood pressure can be taken manually or electronically. No matter what type of device you are using, be sure it is in working order before taking a blood pressure measurement. Make sure you are using the correct size cuff. Have patients relax for a few minutes before taking their blood pressure.

### Lesson 16.4 Height and Weight

- 16.4–1** When measuring height, use an upright, balance scale if the patient is able to walk. If the patient is bedridden, use a tape measure.
- 16.4–2** When measuring weight, use a balance or digital scale if the patient is able to walk. If the patient is bedridden, use a hydraulic digital lift or a sling bed scale.
- 16.4–3** Take care to be aware of safety issues when measuring height and weight. Also remember to wash your hands or use hand sanitizer before and after measuring a patient's height and weight.

## Career Exploration

### Home Health Aide



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Home health aides assist people with activities of daily living (ADLs) such as bathing, dressing, eating, grooming, and going to the bathroom. They help with mobility. Home health aides

do not provide physical or occupational services but do observe physical and mental health, reporting any changes such as in eating and drinking to a registered nurse or other provider assigned. Home health aides check vital signs, including temperature, pulse, respirations, and blood pressure, under supervision. They are trained to handle emergencies such as a heart attack or stroke. They may also be asked to do routine chores such as laundry, cooking, and shopping. Home health aides require good communication and observation skills; knowledge of infection control; skills in safe techniques for grooming, positioning, and mobility; and physical strength.

Home health aides may work with home health agencies, day care, retirement communities, group homes, or in a person's home. They may visit several people a day or care for one person over a long period of time.

Training requirements vary by state. Usually, a high school diploma and some on-the-job training is required. However, if certification is required or they work in an agency funded by Medicare or Medicaid, a minimum of at least 75 hours of training through state-approved programs, including at least 16 hours of hands-on practical and clinical training and passing a competency evaluation is required. Some states set

higher standards, such as Illinois (120 hours) and Maine (180 hours).

Overall employment of home health aides is projected to grow 36 percent (3.3 million to 4.4 million) from 2018 to 2028. The average salary is \$24,060, with a range of \$19,950 to \$30,830.

#### Further Research

1. Research one of the related careers using the *Occupational Outlook Handbook* and other reliable internet sources. What is the outlook for this career?
2. Review the educational requirements for this related career. What level of education is necessary? What courses would you need to pursue this related career?
3. What is the salary range for this career?
4. What do you think you would like about this career? What might you dislike? Compare the career you have researched with the description of a home health aide. Which appeals to you more? Explain.

#### Related Careers

Personal Care Aide	Child Care Worker
Nursing Assistant	Occupational Assistant/ Aide
Orderly	Physical Therapist Assistant/Aide
Patient Care Technician	Psychiatric Technician/ Aides
Medical Assistant	Social and Human Services Assistant
Licensed Practical/ Vocational Nurse	Community Health Worker
Home Health Registered Nurse	Clinical Navigator
Community Health Registered Nurse	

## Review Questions

Answer the following questions using what you have learned in this chapter.

### Multiple Choice

Select the letter that corresponds to the correct answer.

- Mr. Hernandez had his blood pressure taken this morning and it was 160/110. This reading is much higher than when it was taken yesterday. Which reading below was yesterday's? (16.3–1)
  - 165/112
  - 175/105
  - 100/70
  - None are correct.
- When taking an apical pulse, the stethoscope should be placed \_\_\_\_\_. (16.2–1)
  - above the sternum
  - above the right nipple on the chest
  - below the sternum
  - below the left nipple on the chest
- When is the best time to count respirations? (16.2–3)
  - right before taking the temperature
  - right after taking the blood pressure
  - right after taking the pulse
  - right before taking the pulse
- Which of the following resting pulse rates is *not* considered normal for an adult? (16.2–2)
  - 90
  - 70
  - 85
  - 101
- Mr. Laila, who is an adult, has a rectal temperature of 100.6°F. What does this mean?
  - His body temperature is low, indicating hypothermia. He should have his temperature taken again in the next few hours.
  - His body temperature is in the normal range and all is okay. No action needs to be taken.
  - His body temperature is high, indicating his body is building defenses. He should have his temperature taken again in the next few hours.
  - His body temperature is high, indicating his body is building defenses. He should have his temperature taken again tomorrow.
- Mrs. Tong had an early breakfast before vital signs were taken. How long should you wait before taking her oral temperature? (16.1–2)
  - 1 to 3 minutes
  - 5 to 10 minutes
  - 10 to 15 minutes
  - 15 to 30 minutes
- When a blood pressure is taken, \_\_\_\_\_ pressure is measured when the heart relaxes. (16.3–3)
  - cardiac
  - diastolic
  - systolic
  - ventilated
- A \_\_\_\_\_ is used to measure the oxygen's saturation in the blood.
  - pulse oximeter
  - sphygmomanometer
  - stethoscope
  - probe
- Which position is preferred when measuring height using an upright, balance scale? (16.4–1)
  - standing on the center of the scale with arms and hands on their sides
  - standing facing the healthcare provider
  - standing on the center of the scale with arms and hands raised
  - standing at the back of the scale looking forward
- Which of the following is standard practice for measuring a patient's weight? (16.4–2)
  - Measure at a different time each day.
  - Use a variety of scales.
  - Make sure the patient has urinated before measurement.
  - Do not adjust for the weight of clothes, shoes, or other medical devices.
- Which of the following is good procedure for measuring height and weight? (16.4–3)
  - Document measurements at the end of your shift.
  - Wash your hands only after the procedure.
  - Notify the appropriate provider of any changes in height or weight.
  - All are correct.
- Which temperature method provides accurate measurements and is used most frequently in medical offices? (16.1–3)
  - Tympanic
  - Axillary
  - Rectal
  - Temporal artery
- Which type of temperature can be less accurate because it is affected by what a patient eats or drinks? (16.1–4)
  - Rectal
  - Oral
  - Axillary
  - Temporal artery
- A pulse oximeter reading below \_\_\_\_\_ percent is considered too low and is called hypoxia. (16.2–3)
  - 95
  - 85
  - 75
  - 65

15. 94–134 systolic and 64–84 diastolic is the average blood pressure measurement for which age group? (16.3–1)
- |             |             |
|-------------|-------------|
| A. Infant   | C. Teenager |
| B. Children | D. Adult    |

### Short Answer

Answer the following questions using what you have learned in this chapter.

1. What are vital signs? Why are they important? (16.1–1)
2. Name the different types of thermometers that can be used to measure a patient's temperature. Which ones are the most effective? (16.1–4)
3. Identify the two primary locations where you can take a patient's pulse. What is the reason for selecting one location over another? (16.2–1)
4. Describe the process for measuring respiration rate. What can you do to be sure you are observing the normal rate for the patient you are measuring? (16.2–3)
5. What is the difference between hypotension and hypertension? (16.3–2)

### Critical Thinking Exercises

Answer the following questions to assess your knowledge of what you learned in this chapter.

1. Vital sign measures must always be as accurate as possible. What specific guidelines or steps can be followed to be sure vital signs are accurate?
2. When taking vital signs, infection control must be maintained. Explain how this can be accomplished for each of the vital signs. (16.4–3)
3. Research and then describe the ethical practices that must be used when taking vital signs and measuring height and weight.

### Math Skills

Mrs. Brown has been in your long-term facility for two years. She is 82 years old and has type 2 diabetes and arthritis. She is also recovering from a stroke. You are taking care of her this morning. When you took her vital signs, her temperature was 101.2°F, pulse was 92, respirations were 5 for the 15 seconds you took it, and blood pressure was 156/102. Later in the day, you were asked to take her weight. She weighed 102 pounds.

1. Her temperature is usually 97.8°F. What is the percentage increase in her temperature?
2. Her pulse is usually 80. How many beats higher is her pulse?
3. What would her respirations be if you had taken them for one minute?

4. Her blood pressure is usually 132/92. Is her blood pressure higher or lower?
5. The last time Mrs. Brown was weighed she was 110 pounds. How many pounds has she lost?

### Language Skills

#### Vocabulary Application

Read the following admission notes for Dr. Smith's patient, Mr. Santiago. Identify any terms you learned in this chapter and define them. Then, write your own admission notes using five other terms you learned in this chapter.

Mr. Santiago, a 49-year-old male, was admitted to the hospital with complaints of severe chest pain. His temperature was taken orally and was 101°F. His pulse was 110 bpm, his respiration rate was 20, and his blood pressure was 180/105. He was weighed using a balance scale, and it read 285 pounds.



### HOSA Event Prep— Personal Care

#### Case Study

Read the following Case Study. Then complete the activities that follow.

Jessica has a hearing condition that makes it difficult to hear the soft sound of a blood pressure. She has learned to use other senses, such as touch and vision, to help take accurate blood pressure measurements. She also has a stethoscope specifically made for people with hearing conditions. Using this stethoscope and other ways to accurately take a patient's vital signs, she could accurately note that her patient Tyrone had severe hypertension. This allowed a swift treatment plan for Tyrone and potentially helped prevent Tyrone from having a stroke or other complication from high blood pressure.

#### Activity

Answer the following questions pertaining to the Case Study.

#### Think About It

1. Explain how Jessica noting Tyrone's high blood pressure may have prevented a stroke or other complications.
2. Imagine you are the person assigned to measure Tyrone's blood pressure. Using reliable and valid online resources, research your responsibilities and what skills you would need. How would a hearing condition affect these skills?
3. What qualities do you think are most important in someone who provides personal care? Why?
4. Is providing personal care a career that interests you? Why or why not?