After completing this chapter, you will be able to:

8.1 Define and spell the word parts used to create terms for the cardiovascular system.

8.2 Break down and define common medical terms used for symptoms, diseases, disorders, procedures, treatments, and devices associated with the cardiovascular system.

8.3 Build medical terms from the word parts associated with the cardiovascular system.

8.4 Pronounce and spell common medical terms associated with the cardiovascular system.
## Anatomy and Physiology Terms

The following table provides the combining forms that commonly apply to the anatomy and physiology of the cardiovascular system. Note that the combining forms are colored red to help you identify them when you see them again later in the chapter.

<table>
<thead>
<tr>
<th>Combining Form</th>
<th>Definition</th>
<th>Combining Form</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>angi/o</td>
<td>blood vessel</td>
<td>pect/o, pector/o</td>
<td>chest</td>
</tr>
<tr>
<td>aort/o, arteri/o</td>
<td>artery</td>
<td>valvul/o</td>
<td>little valve</td>
</tr>
<tr>
<td>atr/i/o</td>
<td>atrium</td>
<td>vas/o</td>
<td>vessel</td>
</tr>
<tr>
<td>cardi/o</td>
<td>heart</td>
<td>vascul/o</td>
<td>little vessel</td>
</tr>
<tr>
<td>coron/o</td>
<td>crown or circle, heart</td>
<td>ven/o</td>
<td>vein</td>
</tr>
<tr>
<td>my/o, myos/o</td>
<td>muscle</td>
<td>ventricul/o</td>
<td>little belly, ventricle</td>
</tr>
</tbody>
</table>

8.1 Every one of the 50 trillion or so cells in your body requires a continuous supply of oxygen and nutrients and an unending removal of waste materials. To meet these demands, the blood carries these materials by way of the body’s circulation within a series of closed tubes, called blood vessels, pushed along mainly by the movements of the heart. Blood vessels include arteries that carry blood away from the heart, veins that carry blood toward the heart, and microscopic capillaries that bridge arteries and veins, whose thin walls permit the exchange of materials between blood and interstitial fluid. The movement and transport of blood is thereby achieved by the __________ system, which consists of the heart and blood vessels, as the word parts that form the term cardiovascular suggest. The constructed form is cardi/o/vascul/ar, in which cardi/o is a combining form that means “heart,” and vascul is a word root that means “little vessel.” The continuous flow of __________ to all tissues is vital to maintain normal body functions. If the supply of oxygen or nutrients or the removal of carbon dioxide is reduced or cut off, even for a few minutes, the affected cells will die. Thus, a disease of the cardiovascular system can pose life-threatening risks to health and survival.

8.2 The functions of the cardiovascular system may be summarized as:

- Propulsion of blood by the __________
- Transport of blood to all body tissues by the __________ __________
- Exchange of materials between the blood and body tissues
8.3 Review the anatomy of the cardiovascular system by studying Figure 8.1 and Figure 8.2.

**Figure 8.1**
The cardiovascular system. A schematic view of the closed circulation of blood. The heart is sectioned, and the capillaries are enlarged to enable you to see them. The black arrows indicate the direction of blood flow.
Many diseases of the cardiovascular system have a profound effect on the body’s overall health. The result of cardiovascular disease is often the reduction or stoppage of blood flow to one or more parts of the body, which results in the death of cells. If ____________ flow reduction affects a large area or a critical organ like the brain, kidneys, or heart itself, the resulting cell death can produce a condition that quickly becomes life-threatening.

The division of medicine known as cardioiology (kar dee AHL oh jee) provides clinical treatment for heart disease. Cardiology is a constructed term, ____________, where the combining form cardi/o means “heart” and the suffix -logy means “study or science of.” A physician specializing in this field is called a cardiologist. Generally, a ______________ also treats conditions associated with blood vessels because of the close functional relationship between blood vessels and the heart.
Signs and Symptoms of the Cardiovascular System

Here are the word parts that commonly apply to the signs and symptoms of the cardiovascular system that are covered in the following section. Note that the word parts are color-coded to help you identify them: prefixes are yellow, combining forms are red, and suffixes are blue.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Definition</th>
<th>Combining Form</th>
<th>Definition</th>
<th>Suffix</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-</td>
<td>without, absence of</td>
<td>angi/o</td>
<td>blood vessel</td>
<td>-a</td>
<td>singular</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cardi/o</td>
<td>heart</td>
<td>-algia</td>
<td>condition of pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cyan/o</td>
<td>blue</td>
<td>-dynia</td>
<td>condition of pain</td>
</tr>
<tr>
<td>brady-</td>
<td>slow</td>
<td></td>
<td></td>
<td>-genic</td>
<td>pertaining to producing, forming</td>
</tr>
<tr>
<td>dys-</td>
<td>bad, abnormal, painful, difficult</td>
<td>pect/o, pector/o</td>
<td>chest</td>
<td>-ia</td>
<td>condition of</td>
</tr>
<tr>
<td>tachy-</td>
<td>rapid, fast</td>
<td>rhythm/o, rrhythm/o</td>
<td>rhythm</td>
<td>-osis</td>
<td>condition of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sten/o</td>
<td>narrow</td>
<td>-plegia</td>
<td>paralysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-sis</td>
<td>state of</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-spasm</td>
<td>sudden involuntary muscle contraction</td>
</tr>
</tbody>
</table>

**KEY TERMS A–Z**

**angina pectoris**

The primary symptom of an insufficient supply of oxygen to the heart is chest pain called __________________________. This Latin term literally means “chest choke.” The level of chest pain varies with the patient, varying from a very slight pressure to an overbearing pain that radiates to the shoulders, upper left arm, and back.

**angiospasm**

The common combining form of “blood vessel” is angi/o. Blood vessel disorders include abnormal muscular contractions, or spasms, of the smooth muscles in the vessel walls. This sign is called __________________________. The constructed form of this term is angi/o/spasm.
8.9 Narrowing of a blood vessel is a sign of cardiovascular disease, causing a reduction of blood flow to the part of the body at the receiving end of the narrowed vessel. This sign is called **angiostenosis**. The constructed form of this term is **angi/o/sten/osis** and includes one combining form: **angi/o**, which means “blood vessel,” and the word root **sten**, which means “narrow.” Thus, the literal meaning of __________________ is “condition of a narrow blood vessel.”

8.10 The prefix **a-** means “without, absence of,” and the prefix **dys-** means “bad, abnormal, painful, difficult.” In some cases, they may be used interchangeably. For example, a loss of the normal rhythm of the heart is called __________________, which means “condition of without rhythm” and is written **a/rrhythm/ia**. An alternate term for an abnormal heart rhythm is **dysrhythmia**. The constructed form of this term is written **dys/rhythm/ia**.

**Arrhythmia and Dysrhythmia**

These two medical terms relating to the abnormal rhythm of the heart are very similar in their meanings, but they have important differences. As you have learned, the prefix **a-** means “without, absence of,” and the prefix **dys-** means “bad, abnormal, painful, difficult.” Now look closer at the word roots. They are not identical. The term **arrhythmia** (“condition of without rhythm”) has an extra **r**. To remember which term is spelled with two **r**s, it might help to think of the expression “without rhyme or reason.” A condition of arrhythmia is a heartbeat “without rhyme or reason,” whereas a condition of dysrhythmia is a heartbeat with an abnormal rhythm. **Arrhythmia** is used much more frequently than **dysrhythmia**.

8.11 The common word root for heart is **cardi**. You will find it used in many terms in this chapter. In the term **bradycardia**, the prefix that means “slow” is used to form the meaning “slow heart.” ____________ is an abnormally slow heart rate, usually under 60 beats per minute at rest. The normal resting heart rate ranges from 60 to 90 beats per minute.

8.12 The most common term for chest pain is, simply, **chest pain**, abbreviated **CP**. An alternate term may also be used for this symptom. This term, **cardiodynia**, uses the suffix **-dynia**, which means “condition of pain.” The constructed form of ________________ is **cardi/o/dynia**.

**WORDS TO Watch Out For**

**bradycardia**

**cardiodynia**
### Chapter 8

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cardiogenic</strong></td>
<td>The suffix <em>-genic</em> means “pertaining to producing, forming.” When combined with the word part for heart, the term __________ is formed. The constructed form of the term is written <em>cardi/o/genic</em>. It refers to a symptom or sign that originates from a condition of the heart. For example, the pain sensation of angina pectoris (Frame 8.7) is a cardiogenic symptom because it is caused by insufficient blood flow to the heart.</td>
</tr>
<tr>
<td><strong>cyanosis</strong></td>
<td>A symptom in which a blue tinge is seen in the skin and mucous membranes is called <strong>cyanosis</strong>, which literally means “condition of blue.” The constructed form is <strong>cyan/osis</strong>. ________________ is caused by oxygen deficiency in tissues and is a common sign of respiratory failure often caused by cardiovascular disease.</td>
</tr>
<tr>
<td><strong>palpitation</strong></td>
<td>A symptom of pounding, racing, or skipping of the heartbeat is called _________________. The term is derived from the Latin word <em>palpitatus</em>, which means “a throbbing.”</td>
</tr>
<tr>
<td><strong>tachycardia</strong></td>
<td>The opposite of the prefix <em>brady-</em> is the prefix <em>tachy-</em>, which means “rapid, fast.” A rapid heart rate is called ________________. It may be a symptom of heart disease if the heart exceeds 100 beats per minute at rest.</td>
</tr>
<tr>
<td><strong>syncope</strong></td>
<td>A temporary loss of consciousness and posture is known as <strong>syncope</strong>. Commonly known as “fainting,” it is often the result of a temporary reduction of blood flow to the brain. Frequent episodes may be symptoms of a cardiovascular disease. For example, heart disease may cause fainting spells, referred to as cardiogenic ________________. The term syncope is derived from the Greek word <em>synkope</em>, which means “to cut short.”</td>
</tr>
</tbody>
</table>
PRACTICE: Signs and Symptoms of the Cardiovascular System

Break the Chain

Analyze these medical terms:

a) Separate each term into its word parts; each word part is labeled for you. (p = prefix, r = root, cf = combining form, and s = suffix).

b) For the Bonus Question, write the requested definition in the blank that follows.

The first set has been completed for you as an example.

1. a) angiostenosis
   angio/sten/osis
   cf r s
   b) Bonus Question: What is the definition of the suffix? condition of

2. a) bradycardia
   p r s
   b) Bonus Question: What is the definition of the word root?

3. a) cardiodynia
   cf s
   b) Bonus Question: What is the definition of the suffix?

4. a) cardiogenic
   cf s
   b) Bonus Question: What is the definition of the suffix?

5. a) cyanosis
   r s
   b) Bonus Question: What is the definition of the word root?

6. a) angiospasm
   cf s
   b) Bonus Question: What is the definition of the suffix?

The Right Match

Match the term on the left with the correct definition on the right.

_____ 1. cyanosis  a. sign or symptom that originates from a condition of the heart
_____ 2. angina pectoris  b. pounding, racing, or skipping of the heartbeat
_____ 3. syncope  c. opposite of bradycardia; fast heartbeat
_____ 4. cardiogenic  d. pain associated with the heart
_____ 5. cardiodynia  e. chest pain or pressure
_____ 6. arrhythmia  f. blue tinge in the skin and mucous membranes
_____ 7. tachycardia  g. fainting
_____ 8. palpitation  h. term that literally means “condition of without rhythm”
### Diseases and Disorders of the Cardiovascular System

Here are the word parts that commonly apply to the diseases and disorders of the cardiovascular system that are covered in the following section. Note that the word parts are color-coded to help you identify them: prefixes are yellow, combining forms are red, and suffixes are blue.

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<thead>
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<th>Definition</th>
<th>Suffix</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>endo-</td>
<td>within</td>
<td>angi/o</td>
<td>blood vessel</td>
<td>-ac</td>
<td>pertaining to</td>
</tr>
<tr>
<td>epi-</td>
<td>upon, over, above, on top</td>
<td>aort/o</td>
<td>aorta</td>
<td>-ade</td>
<td>process</td>
</tr>
<tr>
<td>hyper-</td>
<td>excessive, abnormally high, above</td>
<td>arter/o, arteri/o</td>
<td>artery</td>
<td>-al</td>
<td>pertaining to</td>
</tr>
<tr>
<td>hypo-</td>
<td>deficient, abnormally low, below</td>
<td>ather/o</td>
<td>fatty plaque</td>
<td>-ar</td>
<td>pertaining to</td>
</tr>
<tr>
<td>peri-</td>
<td>around</td>
<td>cardi/o</td>
<td>heart</td>
<td>-emia</td>
<td>condition of blood</td>
</tr>
<tr>
<td>poly-</td>
<td>excessive, over, many</td>
<td>coron/o</td>
<td>crown or circle, heart</td>
<td>-ic</td>
<td>pertaining to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hem/o</td>
<td>blood</td>
<td>-ion</td>
<td>process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>isch/o</td>
<td>hold back</td>
<td>-itis</td>
<td>inflammation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>my/o</td>
<td>muscle</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>phleb/o</td>
<td>vein</td>
<td>-megaly</td>
<td>abnormally large</td>
</tr>
<tr>
<td></td>
<td></td>
<td>scler/o</td>
<td>hard</td>
<td>-oma</td>
<td>tumor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sept/o</td>
<td>putrefying; wall, partition</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>sten/o</td>
<td>narrow</td>
<td>-osis</td>
<td>condition of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tampon/o</td>
<td>plug</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>tens/o</td>
<td>pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>thromb/o</td>
<td>clot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>valvul/o</td>
<td>little valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>varic/o</td>
<td>dilated vein</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Key Terms A–Z

**aneurysm**

AN yoo rism

8.18 An abnormal bulging of an arterial wall is called an **aneurysm** and is shown in Figure 8.3. The term is derived from the Greek word *aneurysma*, which means “a widening.” An ______________ is usually caused by a congenital defect or an acquired weakness of the arterial wall, which worsens in time as blood is pushed against it. The bursting of a large aneurysm is usually life-threatening, resulting in massive hemorrhage.

![Figure 8.3](image)

**Figure 8.3**

Aneurysm. Photograph of the aorta, the large blood vessel arising from the heart, with a large bulge, or aneurysm, in its wall (just to the left of the tubing). An aneurysm is caused by a weakened blood vessel wall that is in danger of bursting, which often results in a life-threatening hemorrhage. Source: Kalewa/Shutterstock.
Inflammation of the heart and blood vessels is a disease called **angiocarditis**. It is usually caused by a widespread bacterial infection of the blood, or septicemia (Frame 8.55). The four word parts of ____________________ are shown when it is written angi/o/ card/itis.

A term describing a tumor arising from a blood vessel combines the word root for blood vessel, *angi*, with the suffix for tumor, *-oma*, to form ____________________. This constructed term is written angi/oma. Also known as hemangiom(a) (heh MAN jee OH mah), it is a benign clump of endothelium forming a mass. In some cases the mass can obstruct the flow of blood through the vessel. The term hemangiom(a) carries a second meaning of a red or purple birthmark on the skin that does not obstruct blood flow.

The aortic valve is the semilunar valve located at the base of the aorta, which normally prevents blood from returning to the left ventricle. If it fails to close completely during ventricular diastole, blood may return to the left ventricle, causing the left ventricle to work harder. This condition is called **aortic insufficiency**. The long-term result of ____________________, abbreviated AI, is a chronic condition of the heart known as congestive heart failure, which is described in Frame 8.36. An alternate term for AI is **aortic regurgitation**.

The word root *sten* means “narrow.” An **aortic stenosis** is a narrowing of the aortic valve, located between the left ventricle and aorta. An ____________________ ____________________ causes the left ventricle to work harder than normal. It is usually a more serious condition than aortic insufficiency, although the long-term effect is similar, leading to congestive heart failure (Frame 8.36). It is a constructed term, written aort/ic sten/osis.

Inflammation of the aorta is called ____________________. The constructed form of this term is aort/itis. Often caused by a bacterial infection, it can lead to acute aortic insufficiency (Frame 8.21).

A general term for a disease of an artery is ____________________. This constructed term uses the suffix *-pathy* (meaning “disease”) and is written arteri/o/pathy.
One common form of arteriopathy occurs when an artery wall becomes thickened and loses its elasticity, resulting in a reduced flow of blood to the tissues. The risk of developing this disease, known as arteriosclerosis, increases with advanced age. The constructed form of arteriosclerosis is arteri/o/scler/osis, which literally means “condition of hard artery.” If coronary arteries supplying the heart are damaged by this disease, the condition is called arteriosclerotic heart disease (ASHD).

A term describing a specific form of arteriosclerosis (Frame 8.25), in which one or more fatty plaques form along the inner walls of arteries, uses the combining form that means “fatty plaque,” ather/o, to form the term ather/o/scler/osis. The plaques thicken with time, which reduces the flow of blood through the affected vessel (Figure 8.4). The constructed form of this term is ather/o/scler/osis, which literally means “condition of hard fatty plaque.” A major cause of coronary artery disease (Frame 8.38), atherosclerosis poses an immediate threat to life if a plaque disrupts blood flow and releases blood clots, which may trigger an acute myocardial infarction (Frame 8.49).

**Figure 8.4**
Atherosclerosis. (a) A sectioned coronary artery that exhibits an accumulation of fatty plaque, which reduces the internal diameter of the vessel. (b) In this close-up, you can see that the plaque consists of cholesterol, triglycerides, phospholipids, collagen, and smooth muscle cells. (c) Two types and degrees of atherosclerotic narrowing, or stenosis.
8.27 A general condition present at birth that centers on a malfunction of the heart is called a **congenital heart disease**. One form of this disease occurs when an infant’s heart allows blood to move between the two atria because of a small opening in the wall separating them. Known as an **atrial septal defect**, it results in a reduction of blood flow to the lungs. As a result, the tissues of an infant with ________________ ________________ ________________ become starved of oxygen. Atrial and septal are constructed terms, as you can see when they are written as atrial and septal.

8.28 The suffix **-megaly** means “abnormally large.” In the condition **atriomegaly**, the atria have become abnormally enlarged or dilated, reducing their ability to push blood into the ventricles. The constructed form of ________________ reveals three word parts: ____/ ____/ ____. It is a form of cardiomegaly (Frame 8.32).

8.29 An injury to the atroventricular node (AV node), which normally receives impulses from the sinoatrial node (SA node) and transmits them to the ventricles to stimulate ventricular contraction, is called an ________________ ________________, or **AV block**. The injury is usually caused by a myocardial infarction (Frame 8.49), during which the cells of the AV node die due to a loss of blood flow. The term **atrioventricular** is a constructed term: atrio/ventricular.

8.30 The cessation of heart activity is called ________________ ________________. As you should know, cardiac is a constructed term written cardi/ac. **Arrest** means “stop.” In **sudden cardiac arrest**, abbreviated **SCA**, the patient may have little or no warning signs; often the arrest causes death. According to the American Heart Association, more than 320,000 people die from an SCA each year in the United States. Most deaths occur within minutes, primarily due to a sudden loss of blood flow to the brain. The most common cause of SCA is an electrical disturbance to the heart that causes arrhythmia (Frame 8.10), although it may also follow a myocardial infarction, or heart attack (Frame 8.49).
Chapter 8

8.31 Acute compression of the heart due to the accumulation of fluid within the pericardial cavity is known as cardiac tamponade. The term is constructed from word parts and is shown as cardi/ac tampon/ade. It literally means “pertaining to heart plug process.” 

__________________________ is a complication of an inflammatory disease of the pericardium known as pericarditis (Frame 8.52).

8.32 Recall that the suffix -megaly means “abnormally large.” The abnormal enlargement of the heart is called ________________, which occurs when the heart must work harder than normal to meet the oxygen demands of body cells. The constructed form of this term is cardi/o/megaly.

8.33 A general term for a disease of the myocardium of the heart is cardiomyopathy. The constructed form of ________________ reveals five word parts: cardi/o/my/o/pathy. The most common causes of cardiomyopathy include coronary artery disease (Frame 8.38), viral or bacterial infection, and stress during pregnancy.

8.34 An inflammation of the valves of the heart is called cardiovalvulitis (Figure 8.5). The constructed form of this term is cardi/o/valvul/itis. As you know, cardi/o means “heart,” and the suffix -itis means “inflammation.” The word root valvul means “little valve.” The most common causes of this disease are bacterial infection, which leads to the deposition of calcium deposits on heart valves (known as vegetations), and congenital defects, which result in abnormally shaped valves. ________________ is usually diagnosed from the presence of a heart murmur (Frame 8.44), which is a gurgling sound detected during auscultation (Frame 8.68).

Figure 8.5
Cardiovalvulitis. The human heart has been sectioned to reveal the left ventricle and origin of the aorta, with the aortic valve between them. The yellow growths, called vegetations, on the aortic valve have been caused by a Streptococcus infection, rendering the valve disfigured and thereby unable to direct the flow of blood properly. 

Source: Courtesy of the Public Health Image Library, Centers for Disease Control and Prevention.
8.35 A congenital (present at birth) heart disease affecting the infant’s aorta is **coarctation of the aorta**. The term *coarctation* is derived from the Latin word *coarcto*, which means “to press together.” **Coarctation** of the aorta causes reduced systemic circulation of blood and accumulation of fluid in the lungs and requires surgical repair.

8.36 A chronic form of heart disease characterized by the failure of the left ventricle to pump enough blood to supply systemic tissues is called **congestive heart failure (CHF)**. Also known as **left-ventricular failure**, the reduced function of the left ventricle characteristic of **________________________** makes the heart work harder, resulting in cardiomegaly (Frame 8.32), pulmonary congestion (fluid in the lungs), and reduced left-ventricle function that eventually leads to cardiac arrest (Frame 8.30). The primary symptoms of CHF include shortness of breath and fatigue.

8.37 If a disease of one or both lungs affects blood flow within the lungs, blood may back up in the right ventricle of the heart (the right ventricle normally pumps blood to the lungs). As a result, the right ventricle will be forced to work harder but with less efficiency, which enlarges the heart on the right side. A chronic enlargement and reduced efficiency of the right ventricle resulting from backup of the pulmonary circulation is called **cor pulmonale**. A French word that literally means “heart lung,” **________________________** is also known as **right-ventricular failure**.

8.38 A general term for a disease that afflicts the coronary arteries supplying the heart is **________________________** (CAD). The most common form of CAD is atherosclerosis (Frame 8.26). Because the coronary arteries supply the heart with blood, an alternate term to coronary artery disease is **coronary heart disease (CHD)**.
### coronary occlusion

8.39 *Oclusion* is a general term that means “blockage.” A **coronary occlusion** is a blockage within a coronary artery, resulting in a reduced blood flow to an area of the heart muscle. The most common single cause of a ____________________ ____________________ is atherosclerosis (Frame 8.26). Atherosclerosis or other diseases may also lead to emboli (drifting blood clots), and a congenital stenosis may also contribute to coronary occlusion.

### embolism

EM boh lizm

8.40 A blockage or occlusion that forms when a blood clot or other foreign particle (including air or fat) moves through the circulation is called an **embolism**. The term is derived from the Greek word *embolisma*, which means “piece or patch.” An ____________________ can produce a severe circulatory restriction when the blood clot or particle, called an **embolus** (plural form is **emboli**), lodges in an artery.

### endocarditis

EHN doh kar DYE tiss

8.41 Inflammation of the endocardium, the thin membrane lining the inside walls of the heart chambers, is an acute disease called _________________. The constructed form of this term is endo/ card/itis. Because the endocardium also covers the heart valves, endocarditis often results in cardiovalvulitis (Frame 8.34). It is usually caused by a bacterial infection.

### fibrillation

fih brl AY shun

8.42 A condition of uncoordinated, rapid contractions of the muscle forming the ventricles or atria is called _________________. It is a severe form of arrhythmia (Frame 8.10). **Atrial fibrillation (A-fib)** leads to a reduction of blood expelled from the atria and is usually not fatal, although it poses an increased risk of stroke due to blood clots forming in the left atrium that may lodge in the brain. However, **ventricular fibrillation** results in circulatory collapse due to the failure of the ventricles to expel blood. It is often fatal within 5 minutes if medical intervention through CPR (Frame 8.71) or defibrillation (Frame 8.74) is not immediately available.

### heart block

8.43 A block or delay of the normal electrical conduction of the heart is called _________________. It is often the result of a myocardial infarction (Frame 8.49) that damages the SA node or AV node, which normally manage the rhythmic contractions of the heart.
### heart murmur

8.44 An abnormal sound heard during auscultation (Frame 8.68) of the heart is a **heart murmur**. An “innocent” ____________________________ is not associated with a heart condition and is very common, while murmurs that are not innocent suggest heart disease such as cardiovalvulitis (Frame 8.34). A common source of heart murmur is a leaky mitral valve (the atrioventricular valve on the left side), and is known as **mitral valve prolapse (MVP)**. Most people with MVP have an innocent heart murmur, but in some, the prolapse causes regurgitation of blood through the damaged mitral valve into the left atrium and thereby requires medical intervention.

### hemorrhoids

8.45 The presence of dilated, or varicose, veins in the anal region is called ____________________. The condition produces symptoms of local pain and itching. It usually results from too much pressure on the veins in the anal wall, producing swollen veins within the anal columns (internal hemorrhoids) or near the anal opening (external hemorrhoids).

### hypertension

8.46 Persistently high blood pressure while at rest is an abnormal condition called ___________________. This constructed term is written hyper/tens/ion and means “process of abnormally high pressure.” It includes **essential hypertension**, in which the condition is not traceable to a single cause, and **secondary hypertension**, in which the high blood pressure is caused by the effects of another disease, such as atherosclerosis or diabetes. Although hypertension usually produces no symptoms, it is one of the most common causes of stroke and kidney failure.

### hypotension

8.47 A condition of abnormally low blood pressure is called ___________________, which includes the prefix hypo- that means “deficient, abnormally low, below.” It is usually an acute reaction to hemorrhage, hypothermia (abnormally low body temperature), or septicemia (Frame 8.55).

### ischemia

8.48 An abnormally low flow of blood to the tissues is the condition known as **ischemia**. The term is a constructed term, isch/emia, which literally means “condition of holding back blood.” Coronary ____________________ is caused by an occlusion, such as atherosclerotic plaque (Frame 8.26), emboli (Frame 8.40), or thrombosis (Frame 8.57), and, because it damages the heart, can lead to a life-threatening myocardial infarction (Frame 8.49).
myocardial infarction
my oh KAR dee al * in FARK shun

8.49 Death of a portion of the myocardium is called **myocardial infarction**, abbreviated MI. The term *infarction* is derived from the Latin word *infarctus*, which means “stuff into.” In medicine, the term is used to describe a death of cells resulting from a sudden loss of blood flow (Figure 8.6). The term *myocardial* is constructed from word parts, as shown when it is written as *my/o/card/i/al*, which means “pertaining to heart muscle.” If the __________________________ affects a large or functionally critical part of the heart, arrhythmia (Frame 8.10), cardiac arrest (Frame 8.30), or both may follow. The common name for an MI is a heart attack. According to the American Heart Association, approximately 790,000 individuals experience heart attacks in the United States each year, roughly 25% of which are fatal.

Figure 8.6
Myocardial infarction. (a) A heart with a myocardial infarction of the ventricle wall, in which cardiac cells have died and surrounding tissues have become damaged. The right image is a section through the heart. (b) Photograph of a human heart (postmortem) to reveal the dead cardiac tissue (necrosis), which perished due to a sudden loss of blood flow. Photo Source: Mediscan/Alamy Stock Photo.

8.50 Inflammation of the myocardium of the heart is an acute condition called __________. The constructed form of this term is *my/o/card/i/tis*. Often caused by bacterial infection, it is a form of cardiomyopathy (Frame 8.33).
### The Cardiovascular System

#### 8.51 Patent Ductus Arteriosus

A congenital condition characterized by an opening between the pulmonary artery and the aorta at birth due to a failure of the fetal vessel, called the *ductus arteriosus*, to close is called **patent ductus arteriosus**. The term *patent* means “open.” The condition permits the flow of blood from the pulmonary artery to the aorta, which bypasses the pulmonary circulation.

#### 8.52 Pericarditis

Inflammation of the membrane surrounding the heart, the pericardium, is called **pericarditis**. The term is written *peri/card/itis*. It is usually caused by bacterial infection and affects both layers of the pericardium (the outer pericardial sac and the inner epicardium).

#### 8.53 Phlebitis

A word root for vein is *phleb*, and it is used in the construction of the term that means “inflammation of a vein.” The term is **phlebitis**, and its constructed form is *phleb/itis*. In the related condition **thrombophlebitis** (THROM boh fleh BYE tiss), the inflammation of the vein includes an obstruction by a blood clot.

#### 8.54 Polyarteritis

Simultaneous inflammation of many arteries is a condition known as **polyarteritis**. The constructed form of this term reveals three word parts and is *poly/arter/itis*.

#### 8.55 Septicemia

A bacterial infection of the bloodstream is called **septicemia**. Because the bacteria are carried throughout the body by way of the infected blood, it becomes widespread and life-threatening quickly. The constructed form of **septicemia** is *sept/ic/emia*, which literally means “condition of putrefying blood.” Recall that **sepsis** is a Greek word that means “putrefying.”

#### 8.56 Tetralogy of Fallot

A severe congenital disease in which four defects associated with the heart are present at birth is called **tetralogy of Fallot**. The four defects are pulmonary stenosis (narrowing of the pulmonary valve), ventricular septal defect (Frame 8.59), incorrect position of the aorta, and right-ventricular hypertrophy. As a result of the pulmonary circulation is partially bypassed.
The presence of stationary blood clots within one or more blood vessels is called thrombosis. The term is the Greek word for clotting, *thrombosis*. A coronary _______________ is often caused by atherosclerosis (Frame 8.26), and its rupture can result in sudden cardiac arrest (Frame 8.30) due to an acute myocardial infarction (Frame 8.49).

An abnormally dilated vein is called ____________________, or varicose vein. *Varicosis* is a constructed term, written *varicosis*, which literally means “condition of dilated vein.” It results when valves within a superficial vein of the leg or elsewhere fail, allowing blood to pool in response to gravitational forces (Figure 8.7).

---

**Figure 8.7**

Varicosis. (a) Varicose veins develop due to the failure of valves in the superficial veins of the leg, which leads to blood accumulation in response to gravity and vein dilation. (b) Photograph of spider veins (small varicose veins) of the leg. *Photo Source: Schankz/Shutterstock.*
PRACTICE: Diseases and Disorders of the Cardiovascular System

Linkup

Link the word parts in the list to create the terms that match the definitions. You may use word parts more than once. Remember to add in combining vowels when needed—and that some terms do not use any combining vowel. The first one is completed as an example.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Combining Form</th>
<th>Suffix</th>
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<tbody>
<tr>
<td>hyper-</td>
<td>angi/o</td>
<td>-ion</td>
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<td>peri-</td>
<td>ather/o</td>
<td>-ism</td>
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<td>cardi/o</td>
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<td>embol/o</td>
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<td>my/o</td>
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<td>thromb/o</td>
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<td></td>
<td>varic/o</td>
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</table>

Definition

1. An occlusion of blood flow
2. A general term for a disease of the myocardium of the heart
3. A specific form of arteriosclerosis in which one or more fatty plaques form along the inner walls of arteries
4. A tumor arising from a blood vessel
5. Inflammation of the membrane surrounding the heart
6. Inflammation of the heart and blood vessels
7. An abnormally dilated vein
8. The presence of a stationary blood clot within a blood vessel
9. Persistently high blood pressure

Term

embo...
The Right Match
Match the term on the left with the correct definition on the right.

<p>| | | | | | | | | |</p>
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<tr>
<td></td>
<td>1. aneurysm a. a disease of the coronary vessels</td>
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<td>2. cardiac tamponade b. a congenital heart defect</td>
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<td>3. cor pulmonale c. a block of the heart conduction system</td>
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<td>4. heart murmur d. a blockage in a coronary vessel</td>
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<td>5. cardiac arrest e. abnormal bulging of an arterial wall</td>
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<td>6. coronary artery disease f. an abnormal sound heard through auscultation</td>
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<td>7. coronary occlusion g. cessation of heartbeat</td>
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<td>8. atrial septal defect h. uncoordinated, rapid heartbeat</td>
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<td>9. congestive heart failure i. literally, “heart lung”</td>
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<td>10. heart block j. left-ventricular failure</td>
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<td>11. fibrillation k. caused by fluid within the pericardial cavity</td>
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Treatments, Procedures, and Devices of the Cardiovascular System

Here are the word parts that commonly apply to the treatments, procedures, and devices associated with the cardiovascular system and are covered in the following section. Note that the word parts are color-coded to help you identify them: prefixes are yellow, combining forms are red, and suffixes are blue.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Definition</th>
<th>Combining Form</th>
<th>Definition</th>
<th>Suffix</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>endo-</td>
<td>within</td>
<td>angi/o</td>
<td>blood vessel</td>
<td>-ac</td>
<td>pertaining to</td>
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<tr>
<td>ultra-</td>
<td>beyond normal</td>
<td>aort/o</td>
<td>aorta</td>
<td>-ary</td>
<td>pertaining to</td>
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<td></td>
<td></td>
<td>arter/o, arteri/o</td>
<td>artery</td>
<td>-ectomy</td>
<td>surgical excision, removal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cardi/o</td>
<td>heart</td>
<td>-gram</td>
<td>a record or image</td>
</tr>
<tr>
<td></td>
<td></td>
<td>coron/o</td>
<td>crown or circle, heart</td>
<td>-graphy</td>
<td>recording process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ech/o</td>
<td>sound</td>
<td>-ist</td>
<td>one who specializes</td>
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<tr>
<td></td>
<td></td>
<td>electr/o</td>
<td>electricity</td>
<td>-lytic</td>
<td>pertaining to loosen, dissolve</td>
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<td></td>
<td></td>
<td>embol/o</td>
<td>plug</td>
<td>-meter</td>
<td>measure, measuring instrument</td>
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<tr>
<td></td>
<td></td>
<td>man/o</td>
<td>thin, scanty</td>
<td>-metry</td>
<td>measurement, process of measuring</td>
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<td></td>
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<td>phleb/o</td>
<td>vein</td>
<td>-plasty</td>
<td>surgical repair</td>
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<td>pulmon/o</td>
<td>lung</td>
<td>-rrhaphy</td>
<td>suturing</td>
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<td>son/o</td>
<td>sound</td>
<td>-scopy</td>
<td>process of viewing</td>
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<td></td>
<td></td>
<td>sphygm/o</td>
<td>pulse</td>
<td>-stomy</td>
<td>surgical creation of an opening</td>
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<td></td>
<td></td>
<td>thromb/o</td>
<td>clot</td>
<td>-tomy</td>
<td>incision, to cut</td>
</tr>
</tbody>
</table>
**KEY TERMS A–Z**

<table>
<thead>
<tr>
<th>Term</th>
<th>Pronunciation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>angiography</td>
<td>an jee OH rah fee</td>
<td>A diagnostic procedure that includes x-ray photography, MRI, or CT scan images of a blood vessel after injection of a contrast medium is called <strong>angiography</strong>. This constructed term is written ang/o/graphy. The image resulting from _________________ is called an <strong>angiogram</strong> (AN jee oh gram), which is written ang/o/gram. When the procedure is focused on the heart, it is called <strong>cardiac angiography</strong> or <strong>coronary angiography</strong>.</td>
</tr>
<tr>
<td>angioscopy</td>
<td>AN jee OS koh pee</td>
<td>The use of a flexible fiber-optic instrument, or endoscope, to observe a diseased blood vessel and to assess any lesions is a procedure called _________________. This constructed term is written ang/o/scopy. The endoscope is often a modified instrument, called an <strong>angioscope</strong>, which includes a camera at one end and a video monitor at the opposite end.</td>
</tr>
<tr>
<td>angioplasty</td>
<td>AN jee oh plass tee</td>
<td>The surgical repair of a blood vessel is generally known as _________________. The constructed form of this term is ang/o/plasty. It includes procedures to reopen blocked vessels, such as <strong>balloon angioplasty</strong>, in which a balloon is inserted into a blocked vessel and inflated (Figure 8.8), and <strong>laser angioplasty</strong>, which uses a laser beam to open a blocked artery.</td>
</tr>
<tr>
<td>angiostomy</td>
<td>an jee OS toh mee</td>
<td>The suffix <strong>-stomy</strong> means “surgical creation of an opening.” The surgical procedure that involves the creation of an opening into a blood vessel, usually for the insertion of a catheter, is called _________________. The constructed form of this term is ang/o/stomy.</td>
</tr>
<tr>
<td>angiotomy</td>
<td>an jee OT oh mee</td>
<td>The surgical incision into a blood vessel is called _________________, which uses the suffix <strong>-tomy</strong> that means “incision, to cut.” The constructed form of this term reveals three word parts, as shown in ang/o/tomy.</td>
</tr>
</tbody>
</table>
### Chapter 8

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>aortography</strong></td>
<td>A procedure that obtains an x-ray image, MRI, or CT scan image of the aorta is called aort/o/graphy. The image is called an aortogram.</td>
</tr>
<tr>
<td><strong>arteriography</strong></td>
<td>A procedure that obtains an image of an artery is known as arteri/o/graphy, which literally means “process of recording an artery.” The image is called an arteriogram.</td>
</tr>
<tr>
<td><strong>arteriotomy</strong></td>
<td>An incision into an artery is called arteri/o/tomy. This constructed term is written arteri/o/tomy. It is usually performed to repair an injured artery during a procedure known as an arterioplasty. The conclusion of the procedure is achieved by suturing the opening, called arteriorrhaphy.</td>
</tr>
<tr>
<td><strong>auscultation</strong></td>
<td>An important part of a physical examination involves listening to internal sounds using a stethoscope and is called auscultation. Certain sounds suggest abnormalities of heart function, especially arrhythmias and valve disorders (Figure 8.9).</td>
</tr>
</tbody>
</table>

**Figure 8.9**

Auscultation. A pediatrician is performing auscultation on an infant to check for possible heart disorders. **Source**: Image Point Fr/Shutterstock.

**AUSCULTATION**

Auscultation is derived from the Latin word ausculto, which means “to listen.” During the ancient times of Aristotle, early physicians practiced this form of evaluation by pressing an ear against the patient’s chest. The stethoscope, which literally means “instrument to view the chest,” is a device that made this procedure much more efficient by amplifying the sounds. French physician Rene Laennec was the inventor of the first stethoscope in 1816. He rolled paper into a tube shape to listen to the chest sounds of a young female patient to avoid unwanted contact between his ear and her chest. He was excited to learn of the amplified effect of the tube and developed a wooden tube that became widely used within a few years. Today, stethoscopes include two rubber earpieces and an amplifying bell or cone.
**cardiac catheterization**
KAR dee ak * kath eh ter ih ZAY shun

**8.69** Insertion of a narrow flexible tube, called a **catheter**, through a blood vessel leading into the heart is called ____________________ (Figure 8.10). The procedure is performed to withdraw blood samples from heart chambers, measure pressures, and inject contrast medium for imaging purposes. The term **catheter** is derived from the Greek word **katheter**, which means “to send down.”

![Cardiac catheterization](image)

**cardiac pacemaker**
KAR dee ak * PAYS may ker

**8.70** A **cardiac pacemaker** is a battery-powered device that is implanted under the skin and wired to the inner wall of the heart to help control abnormal heart rhythms (Figure 8.11). It produces timed electric pulses that replace the function of the SA node as a treatment for a heart block and certain other arrhythmias. Recently, the ____________________ ____________________ has been improved to adjust to the patient’s physical activity and SA node function. This is called an **on-demand pacemaker**.

![Cardiac pacemaker](image)
8.71 An emergency procedure that is used to maintain some blood flow to vital organs until the heart can be restarted is commonly abbreviated **CPR**, which means __________________________. It consists of rhythmic chest compression. If the restoration of breathing is also needed, artificial respiration may be included. The constructed form of this term is written **cardi/o/pulmon/ary resuscitation**. The term *resuscitation* is derived from the Latin word *resuscitatio*, which means “to revive.”

8.72 A surgical procedure that involves removing a blood vessel from another part of the body and inserting it into the coronary circulation is called __________________________ __________________________, or **CABG**. The grafted vessel restores blood flow to an oxygen-deprived area of the heart by carrying blood around an occluded (blocked) coronary artery (Figure 8.12).

*Figure 8.12*  
Coronary artery bypass graft (CABG). The grafts are often obtained from the patient’s saphenous veins in the legs and are inserted to carry blood around the blockage (occlusion).
An artificial, metallic scaffold that is used to support an injured blood vessel, compress an atherosclerotic plaque, or anchor a surgical implant or graft is called a **stent** (Figure 8.13). In coronary circulation, a **coronary stent** may be implanted into a coronary artery that is occluded to restore blood flow to an oxygen-deprived part of the heart. A ____________________ ________________ may also be used to prevent closure of a coronary artery after angioplasty (Frame 8.61).

**Figure 8.13**
Coronary stent. Insertion of a stent to open a coronary artery that is blocked by an atherosclerotic plaque is a popular surgery that improves blood flow to the heart. The top figure shows the stent, temporarily attached to a catheter, in place in the area of the occluding plaque. The middle figure shows the process of expanding the stent, which pushes the plaque to clear the occlusion. In the bottom figure, the catheter has been removed and the stent is fully expanded, and will remain in place after the surgery.

*Source: Pearson Education, Inc.*
8.74 In cases in which an arrhythmia progresses to the state of ventricular fibrillation (Frame 8.42), an electric charge may be applied to the chest wall to stop the heart conduction system momentarily, then restart it to establish a more normal heart rhythm. This procedure is called __________________. In most cases, the electric charge is applied to the skin of the chest with paddles using an automated external defibrillator. Abbreviated AED, a portable unit is illustrated in Figure 8.14a. Alternatively, a smaller device may be surgically implanted under the skin with electrodes terminating directly on the heart. This device is called an implantable cardioverter defibrillator (ICD) and is illustrated in Figure 8.14b.

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8.75 An ultrasound procedure that evaluates blood flow through a blood vessel is called Doppler sonography. It is often performed on the heart or on the carotid artery of the neck to evaluate problems in blood flow in a noninvasive manner, and it may also be used to monitor pulse rate from peripheral arteries. In the term __________________, sonography is a constructed term, written son/o/graphy, which literally means “recording process of sound.”
Echocardiography

An ultrasound procedure that directs sound waves through the heart to observe heart structures in an effort to evaluate heart function is called ____________________ (Figure 8.15). This is a constructed term with five word parts that is written ech/o/ cardi/o/graphy. The procedure may also be called cardiac ultrasonography (KAR dee ak * ul trah son OG rah fee). The record or image of the data is typically called an echocardiogram (ek oh KAR dee oh gram). If a heart condition is suspected, it is often performed during or immediately after exercise using a treadmill or stationary bicycle to reproduce the dysfunction for closer evaluation, in the procedure known as a stress ECHO.

Figure 8.15
Echocardiography. (a) The procedure is performed by placing electrodes on the chest wall, which sends ultrasound pulses to the heart. A receiver, held by the physician or technician, picks up echoes from the pulses and sends them to a computer for analysis. (b) A monitor displays the flow of blood passing through the heart (red and yellow) and action of the heart valves, providing a record that may be digitally saved and printed. Source: (a) Anamaria Mejia/Shutterstock (b) cylonphoto/123RF.com.
Echocardiography and electrocardiography are both methods of measuring heart function. The two medical terms are similar enough in construction and in meaning to be confusing. Let the word parts provide the clue. Remember that one hears an echo, and thus, echocardiography is the procedure that uses ultrasound technology to make measurements of heart function. Also remember a synonym for ultrasound is sonography, which means “recording process of sound.”

**Echocardiography**

Echocardiography is the procedure that uses ultrasound technology to make measurements of heart function. It is used extensively to evaluate heart function and is the most common method for diagnosing a heart attack. It is particularly useful in diagnosing cardiac arrhythmias (Frame 8.10). When measured during physical activity using a treadmill or stationary bicycle, it is called a stress ECG.

**Electrocardiography**

In the procedure known as electrocardiography, electrodes are pasted to the skin of the chest to detect and record the electrical events of the heart conduction system (Figure 8.16). The constructed form of _______________ is written electr/o/ cardi/o/graphy. The record or image of the data is called an electrocardiogram and abbreviated ECG or EKG (the K is from the Greek word for heart, kardia) (see Figure 8.16b). Electrocardiography is used extensively to evaluate heart function and is the most common method for diagnosing a heart attack. It is particularly useful in diagnosing cardiac arrhythmias (Frame 8.10). When measured during physical activity using a treadmill or stationary bicycle, it is called a stress ECG.

**Figure 8.16**

An electrocardiogram may be obtained while at rest (shown) or during exercise when it is called a stress ECG. (a) Electrodes are placed on the patient’s chest to record the electrical events within the heart, and the results are collected by computer and displayed on a monitor. (b) Each cardiac cycle of a normal electrocardiogram includes three peaks or waves, called the P wave, QRS wave, and T wave.

Source (a): Lapina/Shutterstock.

**WORDS TO Watch Out For**

**electrocardiography**

EE LEK troh KAR dee AWG rah fee

**Electrocardiography and Electrocardiography**

Echocardiography and electrocardiography are both methods of measuring heart function. The two medical terms are similar enough in construction and in meaning to be confusing. Let the word parts provide the clue. Remember that one hears an echo, and thus, echocardiography is the procedure that uses ultrasound technology to make measurements of heart function. Also remember a synonym for ultrasound is sonography, which means “recording process of sound.”
8.78 The suffix -ectomy means “surgical excision, removal.” The surgical removal of a floating blood clot, or embolus (Frame 8.40), is called ________________. The constructed form of this term is embol/ectomy.

8.79 The removal of the inner lining of an artery to remove a fatty plaque is a surgical procedure called endarterectomy. The constructed form of ________________ is end/arter/ectomy, which literally means “surgical excision or removal of within artery.” The most common surgical site for this procedure is the carotid artery in the neck, which is subject to developing atherosclerotic plaques (Frame 8.26). Note that the o ending in the prefix endo- is deleted from this constructed term for ease of pronunciation.

8.80 A portable electrocardiograph may be worn by the patient to monitor electrical activity of the heart over 24-hour periods. The device is called a ________________ ________________ and is useful in detecting periodic or transient cardiac abnormalities (Figure 8.17).

8.81 A drug that is commonly used as an emergency vasodilator to treat severe angina pectoris (Frame 8.7) or myocardial infarction (Frame 8.49) is the compound nitroglycerin. The vasodilation that results from ________________ temporarily improves blood flow to the heart and other vital organs.
**Chapter 8**

**8.82 Phlebectomy** is constructed from the word root meaning “vein” (*phleb*) and the suffix meaning “surgical excision, removal” (*ectomy*). From its word parts, we know that a ____________ is a procedure involving the surgical removal of a vein. The constructed form of this term is *phleb/ectomy*.

**8.83** A puncture into a vein to remove blood for sampling or donation is called **phlebotomy** (Figure 8.18). This constructed term combines the word root for vein, the combining vowel *o*, and the suffix meaning “incision or to cut” to create the term ________________, which is written *phleb/o/tomy*. Although the word part for incision is included, a small puncture is made rather than an incision when withdrawing blood (called a **venipuncture**). A healthcare professional who performs this procedure is called a **phlebotomist** (fleh BOT oh mist).

**Figure 8.18**
Phlebotomy. In this common procedure, a syringe needle punctures a vein, usually in the arm, and withdraws blood for sampling or donation.

*Source: Courtesy of the Public Health Image Library, Centers for Disease Control and Prevention.*

**8.84** A noninvasive procedure that provides blood flow images using **positron emission tomography (PET)** techniques combined with radioactive isotope labeling may be used to produce images of the heart to reveal functional defects. The procedure is called ________________ ________________ ________________, or **PET scan**.
A common procedure that measures arterial blood pressure is called sphygmomanometry. This constructed term is written sphygm/o/man/o/metry, which literally means “the process of measuring scanty gas.” It utilizes a device called a sphygmomanometer, which consists of an arm cuff and air pressure pump with a pressure gauge (Figure 8.19). In recent years, the mercury pressure gauge has been replaced by aneroid dials and digital technology.

Treatments to dissolve unwanted blood clots are often necessary after surgery to prevent the development of emboli (Frame 8.40). It is also performed soon after a myocardial infarction (Frame 8.49) to minimize damage to the heart and is credited with saving many lives. Known as thrombolytic therapy, it includes the use of drugs such as streptokinase and tissue plasminogen activator (TPA). The constructed term thrombolytic is made up of the combining form that means “clot” (thromb/o) and the suffix that means “pertaining to loosen or dissolve” (-lytic).

If a heart condition is suspected, a cardiologist will often require the patient to undergo exercise during echocardiography or electrocardiography (or both) in an effort to examine heart function under stress. The most common term for this procedure is treadmill stress test.

The surgical repair of a heart valve is called valvuloplasty. The constructed form of this term is written valvul/o/plasty. If repair is not possible due to the extent of the damage or defect, valve replacement may be required using an artificial valve or a porcine (pig) valve.
PRACTICE: Treatments, Procedures, and Devices of the Cardiovascular System

The Right Match

Match the term on the left with the correct definition on the right.

1. cardiac pacemaker
   a. an artificial metallic scaffold that is implanted to open a blocked coronary artery
2. defibrillation
   b. a drug that is commonly used as an emergency vasodilator
3. phlebotomy
   c. a patient undergoes exercise before or during echocardiography to examine heart function under stress
4. Holter monitor
   d. a battery-powered device that is implanted under the skin and wired to the wall of the heart
5. coronary stent
   e. puncture into a vein, usually to remove blood for sampling or donation
6. PET scan
   f. a portable electrocardiograph worn by the patient
7. stress ECHO
   g. an electric charge applied to the chest wall to stop the heart conduction system momentarily, then restart it with a more normal heart rhythm
8. nitroglycerin
   h. a noninvasive procedure that provides blood flow images using positron emission tomography techniques combined with radioactive isotope labeling
9. auscultation
   i. an ultrasound procedure that evaluates blood flow
10. Doppler sonography
    j. a physical examination that involves listening to internal sounds

Break the Chain

Analyze these medical terms:

a) Separate each term into its word parts; each word part is labeled for you (p = prefix, r = root, cf = combining form, and s = suffix).

b) For the Bonus Question, write the requested definition in the blank that follows.

1. a) arteriogram ________/___/________
cf s

   b) Bonus Question: What is the definition of the suffix? ______________________________

2. a) echocardiography ________/___/________/___/_______
cf cf s

   b) Bonus Question: What is the definition of the first combining form? ______________________________

3. a) embolectomy ________/________
r s

   b) Bonus Question: What is the definition of the word root? ______________________________
Abbreviations of the Cardiovascular System

The abbreviations that are associated with the cardiovascular system are summarized here. Study these abbreviations and review them in the exercise that follows.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AED</td>
<td>automated external defibrillator</td>
</tr>
<tr>
<td>A-fib</td>
<td>atrial fibrillation</td>
</tr>
<tr>
<td>AI</td>
<td>aortic insufficiency</td>
</tr>
<tr>
<td>AS</td>
<td>aortic stenosis</td>
</tr>
<tr>
<td>ASD</td>
<td>atrial septal defect</td>
</tr>
<tr>
<td>ASHD</td>
<td>arteriosclerotic heart disease</td>
</tr>
<tr>
<td>AV</td>
<td>atrioventricular</td>
</tr>
<tr>
<td>CABG</td>
<td>coronary artery bypass graft</td>
</tr>
<tr>
<td>CAD</td>
<td>coronary artery disease</td>
</tr>
<tr>
<td>CHD</td>
<td>coronary heart disease</td>
</tr>
<tr>
<td>CHF</td>
<td>congestive heart failure</td>
</tr>
<tr>
<td>CP</td>
<td>chest pain</td>
</tr>
<tr>
<td>CPR</td>
<td>cardiopulmonary resuscitation</td>
</tr>
<tr>
<td>ECG, EKG</td>
<td>electrocardiogram</td>
</tr>
<tr>
<td>ICD</td>
<td>implantable cardioverter defibrillator</td>
</tr>
<tr>
<td>LA</td>
<td>left atrium</td>
</tr>
<tr>
<td>LV</td>
<td>left ventricle</td>
</tr>
<tr>
<td>MI</td>
<td>myocardial infarction</td>
</tr>
<tr>
<td>MVP</td>
<td>mitral valve prolapse</td>
</tr>
<tr>
<td>PET</td>
<td>positron emission tomography</td>
</tr>
<tr>
<td>RA</td>
<td>right atrium</td>
</tr>
<tr>
<td>RV</td>
<td>right ventricle</td>
</tr>
<tr>
<td>SCA</td>
<td>sudden cardiac arrest</td>
</tr>
<tr>
<td>VSD</td>
<td>ventricular septal defect</td>
</tr>
</tbody>
</table>
PRACTICE: Abbreviations

Fill in the blanks with the abbreviation or the complete medical term.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Medical Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>congestive heart failure</td>
</tr>
<tr>
<td>2. ASD</td>
<td>coronary artery bypass graft</td>
</tr>
<tr>
<td>3.</td>
<td>positron emission tomography</td>
</tr>
<tr>
<td>4. MI</td>
<td>arteriosclerotic heart disease</td>
</tr>
<tr>
<td>5. CPR</td>
<td>electrocardiogram</td>
</tr>
<tr>
<td>6. AV</td>
<td>automated external defibrillator</td>
</tr>
<tr>
<td>7.</td>
<td>ventricular septal defect</td>
</tr>
<tr>
<td>8.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
</tr>
<tr>
<td>10. CAD</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td></td>
</tr>
<tr>
<td>12. RV</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td></td>
</tr>
<tr>
<td>14. MVP</td>
<td></td>
</tr>
</tbody>
</table>

CHAPTER REVIEW

Word Building

Construct medical terms from the following meanings. (Some are built from word parts, some are not.) The first question has been completed as an example.

1. generalized disease of the heart muscle **cardiomyopathy**
2. inflammation of the heart and blood vessels angio____________
3. narrowing of a blood vessel angio____________
4. tumor arising from a blood vessel angi____________
5. hardening of the arteries ____________________sclerosis
6. abnormally slow heart rate ____________________cardia
7. a sensation of pain in the heart cardio____________
8. incision into an artery to remove plaque end____________ectomyl
9. abnormal hypertrophy of the heart cardio____________
10. inflammation of the inner heart membrane endo____________
11. an abnormal heart rhythm a____________
12. high blood pressure that is persistent ____________________tension
13. death of a portion of the myocardium __cardial in____________
14. inflammation of the myocardium myo____________
15. a process of recording heart electrical activity ____________________cardiography
### Define the Combining Form

In the space provided, write the definition of the combining form, followed by one example of the combining form used to build a medical term in Chapter 8.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Use in a Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. angi/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>2. cardi/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>3. hem/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>4. phleb/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>5. sten/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>6. scler/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>7. thromb/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>8. ech/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>9. arter/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>10. coron/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>11. electr/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>12. valvul/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>13. isch/o</td>
<td>_________________________________</td>
</tr>
<tr>
<td>14. sphygm/o</td>
<td>_________________________________</td>
</tr>
</tbody>
</table>
**Chapter 8**

---

**Complete the Labels**

Complete the blank labels in the illustrations by writing the labels in the spaces provided.

1. __________________
2. __________________
3. __________________

**Figure 8.20**

The cardiovascular system.

4. __________________
5. __________________
6. __________________
7. __________________
8. __________________

**Figure 8.21**

Internal anatomy of the heart.

The heart is sectioned to reveal its internal features.
**MEDICAL REPORT EXERCISES**

**Robert Gorman**

Read the following medical report, then answer the questions that follow.

---

**PEARSON GENERAL HOSPITAL**

5500 University Avenue, Metropolis, New York
Phone: (211) 594-4000 • Fax (211) 594-4001

<table>
<thead>
<tr>
<th>Medical Consultation: Cardiology</th>
<th>Date: 10/22/2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient: Robert Gorman</td>
<td>Patient ID: 123456</td>
</tr>
<tr>
<td>Dob: 3/14/1954</td>
<td>Age: 62</td>
</tr>
<tr>
<td>Sex: Male</td>
<td>Allergies: NKDA</td>
</tr>
<tr>
<td>Provider: Richard Freemann, MD</td>
<td></td>
</tr>
</tbody>
</table>

**Subjective:**

“I have been experiencing chest pain for the past couple of weeks, unlike any I’ve felt before. I am also tired most of the time and have lost my appetite.”

62 y/o male patient has a recent history of mild chest pain, shortness of breath, and malaise. No murmur has yet been reported. The patient says he underwent tooth extractions a month ago and had been given antibiotics by the dentist, but since he wasn’t feeling ill, he did not take them. Patient reports his father died at 79 y/o due to CHF.

**Objective:**

**Vital Signs:** T: 98.6°F; P: 80; R: 23; BP: 144/102

**Ht:** 5’8”

**Wt:** 183 lb

**General Appearance:** Some pallor and edema present in the face and neck. Mild diaphoresis. No noticeable discolorations of the skin.

**Heart:** Rate at 80 bpm, with possible murmur at mitral valve.

**Lungs:** Clear without signs of disease.

**AbD:** Bowel sounds normal all four quadrants.

**MS:** Joints and muscles symmetric. No swelling, masses, or deformity.

**CV:** ECG normal. Stress ECHO shows minor vegetations of mitral valve.

**Assessment:**

Endocarditis with cardiovalvulitis on left side

**Plan:**

Long-term IV drip with nonpenicillin antibiotic. If there is no improvement in 4 weeks, consult for valvuloplasty.

*Photo Source: Aletia2011/Fotolia.*
Comprehension Questions

1. What complaints support the diagnosis? ____________________________________________
   ____________________________________________
   ____________________________________________

2. Why is the patient history an important part of this diagnosis? ______________________________
   ________________________________________________________________________________
   ________________________________________________________________________________

3. What is the meaning of the abbreviation CHF? ____________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________

Case Study Questions

The following Case Study provides further discussion regarding the patient in the medical report. Fill in the blanks with the correct terms. Choose your answers from the following list of terms. (Note that some terms may be used more than once.)

angina pectoris  angiostenosis  atherosclerosis  block
cardiologist  cardiology  cardiovalvulitis  electrocardiography
endocarditis  myocardial infarction  stress ECHO  valvuloplasty

A patient named Robert Gorman complained of pain in the heart area of the chest, or (a) ____________________, and was subsequently referred to (b) ____________________ for immediate diagnosis and treatment. The specialist, a (c) ____________________, diagnosed the pain as having a cause from insufficient blood supply to the heart. The patient was given medication and educated about heart disease management. Several weeks later, the patient was readmitted due to continued complaints of chest pain. After evaluating heart electrical events with (d) ____________________, the physician performed a technique using sound waves to evaluate heart activity during physical exercise, known as a(n) (e) ____________________ ____________________. The ECG showed a normal conduction system, thereby ruling out damage to the conduction system, or a heart (f) ____________________. The stress ECHO also showed mostly normal results, ruling out damage to the heart muscle, or a(n) (g) ____________________ ____________________, because the heart muscle was receiving sufficient levels of oxygen. Because blood flow was normal, the narrowing of a coronary artery, generally called a(n) (h) ____________________, was
eliminated as a cause, which also eliminated the common plaque-forming disease that causes a stenosis, known as (i) _________________. However, the stress ECHO did reveal abnormal valvular activity during ventricular contraction, or systole, indicating a valvular disorder called (j) _________________. A course of treatment was ordered that included a long-term, nonpenicillin antibiotic therapy with an IV drip. If the patient did not improve, consideration for a surgical operation to repair a damaged valve, called (k) _________________, would be made.
Danika Price

For a greater challenge, read the following medical report and answer the critical thinking questions that follow from the information in the chapter.

**Medical Consultation: Cardiology**

**Date:** 12/09/2016  
**Patient:** Danika Price  
**Patient ID:** 123456  
**Dob:** 04/15/1974  
**Age:** 42  
**Sex:** Female  
**Allergies:** NKDA  
**Provider:** Donald H. Surley, MD

**Subjective:**

“I have been experiencing pain in my upper abdomen that comes and goes. It started about a week ago, and it interrupts my sleep.”

42 y/o female patient describes the pain as recent, within 1 week, occurring between the median and radiating to the left upper quadrant. According to her it is a sharp, intermittent pain, which increases in intensity when she stands from a sitting or lying position.

**Objective:**

**Vital Signs:**  
- **T:** 98.6°F; **P:** 83; **R:** 21; **BP:** 135/90  
- **Ht:** 5’7”  
- **Wt:** 135 lb

**General Appearance:** No pallor, edema, or diaphoresis of the skin. No noticeable discolorations of the skin. No masses.

**Heart:** Rate at 83 bpm. Heart sounds with auscultation appear normal.

**Lungs:** Clear without signs of disease.

**AbD:** Bowel sounds normal all four quadrants. Tenderness of the LUQ with palpation.

**MS:** Joints and muscles symmetric. No swelling, masses, or deformity.

**CV:** ECG normal. Aortogram reveals abnormal swelling of the aorta inferior to the celiac trunk.

**Assessment:**

Aortic aneurysm of upper abdominal aorta inferior to celiac trunk

**Plan:**

Angioplasty with stent insertion at aortic aneurysm.

Photo Source: Monkey Business Images/Shutterstock.
Comprehension Questions

1. What is the actual cause of the abdominal pain reported by the patient?

______________________________________________________________________________________________

______________________________________________________________________________________________

2. What procedure provided the evidence for the diagnosis?

______________________________________________________________________________________________

______________________________________________________________________________________________

3. What is an angioplasty and how might it correct an aortic aneurysm?

______________________________________________________________________________________________

______________________________________________________________________________________________

Case Study Questions

The following case study provides additional discussion of the patient’s condition in the medical report. Fill in the blanks with the correct terms from your readings in this chapter.

Danika Price, a 42-year-old female patient with a history of persistently high blood pressure, or (l) __________________, complained of intermittent pain sensations in the upper abdomen. Upon evaluation during which an x-ray was taken of the aorta, called a(n) (m) __________________, it became apparent that the source of the pain was from abdominal spasms of the aorta wall, called (n) ________________, due to an abnormal dilation of the vessel wall known as a(n) (o) ________________, To prevent a possible rupture of the wall of the aorta, a surgical repair called a(n) (p) ________________ was scheduled. During the repair, an incision was made into the wall of the vessel in a procedure called a(n) (q) ________________ and the vessel wall received a stent to strengthen it. The patient made a complete recovery, and received education on ways to control her essential hypertension.

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- A space where you and your instructors can view and manage your assignments