Chapter 5

Cardiovascular System

Learning Objectives

Upon completion of this chapter, you will be able to

1. Identify and define the combining forms, suffixes, and prefixes introduced in this chapter.
2. Correctly spell and pronounce medical terms and major anatomical structures relating to the cardiovascular system.
3. Describe the major organs of the cardiovascular system and their functions.
4. Describe the anatomy of the heart.
5. Describe the flow of blood through the heart.
6. Explain how the electrical conduction system controls the heartbeat.
7. List and describe the characteristics of the three types of blood vessels.
8. Define *pulse* and *blood pressure*.
9. Identify and define cardiovascular system anatomical terms.
10. Identify and define selected cardiovascular system pathology terms.
11. Identify and define selected cardiovascular system diagnostic procedures.
12. Identify and define selected cardiovascular system therapeutic procedures.
13. Identify and define selected medications relating to the cardiovascular system.
14. Define selected abbreviations associated with the cardiovascular system.

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CARDIOVASCULAR SYSTEM

AT A GLANCE

Function

The cardiovascular system consists of the pump and vessels that distribute blood to all areas of the body. This system allows for the delivery of needed substances to the cells of the body as well as for the removal of wastes.

Organs

The primary structures that comprise the cardiovascular system:

blood vessels **heart**

- **arteries**
- **capillaries**
- **veins**

Word Parts

Presented here are the most common word parts (with their meanings) used to build cardiovascular system terms. For a more comprehensive list, refer to the Terminology section of this chapter.

Combining Forms

angi/o	vessel	**sept/o**	wall
aort/o	aorta	**son/o**	sound
arteri/o	artery	**sphygm/o**	pulse
arteriol/o	arteriole	**steth/o**	chest
ather/o	fatty substance	**thromb/o**	clot
atri/o	atrium	**valv/o**	valve
cardi/o	heart	**valvul/o**	valve
coron/o	heart	**varic/o**	dilated vein
embol/o	plug	**vascul/o**	blood vessel
fibrin/o	fibers	**vas/o**	vessel
isch/o	to hold back	**ven/o**	vein
myocardi/o	heart muscle	**ventricul/o**	ventricle
phleb/o	vein	**venul/o**	venule

Suffixes

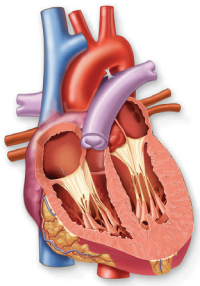
-cardia	heart condition	**-spasm**	involuntary muscle contraction
-manometer	instrument to measure pressure	**-tension**	pressure
-ole	small	**-tonic**	pertaining to tone
-pressor	to press down	**-ule**	small

Prefixes

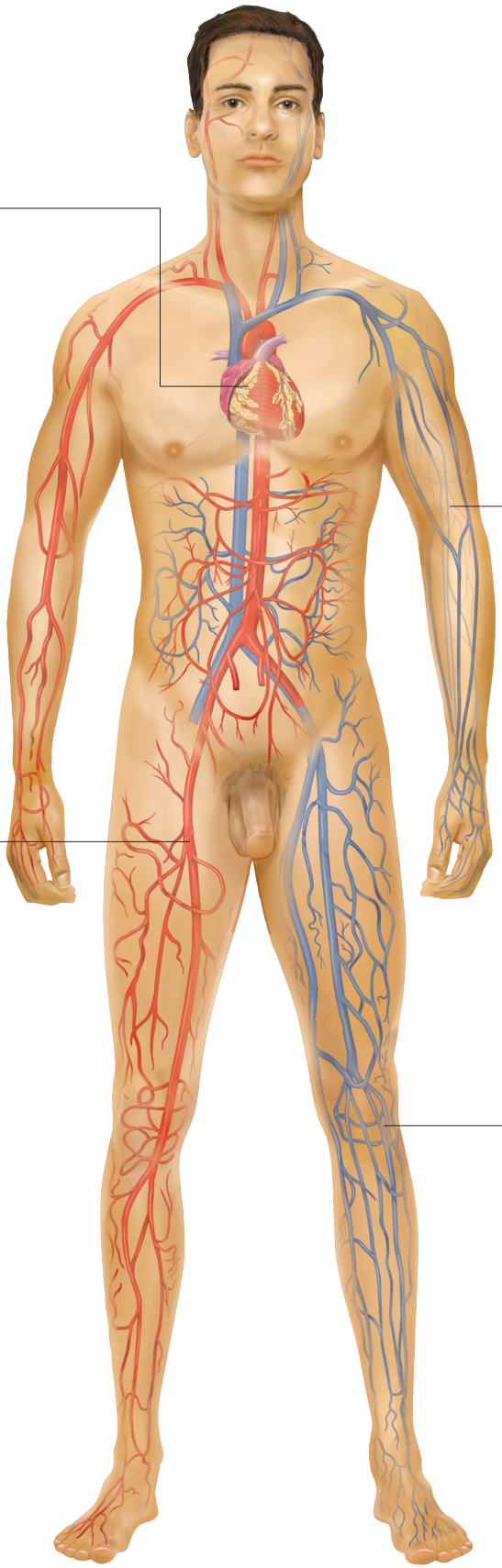
di-	two

Cardiovascular System Illustrated

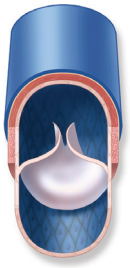
heart, p. 149



Pumps blood through blood vessels



vein, p. 156



Carries blood toward the heart

artery, p. 155

Carries blood away from the heart

capillary, p. 156

Exchange site between blood and tissues

Anatomy and Physiology of the Cardiovascular System

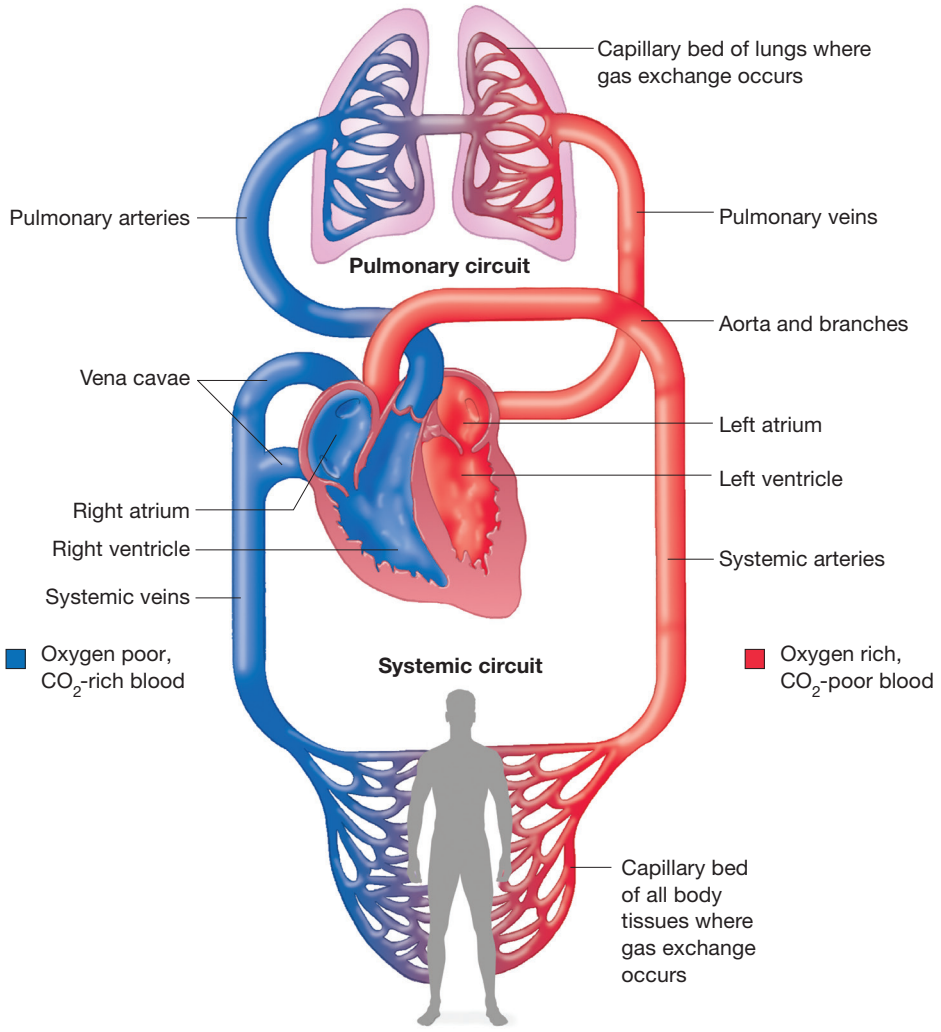
arteries
blood vessels
capillaries
carbon dioxide
circulatory system
deoxygenated (dee-OK-sih-jen-ay-ted)
heart
oxygen
oxygenated (OK-sih-jen-ay-ted)
pulmonary circulation (PULL-mon-air-ee / ser-kyoo-LAY-shun)
systemic circulation (sis-TEM-ik / ser-kyoo-LAY-shun)
veins

What's In A Name?

Look for these word parts:
ox/o = oxygen
pulmon/o = lung
system/o = system
-ary = pertaining to
-ic = pertaining to
de- = without
di- = two

The cardiovascular (CV) system, also called the **circulatory system**, maintains the distribution of blood throughout the body and is composed of the **heart** and the **blood vessels**—**arteries**, **capillaries**, and **veins**.

The circulatory system is composed of two parts: the **pulmonary circulation** and the **systemic circulation**. The pulmonary circulation, between the heart and lungs, transports **deoxygenated** blood to the lungs to get oxygen, and then back to the heart. The systemic circulation carries **oxygenated** blood away from the heart to the tissues and cells, and then back to the heart (see Figure 5-1 ■). In this way, all the body's cells receive blood and oxygen.



■ **Figure 5-1** A schematic of the circulatory system illustrating the pulmonary circulation picking up oxygen from the lungs and the systemic circulation delivering oxygen to the body.

In addition to distributing **oxygen** and other nutrients, such as glucose and amino acids, the cardiovascular system also collects the waste products from the body's cells. **Carbon dioxide** and other waste products produced by metabolic reaction are transported by the cardiovascular system to the lungs, liver, and kidneys, where they are eliminated from the body.

Heart

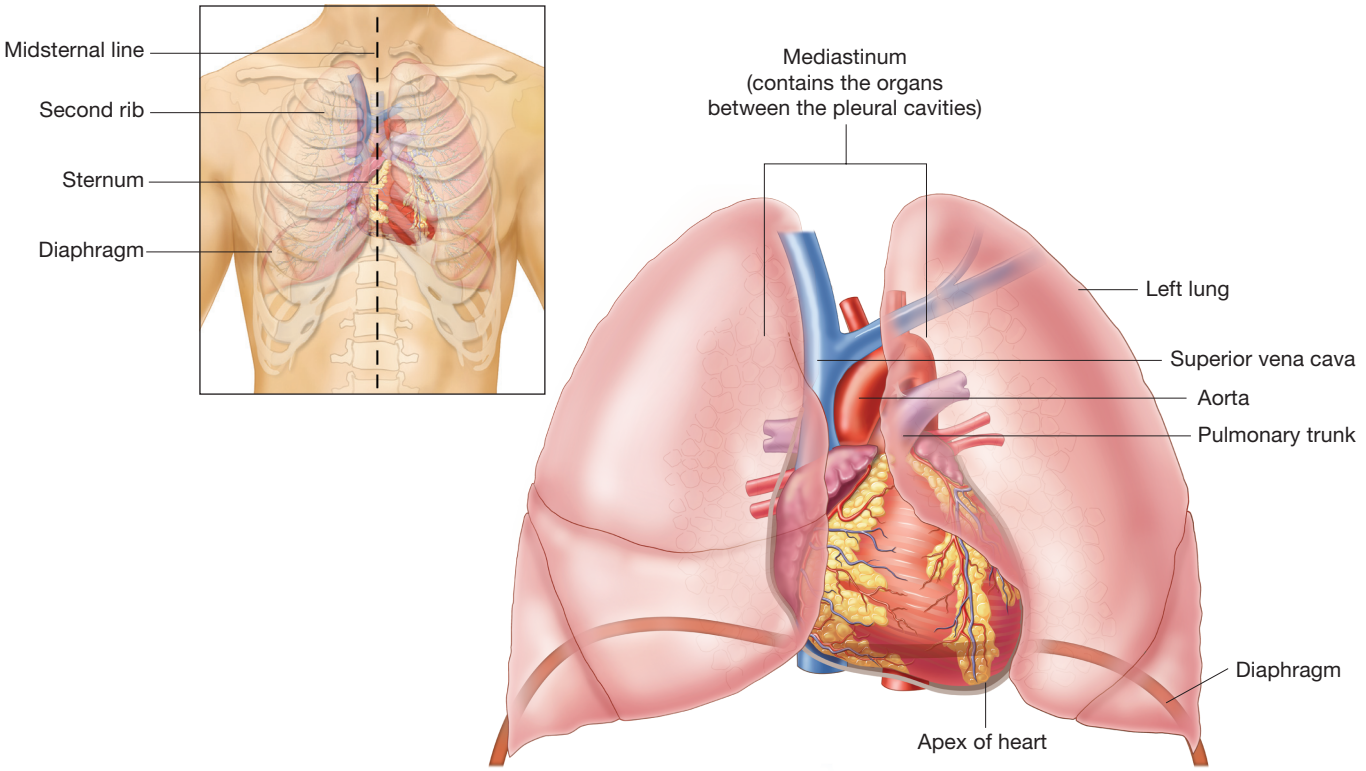
apex (AY-peks) **cardiac muscle** (KAR-dee-ak)

The heart, a muscular pump made up of **cardiac muscle** fibers, could be considered a muscle rather than an organ. It has four chambers, or cavities, and beats an average of 60–100 beats per minute (bpm) or about 100,000 times in one day. Each time the cardiac muscle contracts, blood is ejected from the heart and pushed throughout the body within the blood vessels.

The heart is located in the mediastinum in the center of the chest cavity; however, it is not exactly centered; more of the heart is on the left side of the mediastinum than the right (see Figure 5-2 ■). At about the size of a fist and shaped like an upside-down pear, the heart lies directly behind the sternum. The tip of the heart at the lower edge is called the **apex**.

Med Term Tip

Your heart is approximately the size of your clenched fist and pumps 4,000 gallons of blood each day. It will beat at least three billion times during your lifetime.



■ **Figure 5-2** Location of the heart within the mediastinum of the thoracic cavity.

What's In A Name?

Look for these word parts:
cardi/o = heart
pariet/o = cavity wall
viscer/o = internal organ
-al = pertaining to
epi- = above

Heart Layers

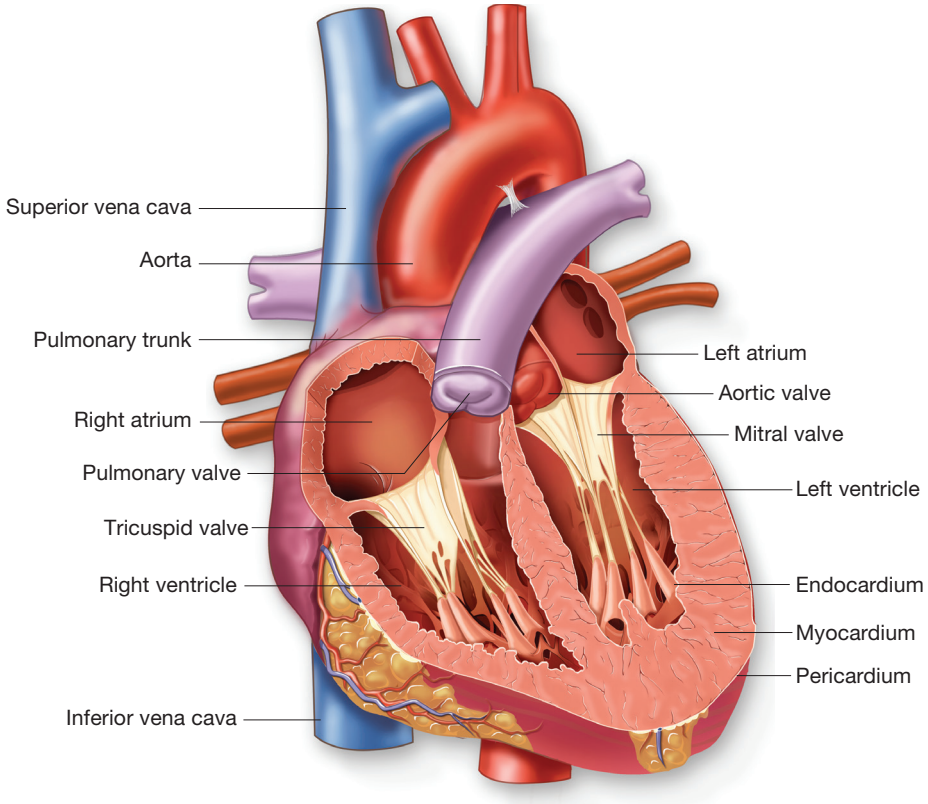
endocardium (en-doh-KAR-dee-um)
epicardium (ep-ih-KAR-dee-um)
myocardium (my-oh-KAR-dee-um)
parietal pericardium (pah-RYE-eh-tal / pair-ih-KAR-dee-um)
pericardium (pair-ih-KAR-dee-um)
visceral pericardium (VISS-er-al / pair-ih-KAR-dee-um)

Med Term Tip

The layers of the heart become important when studying the disease conditions affecting the heart. For instance, when the prefix **endo-** is added to *carditis*, forming *endocarditis*, we know that the inflammation is within the "inner layer of the heart." In discussing the muscular action of the heart, the combining form **my/o**, meaning *muscle,* is added to *cardium* to form the word *myocardium*. The diagnosis *myocardial infarction* (MI), or heart attack, means that the patient has an infarct or "dead tissue in the muscle of the heart." The prefix **peri-**, meaning *around,* when added to the word *cardium* refers to the sac surrounding the heart. Therefore, *pericarditis* is an "inflammation of the outer sac of the heart."

The wall of the heart is quite thick and is composed of three layers (see Figure 5-3 ■):

1. The **endocardium** is the inner layer of the heart lining the heart chambers. It is a very smooth, thin layer that serves to reduce friction as the blood passes through the heart chambers.
2. The **myocardium** is the thick, muscular middle layer of the heart. Contraction of this muscle layer develops the pressure required to pump blood through the blood vessels.
3. The **epicardium** is the outer layer of the heart. The heart is enclosed within a double-layered pleural sac, called the **pericardium**. The epicardium is the **visceral pericardium**, or inner layer of the sac. The outer layer of the sac is the **parietal pericardium**. Fluid between the two layers of the sac reduces friction as the heart beats.



■ **Figure 5-3** Internal view of the heart illustrating the heart chambers, heart layers, and major blood vessels associated with the heart.

Heart Chambers

atria (AY-tree-ah)
interatrial septum (in-ter-AY-tree-al / SEP-tum)
interventricular septum (in-ter-ven-TRIK-yoo-lar / SEP-tum)
ventricles (VEN-trih-kulz)

The heart is divided into four chambers or cavities (see again Figure 5-3). There are two **atria**, or upper chambers, and two **ventricles**, or lower chambers. These chambers are divided into right and left sides by walls called the **interatrial septum** and the **interventricular septum**. The atria are the receiving chambers of the heart. Blood returning to the heart via veins first collects in the atria. The ventricles are the pumping chambers. They have a much thicker myocardium and their contraction ejects blood out of the heart and into the great arteries.

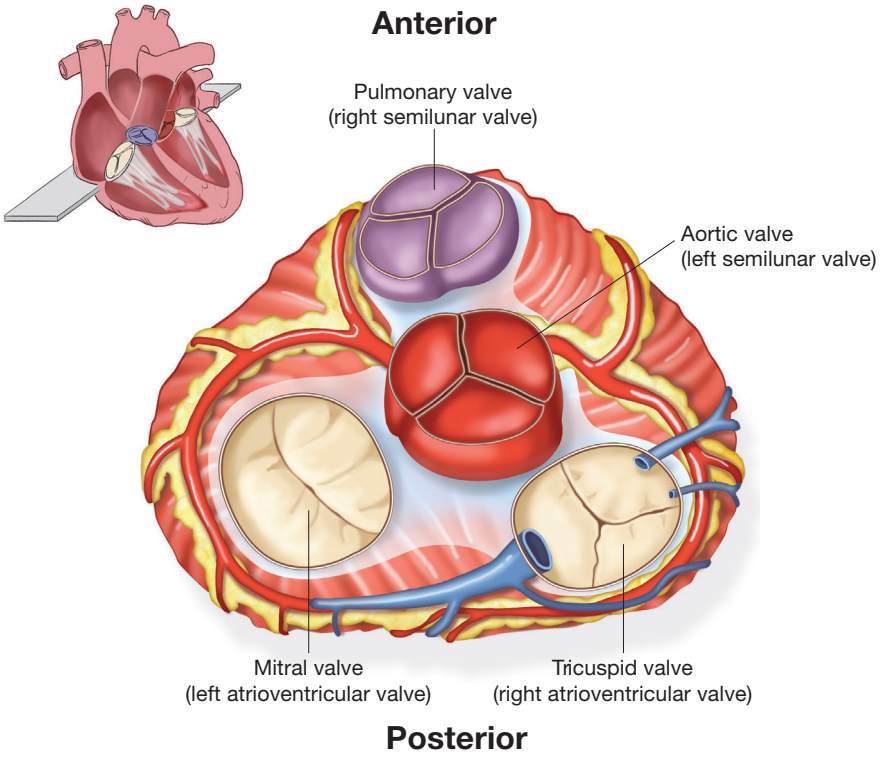
Med Term Tip

The term *ventricle* comes from the Latin term *venter*, which means *little belly.* Although it originally referred to the abdomen and then the stomach, it came to stand for any hollow region inside an organ.

Heart Valves

aortic valve (ay-OR-tik)
atrioventricular valve (ay-tree-oh-ven-TRIK-yoo-lar)
bicuspid valve (bye-KUSS-pid)
cusps
mitral valve (MY-tral)
pulmonary valve (PULL-mon-air-ee)
semilunar valve (sem-ee-LOO-nar)
tricuspid valve (trye-KUSS-pid)

Four valves act as restraining gates to control the direction of blood flow. They are situated at the entrances and exits to the ventricles (see Figure 5-4 ■). Properly functioning valves allow blood to flow only in a forward direction by blocking it from returning to the previous chamber.



■ **Figure 5-4** Superior view of heart valves illustrating position, size, and shape of each valve.

What's In A Name?
Look for these word parts:
pulmon/o = lung
-al = pertaining to
-ar = pertaining to
bi- = two
semi- = partial
tri- = three

Med Term Tip
The heart makes two distinct sounds, referred to as *lub-dupp*. These sounds are produced by the forceful snapping shut of the heart valves. *Lub* is the closing of the atrioventricular valves. *Dupp* is the closing of the semilunar valves.

The four valves are:

1. **Tricuspid valve:** an **atrioventricular valve** (AV), meaning that it controls the opening between the right atrium and the right ventricle. Once the blood enters the right ventricle, it cannot go back up into the atrium again. The prefix **tri-**, meaning three, indicates that this valve has three leaflets or **cusps**.
2. **Pulmonary valve:** a **semilunar valve**, with the prefix **semi-** meaning *half* and the term **lunar** meaning *moon,* indicate that this valve looks like a half moon. Located between the right ventricle and the pulmonary artery, this valve prevents blood that has been ejected into the pulmonary artery from returning to the right ventricle as it relaxes.
3. **Mitral valve:** also called the **bicuspid valve**, indicating that it has two cusps. Blood flows through this atrioventricular valve to the left ventricle and cannot go back up into the left atrium.
4. **Aortic valve:** a semilunar valve located between the left ventricle and the aorta. Blood leaves the left ventricle through this valve and cannot return to the left ventricle.

Blood Flow Through the Heart

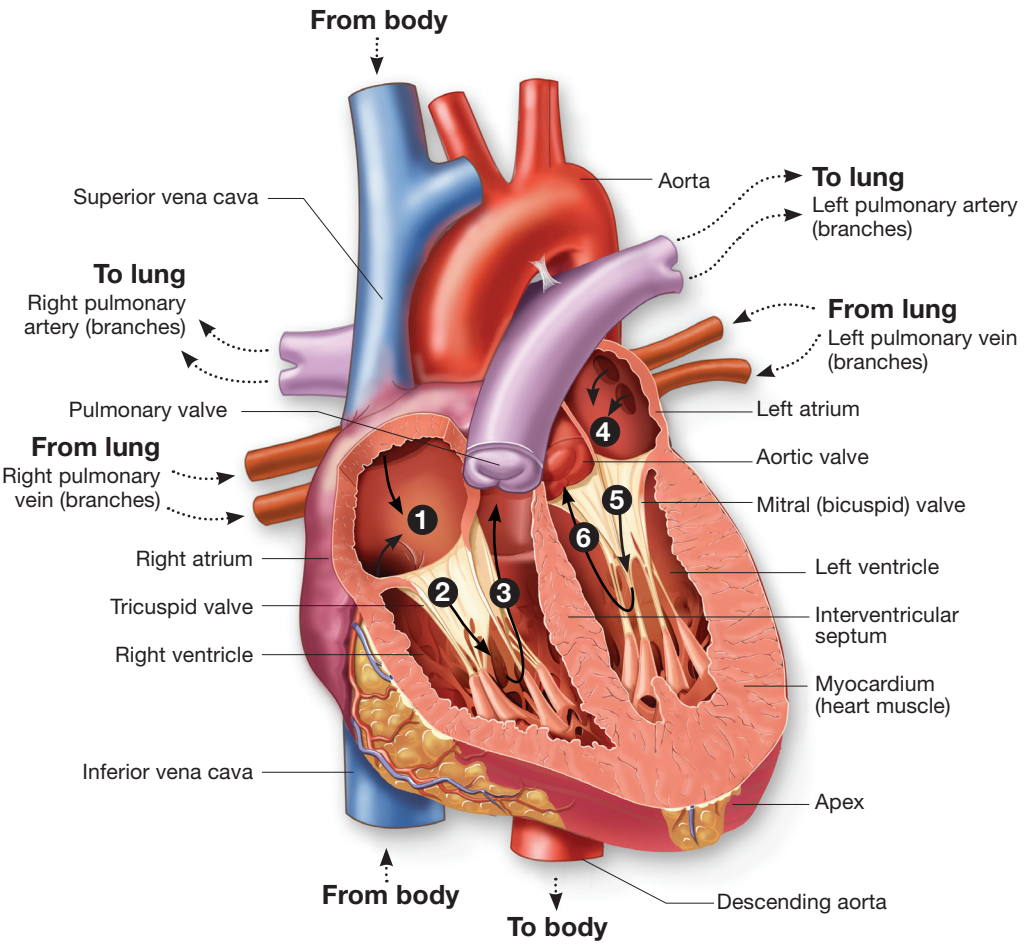
aorta (ay-OR-tah)
diastole (dye-ASS-toh-lee)
inferior vena cava (VEE-nah / KAY-vah)
pulmonary artery (PULL-mon-air-ee)
pulmonary veins
superior vena cava
systole (SIS-toh-lee)

The flow of blood through the heart is very orderly (see Figure 5-5 ■). It progresses through the heart to the lungs, where it receives oxygen; then goes back to the heart; and then out to the body tissues and parts. The normal process of blood flow is:

What's In A Name?
Look for these word parts:
infer/o = below
pulmon/o = lung
super/o = above
-ary = pertaining to
-ior = pertaining to

1. Deoxygenated blood from all the tissues in the body enters a relaxed right atrium via two large veins called the **superior vena cava** and **inferior vena cava**.
2. The right atrium contracts and blood flows through the tricuspid valve into the relaxed right ventricle.
3. The right ventricle then contracts and blood is pumped through the pulmonary valve into the **pulmonary artery**, which carries it to the lungs for oxygenation.
4. The left atrium receives blood returning to the heart after being oxygenated by the lungs. This blood enters the relaxed left atrium from the four **pulmonary veins**.
5. The left atrium contracts and blood flows through the mitral valve into the relaxed left ventricle.
6. When the left ventricle contracts, the blood is pumped through the aortic valve and into the **aorta**, the largest artery in the body. The aorta carries blood to all parts of the body.

It can be seen that the heart chambers alternate between relaxing, in order to fill, and contracting to push blood forward. The period of time a chamber is relaxed is **diastole**. The contraction phase is **systole**.



■ **Figure 5-5** The path of blood flow through the chambers of the left and right side of the heart, including the veins delivering blood to the heart and arteries receiving blood ejected from the heart.

Conduction System of the Heart

atrioventricular bundle
atrioventricular node
autonomic nervous system (aw-toh-NOM-ik / NER-vus / SIS-tem)
bundle branches
bundle of His
pacemaker
Purkinje fibers (per-KIN-jee)
sinoatrial node (sigh-noh-AY-tree-al)

The heart rate is regulated by the **autonomic nervous system**; therefore, there is no voluntary control over the beating of the heart. Special tissue within the heart is responsible for conducting an electrical impulse stimulating the different chambers to contract in the correct order.

The path that the impulses travel is as follows (see Figure 5-6 ■):

1. The **sinoatrial (SA, S-A) node**, or **pacemaker**, is where the electrical impulses begin. From the sinoatrial node, a wave of electricity travels through the atria, causing them to contract, or go into systole.
2. The **atrioventricular node** is stimulated.
3. This node transfers the stimulation wave to the **atrioventricular bundle** (formerly called **bundle of His**).
4. The electrical signal next travels down the **bundle branches** within the interventricular septum.
5. The **Purkinje fibers** out in the ventricular myocardium are stimulated, resulting in ventricular systole.

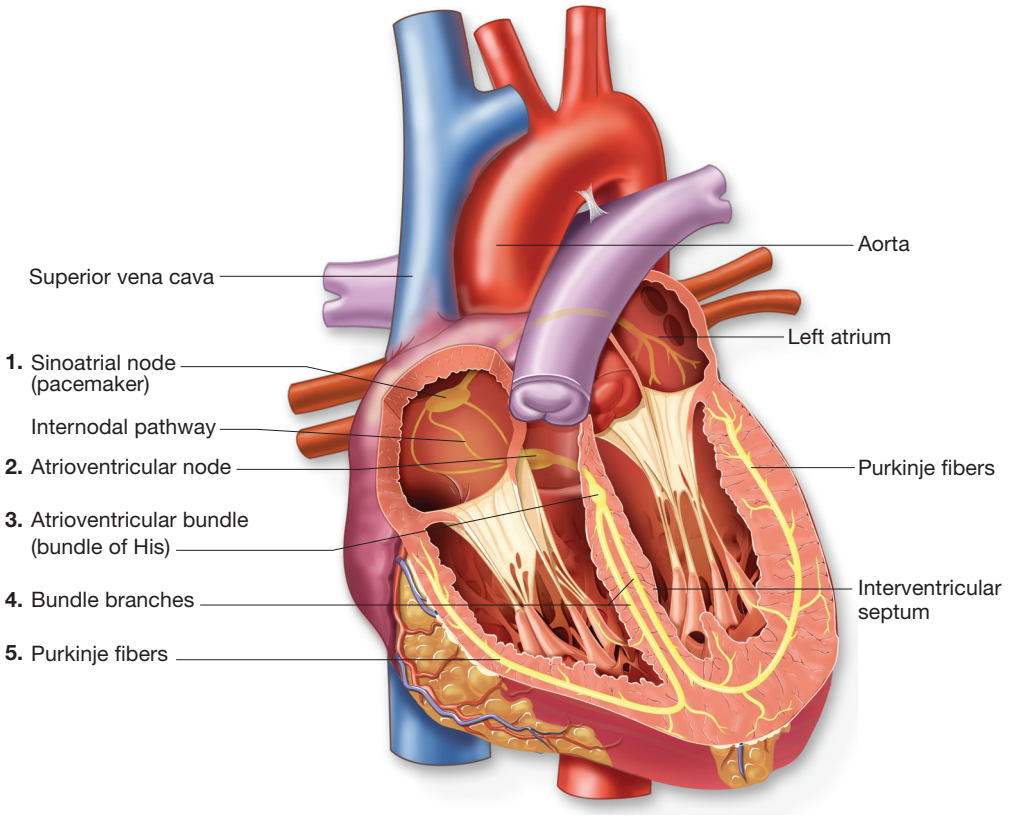
What's In A Name?

Look for these word parts:
atri/o = atrium
-al = pertaining to
-ic = pertaining to
auto- = self

Med Term Tip

The atrioventricular bundle was originally named the *bundle of His* in recognition of the Swiss cardiologist who first discovered these fibers. Current medical terminology usage has moved away from eponyms and toward anatomically descriptive terms for naming structures.

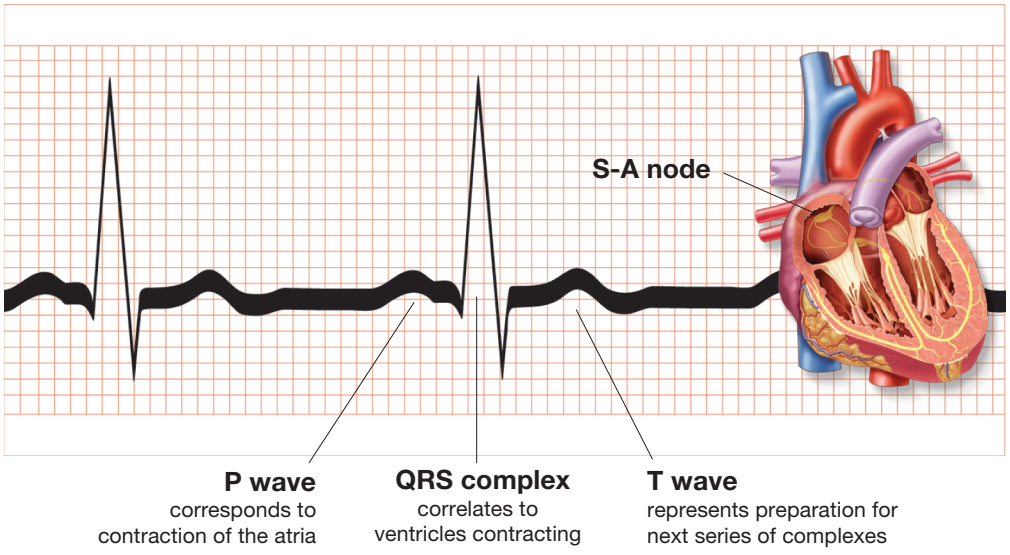
Figure 5-6 The conduction system of the heart; traces the path of the electrical impulse that stimulates the heart chambers to contract in the correct sequence.



Med Term Tip

The electrocardiogram, referred to as an EKG or ECG, is a measurement of the electrical activity of the heart (see Figure 5-7 ■). This can give the physician information about the health of the heart, especially the myocardium.

Figure 5-7 An electrocardiogram (EKG or ECG) wave record of the electrical signal as it moves through the conduction system of the heart. This signal stimulates the chambers of the heart to contract and relax in the proper sequence.



PRACTICE AS YOU GO

A. Complete the Statement

1. The study of the heart is called _____.
2. The three layers of the heart are _____, _____, and _____.
3. The impulse for the heartbeat (the pacemaker) originates in the _____.

4. Arteries carry blood _____ the heart.
5. The four heart valves are _____, _____, _____, and _____.
6. The _____ are the receiving chambers of the heart and the _____ are the pumping chambers.
7. The _____ circulation carries blood to and from the lungs.
8. The pointed tip of the heart is called the _____.
9. The _____ divides the heart into left and right halves.
10. _____ is the contraction phase of the heartbeat and _____ is the relaxation phase.

Blood Vessels

lumen (LOO-men)

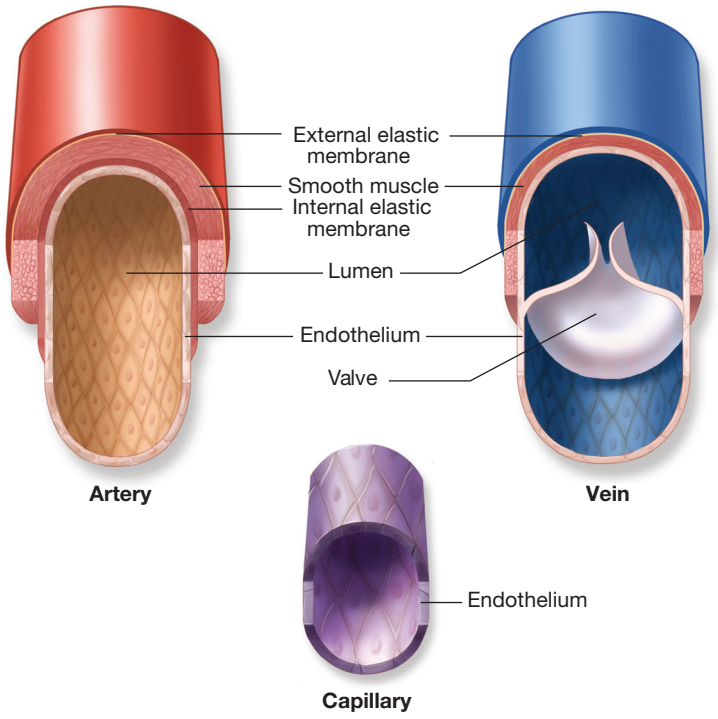
There are three types of blood vessels: arteries, capillaries, and veins (see Figure 5-8■). These are the pipes that circulate blood throughout the body. The **lumen** is the channel within these vessels through which blood flows.

Arteries

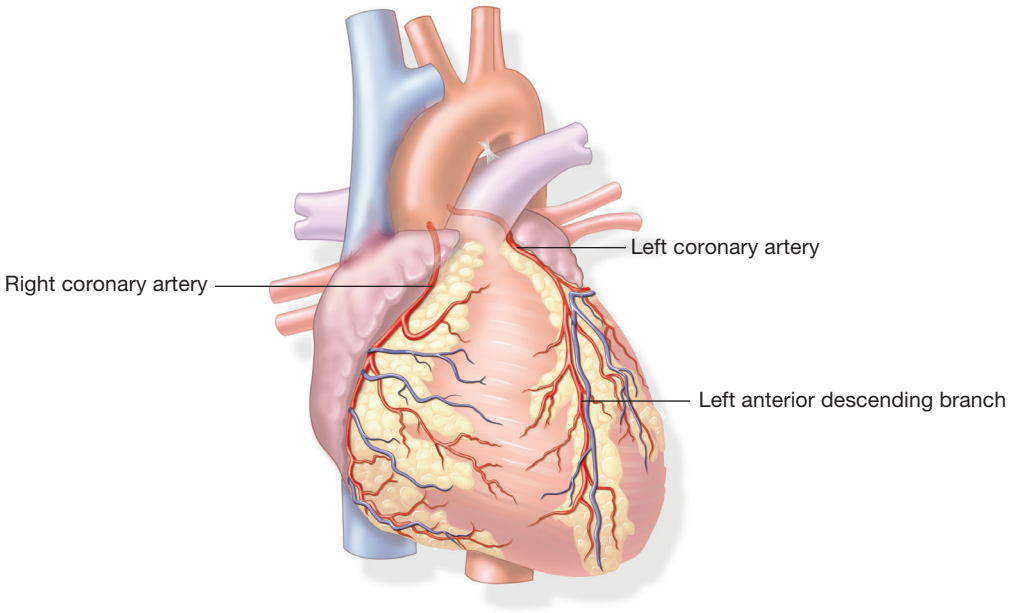
arterioles (ar-TEER-ee-ohlz)

coronary arteries (KOR-ah-nair-ee / AR-ter-eez)

The arteries are the large, thick-walled vessels that carry the blood away from the heart. The walls of arteries contain a thick layer of smooth muscle that can contract or relax to change the size of the arterial lumen. The pulmonary artery carries deoxygenated blood from the right ventricle to the lungs. The largest



■ **Figure 5-8** Comparative structure of arteries, capillaries, and veins.



■ **Figure 5-9** The coronary arteries.

Med Term Tip

The term *coronary*, from the Latin word for crown, describes how the great vessels encircle the heart as they emerge from the top of the heart.

artery, the aorta, begins from the left ventricle of the heart and carries oxygenated blood to all the body systems. The **coronary arteries** then branch from the aorta and provide blood to the myocardium (see Figure 5-9 ■). As they travel through the body, the arteries branch into progressively smaller-sized arteries. The smallest of the arteries, called **arterioles**, deliver blood to the capillaries. Figure 5-10 ■ illustrates the major systemic arteries.

Capillaries

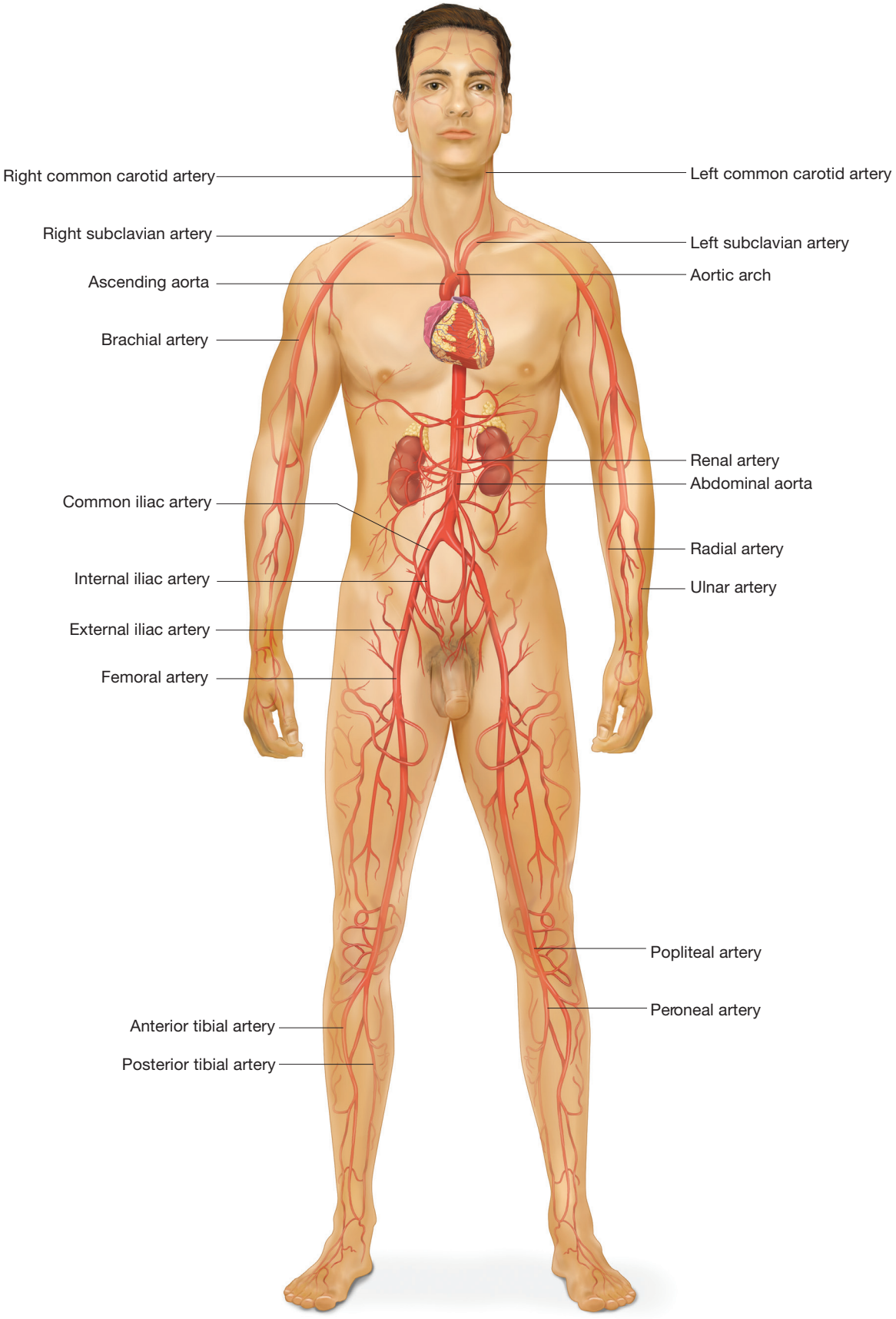
capillary bed

Capillaries are a network of tiny blood vessels referred to as a **capillary bed**. Arterial blood flows into a capillary bed, and venous blood flows back out. Capillaries are very thin walled, allowing for the diffusion of the oxygen and nutrients from the blood into the body tissues (see Figure 5-8). Likewise, carbon dioxide and waste products are able to diffuse out of the body tissues and into the bloodstream to be carried away. Since the capillaries are so small in diameter, the blood will not flow as quickly through them as it does through the arteries and veins. This means that the blood has time for an exchange of nutrients, oxygen, and waste material to take place. As blood exits a capillary bed, it returns to the heart through a vein.

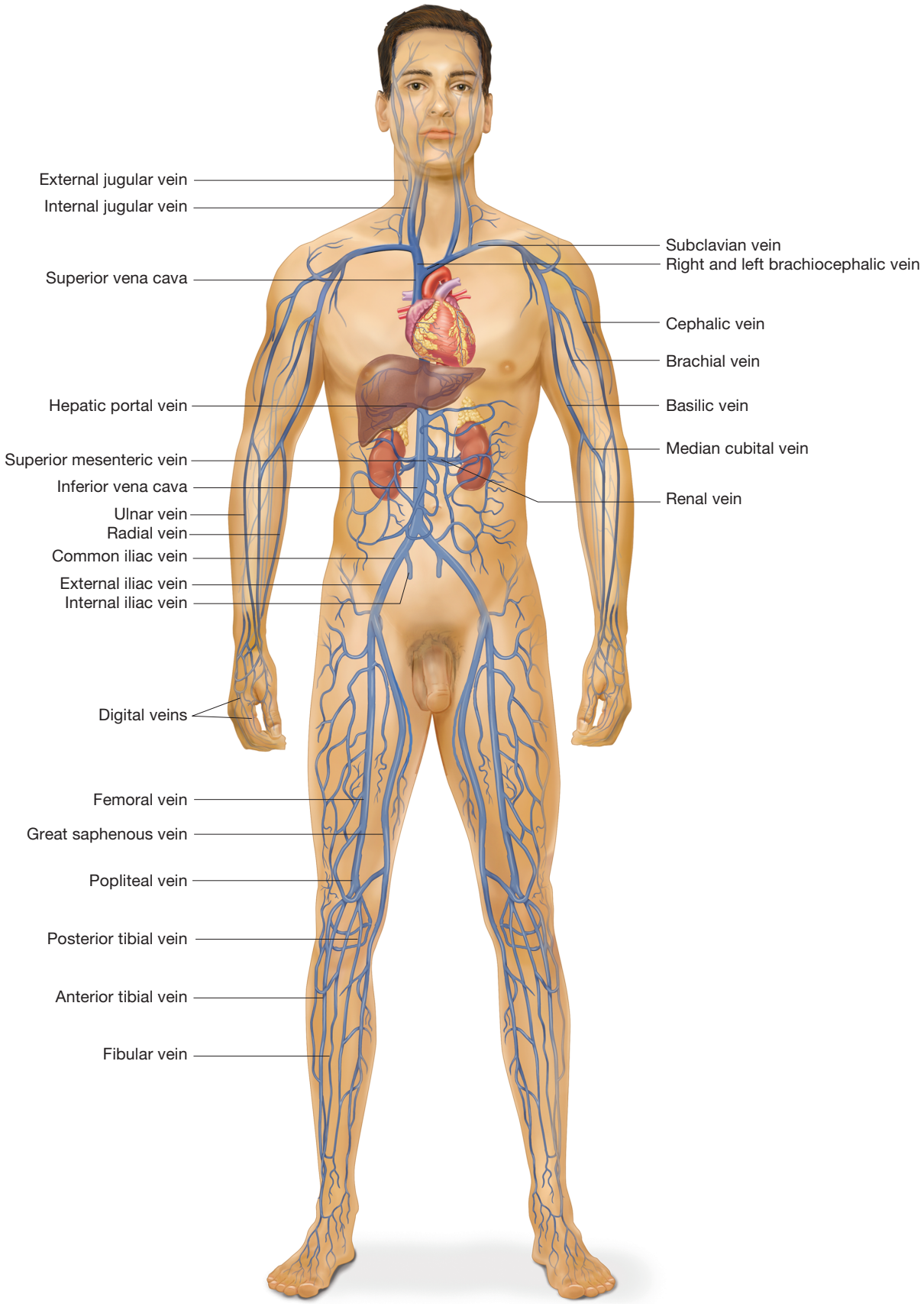
Veins

venules (VEN-yools)

The veins carry blood back to the heart (see Figure 5-8). Blood leaving capillaries first enters small **venules**, which then merge into larger veins. Veins have much thinner walls than arteries, causing them to collapse easily. The veins also have valves that allow the blood to move only toward the heart. These valves prevent blood from backflowing, ensuring that blood always flows toward the heart. The two large veins that enter the heart are the superior vena cava, which carries blood from the upper body, and the inferior vena cava, which carries blood from the lower body. Blood pressure in the veins is much lower than in the arteries. Muscular action against the veins and skeletal muscle contractions help in the movement of blood. Figure 5-11 ■ illustrates the major systemic veins.



■ **Figure 5-10** The major arteries of the body.



■ **Figure 5-11** The major veins of the body.

Pulse and Blood Pressure

blood pressure
diastolic pressure (dye-ah-STOL-ik)
pulse
systolic pressure (sis-TOL-ik)

Blood pressure (BP) is a measurement of the force exerted by blood against the wall of a blood vessel. During ventricular systole, blood is under a lot of pressure from the ventricular contraction, giving the highest blood pressure reading—the **systolic pressure**. The **pulse** (P) felt at the wrist or throat is the surge of blood caused by the heart contraction. This is why pulse rate is normally equal to heart rate. During ventricular diastole, blood is not being pushed by the heart at all and the blood pressure reading drops to its lowest point—the **diastolic pressure**. Therefore, to see the full range of what is occurring with blood pressure, both numbers are required. Blood pressure is also affected by several other characteristics of the blood and the blood vessels. These include the elasticity of the arteries, the diameter of the blood vessels, the viscosity of the blood, the volume of blood flowing through the vessels, and the amount of resistance to blood flow.

What's In A Name?
Look for this word part:
-ic = pertaining to

Med Term Tip
The instrument used to measure blood pressure is called a *sphygmomanometer*. The combining form **sphygm/o** means *pulse* and the suffix **-manometer** means *instrument to measure pressure*. A blood pressure reading is reported as two numbers, for example, 120/80. The 120 is the systolic pressure and the 80 is the diastolic pressure. There is no one "normal" blood pressure number. The normal blood pressure for an adult is a systolic pressure less than 120 and diastolic pressure less than 80.

PRACTICE AS YOU GO

B. Complete the Statement

1. The three types of blood vessels are _____, _____, and _____.
2. _____ carry blood toward the heart.
3. _____ carry blood away from the heart.
4. Diffusion of oxygen and nutrients from blood into body tissues occurs in the _____.
5. The highest blood pressure is the _____ pressure and the lowest blood pressure is the _____ pressure.

Terminology

Word Parts Used to Build Cardiovascular System Terms

The following lists contain the combining forms, suffixes, and prefixes used to build terms in the remaining sections of this chapter.

Combining Forms

angi/o	vessel	**cardi/o**	heart	**fibrin/o**	fibers
aort/o	aorta	**coron/o**	heart	**hem/o** (see Chapter 6)	blood
arteri/o	artery	**corpor/o**	body	**isch/o**	to hold back
arteriol/o	arteriole	**cutane/o**	skin	**lip/o**	fat
ather/o	fatty substance	**duct/o**	to bring	**my/o**	muscle
atri/o	atrium	**electr/o**	electricity	**myocardi/o**	heart muscle
bi/o	life	**embol/o**	plug		

Combining Forms (continued)

orth/o	straight
pector/o	chest
peripher/o (see Chapter 12)	away from center
phleb/o	vein
pulmon/o	lung
scler/o	hard
sept/o	a wall
son/o	sound
sphygm/o	pulse
steth/o	chest
thromb/o	clot
valv/o	valve
valvul/o	valve
varic/o	dilated vein
vas/o	vessel
vascul/o	blood vessel
ven/o	vein
ventricul/o	ventricle
venul/o	venule

Suffixes

-ac	pertaining to
-al	pertaining to
-ar	pertaining to
-ary	pertaining to
-cardia	heart condition
-eal	pertaining to
-ectomy	surgical removal
-gram	record
-graphy	process of recording
-ia	condition
-ic	pertaining to
-itis	inflammation
-logy	study of
-lytic	destruction
-manometer	instrument to measure pressure
-megaly	enlarged
-ole	small
-oma	mass
-ose	pertaining to
-ous	pertaining to
-pathy	disease
-plasty	surgical repair
-pressor	to press down
-rrhexis	rupture
-sclerosis	hardening
-scope	instrument for viewing
-spasm	involuntary muscle contraction
-stenosis	narrowing
-tension	pressure
-therapy	treatment
-tic	pertaining to
-tonic	pertaining to tone
-ule	small

Prefixes

a-	without
anti-	against
brady-	slow
de-	without
endo-	inner
extra-	outside of
hyper-	excessive
hypo-	insufficient
inter-	between
intra-	within
per-	through
peri-	around
poly-	many
pre-	before
re-	again
tachy-	fast
tetra-	four
trans-	across
ultra-	beyond

Adjective Forms of Anatomical Terms

Term	Word Parts	Definition
aortic (ay-OR-tik)	aort/o = aorta -ic = pertaining to	Pertaining to aorta
arterial (ar-TEE-ree-al)	arteri/o = artery -al = pertaining to	Pertaining to artery

Adjective Forms of Anatomical Terms (continued)

Term	Word Parts	Definition
arteriolar (ar-teer-ee-OH-lar)	arteriol/o = arteriole -ar = pertaining to	Pertaining to arteriole
atrial (AY-tree-al)	atri/o = atrium -al = pertaining to	Pertaining to atrium
atrioventricular (AV, A-V) (ay-tree-oh-ven-TRIK-yoo-lar)	atri/o = atrium ventricul/o = ventricle -ar = pertaining to	Pertaining to atrium and ventricle
cardiac (KAR-dee-ak)	cardi/o = heart -ac = pertaining to	Pertaining to heart
coronary (KOR-ah-nair-ee)	coron/o = heart -ary = pertaining to	Pertaining to heart
corporeal (kor-POH-ree-al)	corpor/o = body -eal = pertaining to	Pertaining to body
interatrial (in-ter-AY-tree-al)	inter- = between atri/o = atrium -al = pertaining to	Pertaining to between the atria
interventricular (in-ter-ven-TRIK-yoo-lar)	inter- = between ventricul/o = ventricle -ar = pertaining to	Pertaining to between the ventricles
myocardial (my-oh-KAR-dee-al)	myocardi/o = heart muscle -al = pertaining to	Pertaining to heart muscle
valvular (VAL-vyoo-lar)	valvul/o = valve -ar = pertaining to	Pertaining to a valve
vascular (VAS-kyoo-lar)	vascul/o = blood vessel -ar = pertaining to	Pertaining to a blood vessel
venous (VEE-nus)	ven/o = vein -ous = pertaining to	Pertaining to a vein
ventricular (ven-TRIK-yoo-lar)	ventricul/o = ventricle -ar = pertaining to	Pertaining to a ventricle
venular (VEN-yoo-lar)	venul/o = venule -ar = pertaining to	Pertaining to venule

PRACTICE AS YOU GO

C. Give the adjective form for each anatomical structure/location.

1. The heart _____
2. Between the ventricles _____
3. An artery _____
4. A small vein _____
5. The heart muscle _____
6. An atrium _____

Pathology

Term	Word Parts	Definition
Medical Specialties		
cardiology (kar-dee-ALL-oh-jee)	cardi/o = heart -logy = study of	Branch of medicine involving diagnosis and treatment of conditions and diseases of cardiovascular system; physician is a *cardiologist*
cardiovascular technologist/ technician	cardi/o = heart vascul/o = blood vessel -ar = pertaining to	Healthcare professional trained to perform variety of diagnostic and therapeutic procedures including electrocardiography, echocardiography, and exercise stress tests
Signs and Symptoms		
angiitis (an-jee-EYE-tis)	angi/o = vessel -itis = inflammation	Inflammation of a vessel
angiospasm (AN-jee-oh-spazm)	angi/o = vessel -spasm = involuntary muscle contraction	Involuntary muscle contraction of smooth muscle in wall of a vessel; narrows vessel
angiostenosis (an-jee-oh-steh-NOH-sis)	angi/o = vessel -stenosis = narrowing	Narrowing of a vessel
embolus (EM-boh-lus)	embol/o = plug	Obstruction of blood vessel by blood clot that has broken off from thrombus somewhere else in body and traveled to point of obstruction; if it occurs in coronary artery, may result in myocardial infarction
infarct (IN-farkt)		Area of tissue within organ or part that undergoes necrosis (death) following loss of its blood supply
ischemia (iss-KEE-mee-ah)	isch/o = to hold back hem/o = blood -ia = condition	Localized and temporary deficiency of blood supply due to obstruction to circulation
murmur (MUR-mur)		A sound, in addition to normal heart sounds, arising from blood flowing through heart; extra sound may or may not indicate a heart abnormality
orthostatic hypotension (or-thoh-STAT-ik)	orth/o = straight hypo- = insufficient -tension = pressure	Sudden drop in blood pressure a person experiences when standing straight up suddenly
palpitations (pal-pih-TAY-shunz)		Pounding, racing heartbeats
plaque (PLAK)		Yellow, fatty deposit of lipids in artery that is hallmark of atherosclerosis; also called an *atheroma*

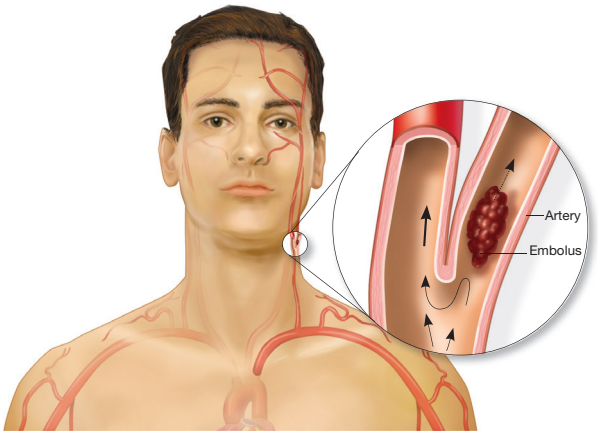
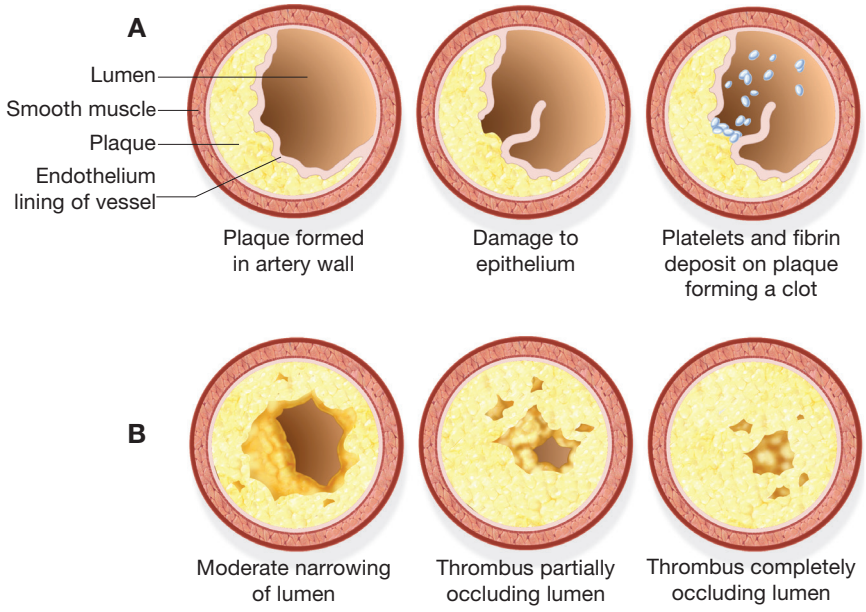


Figure 5-12 Illustration of an embolus floating in an artery. The embolus will become lodged in a blood vessel that is smaller than it is, resulting in occlusion of that artery.

Pathology (continued)

Term	Word Parts	Definition
regurgitation (ree-ger-jih-TAY-shun)	re- = again	To flow backward; in cardiovascular system this refers to backflow of blood through a valve
thrombus (THROM-bus)	thromb/o = clot	Blood clot forming within blood vessel; may partially or completely occlude blood vessel



■ **Figure 5-13** Development of an atherosclerotic plaque that progressively narrows the lumen of an artery.

Heart

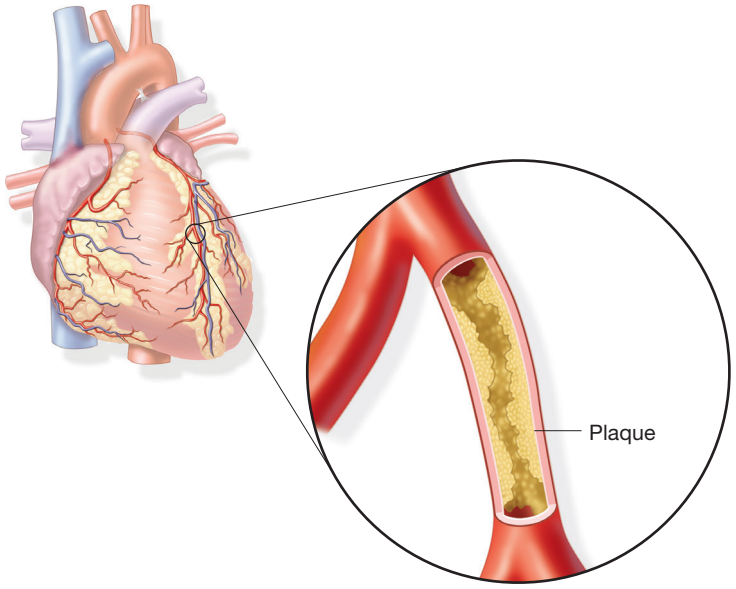
angina pectoris (an-JYE-nah / PEK-tor-is)	pector/o = chest	Condition in which there is severe pain with sensation of constriction around heart; caused by deficiency of oxygen to heart muscle; commonly called *chest pain* (CP)
cardiac arrest	cardi/o = heart -ac = pertaining to	Complete stopping of heart activity
cardiac tamponade (KAR-dee-ak / tam-poh-NADE)	cardi/o = heart -ac = pertaining to	Pressure on heart as a result of fluid buildup around heart inside pericardial sac; heart becomes unable to pump blood effectively
cardiomegaly (kar-dee-oh-MEG-ah-lee)	cardi/o = heart -megaly = enlarged	Enlarged heart
cardiomyopathy (kar-dee-oh-my-OP-ah-thee)	cardi/o = heart my/o = muscle -pathy = disease	General term for disease of myocardium; can be caused by alcohol abuse, parasites, viral infection, and congestive heart failure; one of most common reasons a patient may require heart transplant
congenital septal defect (CSD)	sept/o = a wall -al = pertaining to	Hole, present at birth, in septum between two heart chambers; results in mixture of oxygenated and deoxygenated blood; can be an *atrial septal defect* (ASD) and a *ventricular septal defect* (VSD)
congestive heart failure (CHF) (kon-JESS-tiv)		Pathological condition of heart in which there is reduced outflow of blood from left side of heart because left ventricle myocardium has become too weak to efficiently pump blood; results in weakness, breathlessness, and edema

Pathology (continued)

Term	Word Parts	Definition
coronary artery disease (CAD) (KOR-ah-nair-ee)	coron/o = heart -ary = pertaining to	Insufficient blood supply to heart muscle due to obstruction of one or more coronary arteries; may be caused by atherosclerosis and may cause angina pectoris and myocardial infarction
endocarditis (en-doh-kar-DYE-tis)	endo- = inner cardi/o = heart -itis = inflammation	Inflammation of lining membranes of heart; may be due to bacteria or to abnormal immunological response; in bacterial endocarditis, mass of bacteria that forms is referred to as *vegetation*
heart valve prolapse (PROH-laps)		Condition in which cusps or flaps of heart valve are too loose and fail to shut tightly, allowing blood to flow backward through valve when heart chamber contracts; most commonly occurs in mitral valve, but may affect any of heart valves; also called *heart valve incompetence* or *heart valve insufficiency*
heart valve stenosis (steh-NOH-sis)	-stenosis = narrowing	Condition in which cusps or flaps of heart valve are too stiff and are unable to open fully (making it difficult for blood to flow through) or shut tightly (allowing blood to flow backward); condition may affect any of heart valves
myocardial infarction (MI) (my-oh-KAR-dee-al / in-FARK-shun)	myocardi/o = heart muscle -al = pertaining to	Condition caused by partial or complete occlusion or closing of one or more of coronary arteries; symptoms include squeezing pain or heavy pressure in middle of chest (angina pectoris); delay in treatment could result in death; also referred to as a *heart attack*; see Figure 5-15 ■

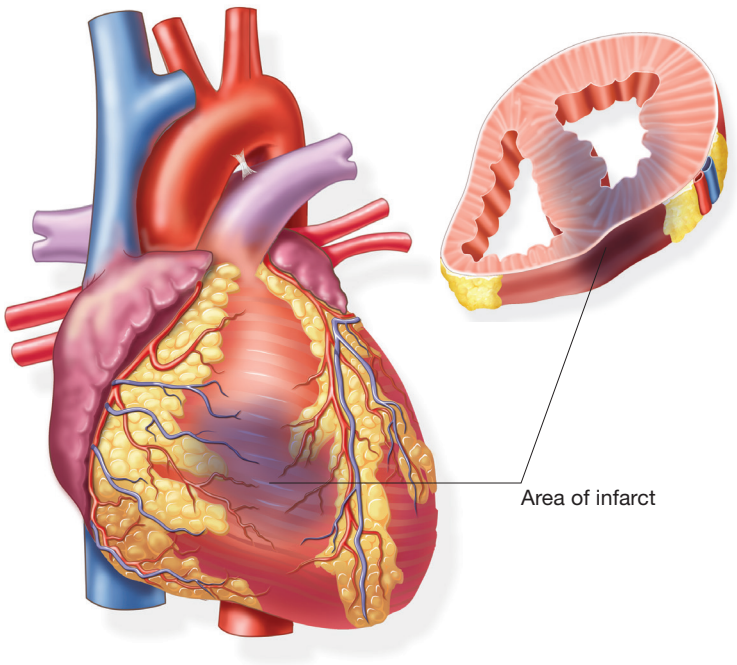
Med Term Tip

All types of cardiovascular disease have been the number one killer of Americans since the 19th century. This disease kills more people annually than cancer.

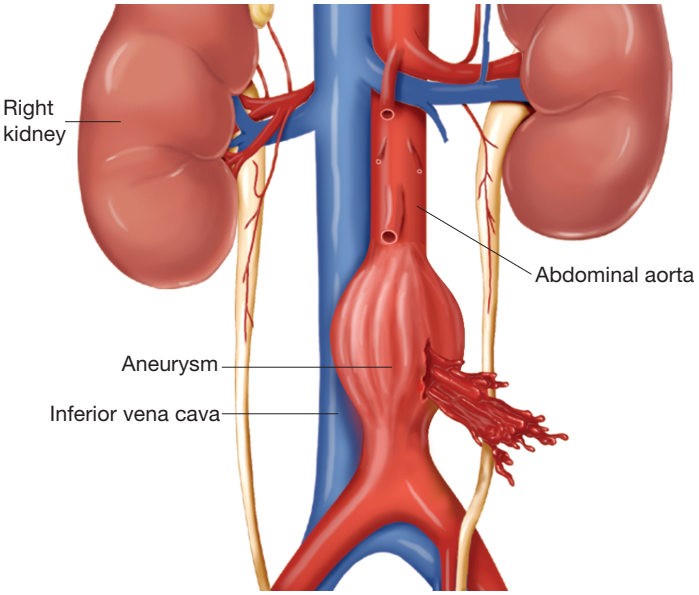


■ **Figure 5-14** Formation of an atherosclerotic plaque within a coronary artery; may lead to coronary artery disease, angina pectoris, and myocardial infarction.

Pathology (continued)

Term	Word Parts	Definition
 ■ **Figure 5-15** External and cross-sectional view of an infarct caused by a myocardial infarction.		
myocarditis (my-oh-kar-DYE-tis)	myocardi/o = heart muscle -itis = inflammation	Inflammation of muscle layer of heart wall
pericarditis (pair-ih-kar-DYE-tis)	peri- = around cardi/o = heart -itis = inflammation	Inflammation of pericardial sac around heart
tetralogy of Fallot (teh-TRALL-oh-jee / fal-LOH)	tetra- = four -logy = study of	Combination of four congenital anomalies: pulmonary stenosis, interventricular septal defect, improper placement of aorta, and hypertrophy of right ventricle; needs immediate surgery to correct
valvulitis (val-vyoo-LYE-tis)	valvul/o = valve -itis = inflammation	Inflammation of a heart valve
Arrhythmias		
arrhythmia (ah-RITH-mee-ah)	a- = without -ia = condition	Irregularity in heartbeat or action; comes in many different forms; may be too fast, too slow, or irregular pattern; some are not serious, while others are life-threatening
bundle branch block (BBB)		Occurs when electrical impulse is blocked from traveling down bundle of His or bundle branches; results in ventricles beating at different rate than atria; also called a *heart block*
bradycardia (brad-ee-KAR-dee-ah)	brady- = slow -cardia = heart condition	Condition of having a slow heart rate, typically less than 60 beats/minute; highly trained aerobic persons may normally have a slow heart rate

Pathology (continued)

Term	Word Parts	Definition
fibrillation (fib) (fih-brill-AY-shun)		Extremely serious arrhythmia characterized by abnormal quivering or contraction of heart fibers; when this occurs in ventricles, cardiac arrest and death can occur; emergency equipment to defibrillate, or convert heart to normal beat, is necessary
flutter		Arrhythmia in which atria beat too rapidly, but in regular pattern
premature atrial contraction (PAC) (AY-tree-al)	pre- = before atri/o = atrium -al = pertaining to	Arrhythmia in which atria contract earlier than they should
premature ventricular contraction (PVC) (ven-TRIK-yoo-lar)	pre- = before ventricul/o = ventricle -ar = pertaining to	Arrhythmia in which ventricles contract earlier than they should
tachycardia (tak-ee-KAR-dee-ah)	tachy- = fast -cardia = heart condition	Condition of having a fast heart rate, typically more than 100 beats/minute while at rest
Blood Vessels		
aneurysm (AN-yoo-rizm)  		Weakness in wall of artery resulting in localized widening of artery; although aneurysm may develop in any artery, common sites include aorta in abdomen and cerebral arteries in brain ■ **Figure 5-16** Illustration of a large aneurysm in the abdominal aorta that has ruptured.
arteriorrhexis (ar-tee-ree-oh-REK-sis)	arteri/o = artery -rrhexis = rupture	Ruptured artery; may occur if aneurysm ruptures arterial wall
arteriosclerosis (AS) (ar-tee-ree-oh-skleh-ROH-sis)	arteri/o = artery -sclerosis = hardening	Thickening, hardening, and loss of elasticity of walls of arteries; most often due to atherosclerosis
atheroma (ath-er-OH-mah)	ather/o = fatty substance -oma = mass	Deposit of fatty substance in wall of artery that bulges into and narrows lumen of artery; characteristic of atherosclerosis; also called a *plaque*

Pathology (continued)

Term	Word Parts	Definition
atherosclerosis (ath-er-oh-skleh-ROH-sis)	ather/o = fatty substance -sclerosis = hardening	Most common form of arteriosclerosis; caused by formation of yellowish plaques of cholesterol on inner walls of arteries (see again Figures 5-13 and 5-14)
coarctation of the aorta (CoA) (koh-ark-TAY-shun)		Severe congenital narrowing of aorta
deep vein thrombosis (DVT) (throm-BOH-sis)	thromb/o = clot	Formation of blood clot in a vein deep in the body, most commonly the legs; embolus breaking off from this thrombosis would travel to lungs and block blood flow through lungs
hemorrhoid (HEM-oh-royd)	hem/o = blood	Varicose veins in anal region
hypertension (HTN) (high-per-TEN-shun)	hyper- = excessive -tension = pressure	Blood pressure (BP) above normal range; *essential* or *primary hypertension* occurs directly from cardiovascular disease; *secondary hypertension* refers to high blood pressure resulting from another disease such as kidney disease
hypotension (high-poh-TEN-shun)	hypo- = insufficient -tension = pressure	Decrease in blood pressure (BP); can occur in shock, infection, cancer, anemia, or as death approaches
patent ductus arteriosus (PDA) (PAY-tent / DUK-tus / ar-tee-ree-OH-sis)	duct/o = to bring arteri/o = artery	Congenital heart anomaly in which fetal connection between pulmonary artery and aorta fails to close at birth; condition may be treated with medication and resolve with time; however, in some cases, surgery is required
peripheral vascular disease (PVD)	peripher/o = away from center -al = pertaining to vascul/o = blood vessel -ar = pertaining to	Any abnormal condition affecting blood vessels outside heart; symptoms may include pain, pallor, numbness, and loss of circulation and pulse
phlebitis (fleh-BYE-tis)	phleb/o = vein -itis = inflammation	Inflammation of a vein
polyarteritis (pol-ee-ar-ter-EYE-tis)	poly- = many arteri/o = artery -itis = inflammation	Inflammation of several arteries
Raynaud's phenomenon (ray-NOZ)		Periodic ischemic attacks affecting extremities of body, especially fingers, toes, ears, and nose; affected extremities become cyanotic and very painful; attacks are brought on by arterial constriction due to extreme cold or emotional stress
thrombophlebitis (throm-boh-fleh-BYE-tis)	thromb/o = clot phleb/o = vein -itis = inflammation	Inflammation of vein resulting in formation of blood clots within vein
varicose veins (VAIR-ih-kohs)	varic/o = dilated vein -ose = pertaining to	Swollen and distended veins, usually in legs

PRACTICE AS YOU GO

D. Terminology Matching

Match each term to its definition.

1. _____	arrhythmia	**a.**	swollen, distended veins
2. _____	thrombus	**b.**	inflammation of vein
3. _____	bradycardia	**c.**	serious congenital anomaly
4. _____	murmur	**d.**	slow heart rate
5. _____	phlebitis	**e.**	cusps are too loose
6. _____	hypotension	**f.**	irregular heartbeat
7. _____	varicose veins	**g.**	an extra heart sound
8. _____	tetralogy of Fallot	**h.**	clot in blood vessel
9. _____	valve prolapse	**i.**	low blood pressure
10. _____	plaque	**j.**	fatty deposit in artery

Diagnostic Procedures

Term	Word Parts	Definition
Medical Procedures		
auscultation (oss-kul-TAY-shun)		Process of listening to sounds within body by using a stethoscope
sphygmomanometer (sfig-moh-mah-NOM-eh-ter)	sphygm/o = pulse -manometer = instrument to measure pressure	Instrument for measuring blood pressure (BP); also referred to as *blood pressure cuff*
stethoscope (STETH-oh-skohp)	steth/o = chest -scope = instrument for viewing	Instrument for listening to body sounds (auscultation), such as chest, heart, or intestines

■ **Figure 5-17** Using a sphygmomanometer to measure blood pressure. *(Michal Heron/Pearson Education, Inc.)*

Diagnostic Procedures (continued)

Term	Word Parts	Definition
Clinical Laboratory Tests		
cardiac biomarkers (KAR-dee-ak)	cardi/o = heart -ac = pertaining to bi/o = life	Blood test to determine level of proteins specific to heart muscle in blood; increase in these proteins may indicate heart muscle damage such as myocardial infarction; proteins include creatine kinase (CK) and troponin
serum lipoprotein level (SEER-um / lip-oh-PROH-teen)	lip/o = fat	Blood test to measure amount of cholesterol and triglycerides in blood; indicator of atherosclerosis risk
Diagnostic Imaging		
angiogram (AN-jee-oh-gram)	angi/o = vessel -gram = record	X-ray record of vessel taken during angiography
angiography (an-jee-OG-rah-fee)	angi/o = vessel -graphy = process of recording	X-rays taken after injection of opaque material into blood vessel; can be performed on aorta as aortic angiography, on heart as angiocardiography, and on brain as cerebral angiography
cardiac scan	cardi/o = heart -ac = pertaining to	Patient is given radioactive thallium intravenously and then scanning equipment is used to visualize heart; especially useful in determining myocardial damage
Doppler ultrasonography (DOP-ler / ul-trah-son-OG-rah-fee)	ultra- = beyond son/o = sound -graphy = process of recording	Measurement of sound-wave echoes as they bounce off tissues and organs to produce an image; procedure is used to measure velocity of blood moving through blood vessels to look for blood clots or deep vein thromboses
echocardiography (ECHO) (ek-oh-kar-dee-OG-rah-fee)	cardi/o = artery -graphy = process of recording	Noninvasive diagnostic procedure using ultrasound to visualize internal cardiac structures; cardiac valve activity can be evaluated using this method
Cardiac Function Tests		
cardiac catheterization (CC, cath) (KAR-dee-ak / kath-eh-ter-ih-ZAY-shun)	cardi/o = heart -ac = pertaining to	Passage of thin-tube catheter through blood vessel leading to heart; done to detect abnormalities, to collect cardiac blood samples, and to determine blood pressure within heart
catheter (KATH-eh-ter)		Flexible tube inserted into body for purpose of moving fluids into or out of body; in the cardiovascular system, a catheter is used to place dye into blood vessels so they may be visualized on X-rays
electrocardiogram (ECG, EKG) (ee-lek-troh-KAR-dee-oh-gram)	electr/o = electricity cardi/o = heart -gram = record	Hardcopy record produced by electrocardiography
electrocardiography (ee-lek-troh-kar-dee-OG-rah-fee)	electr/o = electricity cardi/o = heart -graphy = process of recording	Process of recording electrical activity of heart; useful in diagnosis of abnormal cardiac rhythm and heart muscle (myocardium) damage

Diagnostic Procedures (continued)

Term	Word Parts	Definition
Holter monitor		Portable ECG monitor worn by patient for a period of a few hours to a few days to assess heart and pulse activity as person goes through activities of daily living; used to assess patient who experiences chest pain and unusual heart activity during exercise and normal activities
stress testing		Method for evaluating cardiovascular fitness; patient is placed on treadmill or bicycle and then subjected to steadily increasing levels of work; EKG and oxygen levels are taken while patient exercises; test is stopped if abnormalities occur on EKG; also called *exercise test* or *treadmill test*

■ **Figure 5-18** Man undergoing a stress test on a treadmill while physician monitors his condition. *(Serafino Mozzo/Shutterstock)*

Therapeutic Procedures

Term	Word Parts	Definition
Medical Procedures		
cardiopulmonary resuscitation (CPR) (kar-dee-oh-PULL-mon-air-ee / ree-suss-ih-TAY-shun)	cardi/o = heart pulmon/o = lung -ary = pertaining to	Procedure to restore cardiac output and oxygenated air to lungs for person in cardiac arrest; combination of chest compressions (to push blood out of heart) and artificial respiration (to blow air into lungs) is performed by one or two CPR-trained rescuers
defibrillation (dee-fib-rih-LAY-shun)	de- = without	Procedure that converts serious irregular heartbeats, such as fibrillation, by giving electric shocks to heart using instrument called defibrillator; also called *cardioversion*; automated external defibrillators (AEDs) are portable devices that automatically detect life-threatening arrhythmias and deliver appropriate electrical shock; designed to be used by nonmedical personnel and found in public places such as shopping malls and schools

■ **Figure 5-19** An emergency medical technician positions defibrillator paddles on the chest of a supine male patient. *(Floyd Jackson/Pearson Education, Inc.)*

Therapeutic Procedures (continued)

Term	Word Parts	Definition
extracorporeal circulation (ECC) (eks-trah-kor-POR-ee-al)	extra- = outside of corpor/o = body -eal = pertaining to	During open-heart surgery, routing of blood to heart-lung machine so it can be oxygenated and pumped to rest of body
implantable cardioverter-defibrillator (ICD) (KAR-dee-oh-ver-ter / dee-FIB-rih-lay-ter)	cardi/o = heart de- = without	Device implanted in heart that delivers electrical shock to restore normal heart rhythm; particularly useful for persons who experience ventricular fibrillation
pacemaker implantation		Electrical device that substitutes for natural pacemaker of heart; controls beating of heart by series of rhythmic electrical impulses; external pacemaker has electrodes on outside of body; internal pacemaker has electrodes surgically implanted within chest wall
sclerotherapy (SKLAIR-oh-thair-ah-pee)	scler/o = hard -therapy = treatment	Medical treatment for varicose veins; injection of solution (usually salt solution) directly into varicose vein; irritates lining of vessel, causing it to collapse and stick together
thrombolytic therapy (throm-boh-LIT-ik / THAIR-ah-pee)	thromb/o = clot -lytic = destruction	Process in which drugs, such as streptokinase (SK) or tissue plasminogen activator (tPA), are injected into a blood vessel to dissolve clots and restore blood flow
Surgical Procedures		
aneurysmectomy (an-yoo-riz-MEK-toh-mee)	-ectomy = surgical removal	Surgical removal of sac of an aneurysm
arterial anastomosis (ar-TEE-ree-al / ah-nas-toh-MOH-sis)	arteri/o = artery -al = pertaining to	Surgical joining together of two arteries; performed if artery is severed or if damaged section of artery is removed
atherectomy (ath-er-EK-toh-mee)	ather/o = fatty substance -ectomy = surgical removal	Surgical procedure to remove deposit of fatty substance, atheroma, from artery
coronary artery bypass graft (CABG) (KOR-ah-nair-ee)	coron/o = heart -ary = pertaining to	Open-heart surgery in which blood vessel from another location in body (often a leg vein) is grafted to route blood around blocked coronary artery
embolectomy (em-boh-LEK-toh-mee)	embol/o = plug -ectomy = surgical removal	Removal of embolus or clot from blood vessel
endarterectomy (end-ar-teh-REK-toh-mee)	endo- = inner arteri/o = artery -ectomy = surgical removal	Removal of diseased or damaged inner lining of artery; usually performed to remove atherosclerotic plaques
heart transplantation		Replacement of diseased or malfunctioning heart with donor's heart

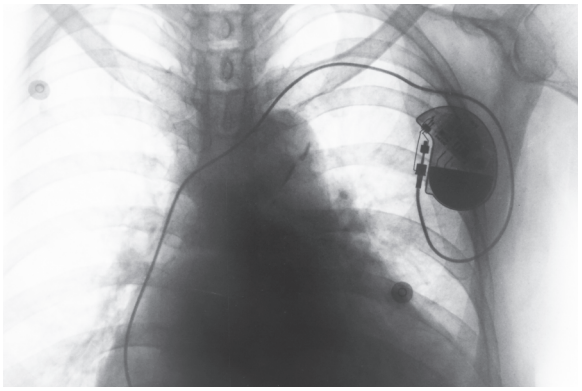
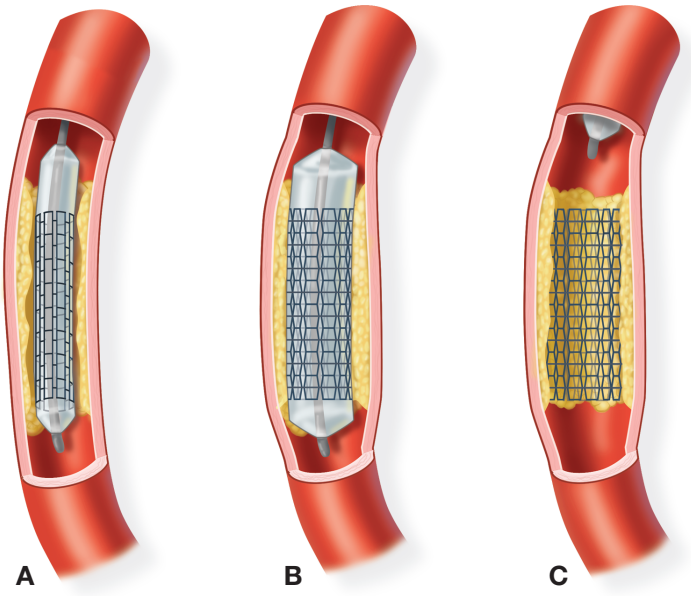


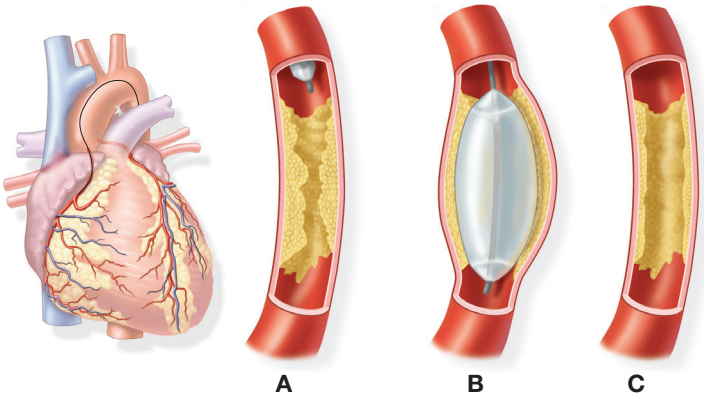
Figure 5-20 X-ray showing a pacemaker implanted in the left side of the chest and the electrode wires running to the heart muscle. *(Chaikom/Shutterstock)*

Therapeutic Procedures (continued)

Term	Word Parts	Definition
intracoronary artery stent (in-trah-KOR-ah-nair-ee / AR-ter-ee)	intra- = within coron/o = heart -ary = pertaining to	Placement of stent within coronary artery to treat coronary ischemia due to atherosclerosis
ligation and stripping (lye-GAY-shun)		Surgical treatment for varicose veins; damaged vein is tied off (ligation) and removed (stripping)
percutaneous translumi-nal coronary angioplasty (PTCA) (per-kyoo-TAY-nee-us / trans-LOO-mih-nal / KOR-ah-nair-ee / AN-jee-oh-plas-tee)	per- = through cutane/o = skin -ous = pertaining to trans- = across -al = pertaining to angi/o = vessel -plasty = surgical repair	Method for treating localized coronary artery narrowing; balloon catheter is inserted through skin into coronary artery and inflated to dilate narrow blood vessel
stent		Stainless steel tube placed within blood vessel or duct to widen lumen (see again Figure 5-21 ■)
valve replacement		Removal of diseased heart valve and replacement with artificial valve
valvoplasty (VAL-voh-plas-tee)	valv/o = valve -plasty = surgical repair	Surgical procedure to repair a heart valve



■ **Figure 5-21** The process of placing a stent in a blood vessel. A) A catheter is used to place a collapsed stent next to an atherosclerotic plaque; B) stent is expanded; C) catheter is removed, leaving the expanded stent behind.



■ **Figure 5-22** Balloon angioplasty: A) deflated balloon catheter is approaching an atherosclerotic plaque; B) plaque is compressed by inflated balloon; C) plaque remains compressed after balloon catheter is removed.

Pharmacology

Classification	Word Parts	Action	Examples
ACE inhibitor drugs		Produce vasodilation and decrease blood pressure	benazepril, Lotensin; catopril, Capoten
antiarrhythmic (an-tye-ah-RHYTH-mik)	anti- = against a- = without -ic = pertaining to	Reduces or prevents cardiac arrhythmias	flecainide, Tambocor; ibutilide, Corvert
anticoagulant (an-tye-koh-AG-yoo-lant)	anti- = against	Prevents blood clot formation	heparin; warfarin, Coumadin
antilipidemic (an-tye-lip-ih-DEEM-ik)	anti- = against lip/o = fat -ic = pertaining to	Reduces amount of cholesterol and lipids in bloodstream; treats hyperlipidemia	atorvastatin, Lipitor; simvastatin, Zocor
antiplatelet agents	anti- = against	Inhibit ability of platelets to clump together as part of blood clot	clopidogrel, Plavix; aspirin; ticlopidine, Ticlid
beta-blocker drugs		Treat hypertension and angina pectoris by lowering heart rate	metoprolol, Lopressor; propranolol, Inderal
calcium channel blocker drugs		Treat hypertension, angina pectoris, and congestive heart failure by causing heart to beat less forcefully and less often	diltiazem, Cardizem; nifedipine, Procardia
cardiotonic (kar-dee-oh-TAHN-ik)	cardi/o = heart -tonic = pertaining to tone	Increases force of cardiac muscle contraction; treats congestive heart failure	digoxin, Lanoxin
diuretic (dye-yoo-RET-ik)	-tic = pertaining to	Increases urine production by kidneys, which works to reduce plasma and therefore blood volume, resulting in lower blood pressure	furosemide, Lasix
fibrinolytic (fye-brin-oh-LIT-ik)	fibrin/o = fibers -lytic = destruction	Dissolves existing blood clots	tissue plasminogen activator (tPA); alteplase, Activase
vasodilator (vay-zoh-DYE-lay-ter)	vas/o = vessel	Relaxes smooth muscle in walls of arteries, thereby increasing diameter of blood vessel; used for two main purposes: increasing circulation to ischemic area and reducing blood pressure	nitroglycerin, Nitro-Dur; hydralazine, Apresoline
vasopressor (vay-zoh-PRESS-or)	vas/o = vessel -pressor = to press down	Contracts smooth muscle in walls of blood vessels; raises blood pressure	dopamine, Myocard-DX; vasopressin, Vasostrict

PRACTICE AS YOU GO

E. Procedure Matching

Match each procedure to its definition.

1. _____ cardiac biomarkers
2. _____ Doppler ultrasound
3. _____ Holter monitor
4. _____ cardiac scan
5. _____ stress testing
6. _____ echocardiography
7. _____ extracorporeal circulation
8. _____ ligation and stripping
9. _____ thrombolytic therapy
10. _____ PTCA

a. visualizes heart after patient is given radioactive thallium
b. uses ultrasound to visualize heart beating
c. blood test that indicates heart muscle damage
d. uses treadmill to evaluate cardiac fitness
e. removes varicose veins
f. clot-dissolving drugs
g. measures velocity of blood moving through blood vessels
h. balloon angioplasty
i. use of a heart-lung machine
j. portable EKG monitor

Abbreviations

AED	automated external defibrillator	**CoA**	coarctation of the aorta
AF	atrial fibrillation	**CP**	chest pain
AMI	acute myocardial infarction	**CPR**	cardiopulmonary resuscitation
AS	arteriosclerosis	**CSD**	congenital septal defect
ASD	atrial septal defect	**CV**	cardiovascular
ASHD	arteriosclerotic heart disease	**DVT**	deep vein thrombosis
AV, A-V	atrioventricular	**ECC**	extracorporeal circulation
BBB	bundle branch block (L for left; R for right)	**ECG, EKG**	electrocardiogram
BP	blood pressure	**ECHO**	echocardiography
bpm	beats per minute	**fib**	fibrillation
CABG	coronary artery bypass graft	**HTN**	hypertension
CAD	coronary artery disease	**ICD**	implantable cardioverter-defibrillator
cath	catheterization	**ICU**	intensive care unit
CC	cardiac catheterization, chief complaint	**IV**	intravenous
CCU	coronary care unit	**LVH**	left-ventricular hypertrophy
CHF	congestive heart failure	**MI**	myocardial infarction, mitral insufficiency
CK	creatine kinase	**mm Hg**	millimeters of mercury

Abbreviations (continued)

MR	mitral regurgitation	**S1**	first heart sound
MS	mitral stenosis **Word Watch** Be careful using the abbreviation *MS*, which can mean either *mitral stenosis* or *multiple sclerosis*.	**S2**	second heart sound
MVP	mitral valve prolapse	**SA, S-A**	sinoatrial
P	pulse	**SK**	streptokinase
PAC	premature atrial contraction	**tPA**	tissue plasminogen activator
PDA	patent ductus arteriosus	**V fib**	ventricular fibrillation
PTCA	percutaneous transluminal coronary angioplasty	**VSD**	ventricular septal defect
PVC	premature ventricular contraction	**VT**	ventricular tachycardia
PVD	peripheral vascular disease		

PRACTICE AS YOU GO

F. What's the Abbreviation?

1. mitral valve prolapse _____
2. ventricular septal defect _____
3. percutaneous transluminal coronary angioplasty _____
4. ventricular fibrillation _____
5. deep vein thrombosis _____
6. arteriosclerotic heart disease _____
7. coarctation of the aorta _____
8. tissue plasminogen activator _____
9. cardiovascular _____
10. extracorporeal circulation _____

Chapter Review

Real-World Applications

Medical Record Analysis

This Discharge Summary contains 13 medical terms. Underline each term and write it in the list below the report. Then explain each term as you would to a nonmedical person.

Date: 6/1/2017
Patient: Juanita Johnson
Patient complaint: Severe pain in the right ankle with any movement of lower limb.

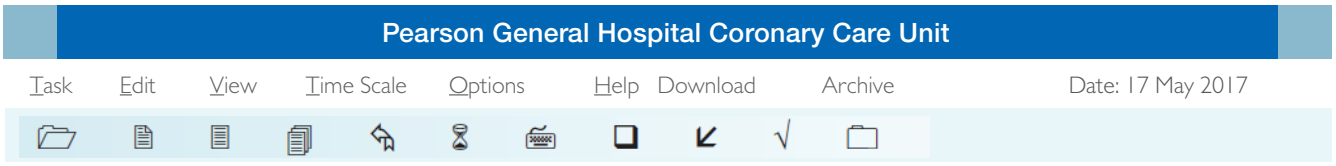
Discharge Summary

Admitting Diagnosis:	Difficulty breathing, hypertension, tachycardia
Final Diagnosis:	CHF secondary to mitral valve prolapse
History of Present Illness:	Patient was brought to the Emergency Room by her family because of difficulty breathing and palpitations. Patient reports having experienced these symptoms for the past six months, but this episode is more severe than any previous. Upon admission in the ER, heart rate was 120 beats per minute and blood pressure was 180/110. The results of an EKG and cardiac biomarkers were normal. She was admitted for a complete workup for tachycardia and hypertension.
Summary of Hospital Course:	Patient underwent a full battery of diagnostic tests. A prolapsed mitral valve was observed by echocardiography. A stress test had to be stopped early due to onset of severe difficulty in breathing. Angiocardiography failed to demonstrate significant CAD. Blood pressure and tachycardia were controlled with medications. At discharge, HR was 88 beats per minute and blood pressure was 165/98.
Discharge Plans:	There was no evidence of a myocardial infarction or significant CAD. Patient was placed on a low-salt and low-cholesterol diet. She received instructions on beginning a carefully graded exercise program. She is to continue her medications. If symptoms are not controlled by these measures, a mitral valvoplasty will be considered.

	Term	Explanation
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____
9.	_____	_____
10.	_____	_____
11.	_____	_____
12.	_____	_____
13.	_____	_____

Chart Note Transcription

The chart note below contains 11 phrases that can be reworded with a medical term presented in this chapter. Each phrase is identified with an underline. Determine the medical term and write your answers in the space provided.



Current Complaint:	A 56-year-old male was admitted to the Cardiac Care Unit from the Emergency Room with left arm pain, severe pain around the heart, **1** an abnormally slow heartbeat, **2** and nausea and vomiting.
Past History:	Patient reports no heart problems prior to this episode. He has taken medication for high blood pressure **3** for the past five years. His family history is significant for a father and brother who both died in their 50s from death of heart muscle. **4**
Signs and Symptoms:	Patient reports severe pain around the heart that radiates into his left jaw and arm. A record of the heart's electrical activity **5** and a blood test to determine the amount of heart damage **6** were abnormal.
Diagnosis:	An acute death of heart muscle **4** resulting from insufficient blood flow to heart muscle due to obstruction of coronary artery. **7**
Treatment:	First, provide supportive care during the acute phase. Second, evaluate heart damage by passing a thin tube through a blood vessel into the heart to detect abnormalities **8** and evaluate heart fitness by having patient exercise on a treadmill. **9** Finally, perform surgical intervention by either inflating a balloon catheter to dilate a narrow vessel **10** or by open heart surgery to create a shunt around a blocked vessel. **11**

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

Case Study

Below is a case study presentation of a patient with a condition discussed in this chapter. Read the case study and answer the questions below. Some questions will ask for information not included within this chapter. Use your text, a medical dictionary, or any other reference material you choose to answer these questions.

(Christopher Coates/Shutterstock)

Mr. Thomas is a 62-year-old man who has been diagnosed with an acute myocardial infarction with the following symptoms and history. His chief complaint is a persistent, crushing chest pain that radiates to his left arm, jaw, neck, and shoulder blade. He describes the pain, which he has had for the past 12 hours, as a "squeezing" sensation around his heart. He has also suffered nausea, dyspnea, and diaphoresis. He has a low-grade temperature and his blood pressure is within a normal range at 130/82. He states that he smokes two packs of cigarettes a day, is overweight by 50 pounds, and has a family history of hypertension and coronary artery disease. He leads a relatively sedentary lifestyle.

Questions

1. What is the common name for Mr. Thomas's acute condition? Look this condition up in a reference source and include a short description of it.

_____

_____

2. What do you think the phrase "chief complaint" means?

_____

_____

3. What is the medical term for this patient's chief complaint? Define this term.

_____

_____

4. List and define each of the patient's additional symptoms in your own words. (These terms appear in other chapters of this book or use a medical dictionary.)

_____

_____

5. Using your text as a resource, name and describe three diagnostic tests that may be performed to determine the extent of the patient's heart damage.

_____

_____

6. What risk factors for developing heart disease does Mr. Thomas have? What changes should he make?

_____

_____

Practice Exercises

A. Word Building Practice

The combining form **cardi/o** refers to the *heart*. Use it to write a term that means:

1. pertaining to the heart _____
2. disease of the heart muscle _____
3. enlargement of the heart _____
4. fast heart condition _____
5. slow heart condition _____
6. record of heart electricity _____

The combining form **angi/o** refers to the *vessel*. Use it to write a term that means:

7. vessel narrowing _____
8. vessel inflammation _____
9. involuntary muscle contraction of a vessel _____

The combining form **arteri/o** refers to the *artery*. Use it to write a term that means:

10. pertaining to an artery _____
11. hardening of an artery _____
12. small artery _____

Add the appropriate prefix to **carditis** to form the term that matches each definition:

13. inflammation of the inner lining of the heart _____
14. inflammation of the outer layer of the heart _____
15. inflammation of the muscle of the heart _____

B. Anatomical Adjectives

Fill in the blank with the missing noun or adjective.

Noun	Adjective
1. aorta	_____
2. atrium	_____
3. _____	cardiac
4. vein	_____
5. _____	arteriolar
6. _____	ventricular
7. valve	_____
8. heart muscle	_____
9. venule	_____
10. _____	coronary
11. _____	vascular
12. _____	arterial

C. Complete the Term

For each definition given below, fill in the blank with the word part that completes the term.

Definition	Term
1. record of a vessel	_____gram
2. fast heart condition	tachy _____
3. heart muscle disease	_____myopathy
4. inflammation of inner lining of heart	_____carditis
5. hardening of an artery	_____sclerosis
6. excessive pressure	hyper _____
7. fatty substance mass	_____oma
8. vein inflammation	_____itis
9. clot destruction	_____lytic
10. surgical removal of a plug	_____ectomy
11. pertaining to within the heart	_____coronary
12. surgical repair of a valve	_____plasty

D. Complete the Statement

1. The _____ circulation carries blood between the heart and lungs, while the _____ circulation carries blood between the heart and the cells and tissues of the body.
2. The _____ is composed of cardiac muscle.
3. The right and left sides of the heart are divided by the _____.
4. The atrioventricular valves are the _____ and _____. The semilunar valves are the _____ and _____.
5. The _____ is the pacemaker of the heart.
6. The _____ arteries carry blood to the heart muscle.
7. _____ is the force exerted by blood against the wall of a blood vessel.
8. A network of tiny blood vessels is referred to as a(n) _____.

E. Using Abbreviations

Fill in each blank with the appropriate abbreviation.

1. A(n) _____ is an arrhythmia, also called a heart block.
2. In a(n) _____, there is partial or complete occlusion of a coronary artery.
3. A(n) _____ occurs when there is an early contraction of an atrium.
4. A(n) _____ is used to diagnose cardiac arrhythmias.
5. A(n) _____ uses ultrasound to visualize cardiac structures.
6. The coronary artery was dilated during a(n) _____ procedure.
7. During open-heart surgery, _____ is used to oxygenate and circulate blood.
8. Doppler ultrasonography was used to look for a(n) _____.

9. In _____, the myocardium is too weak to efficiently pump blood.
10. _____ means that at birth there is a hole in the septum between two heart chambers.

F. Define the Term

1. catheter _____
2. infarct _____
3. thrombus _____
4. palpitation _____
5. regurgitation _____
6. aneurysm _____
7. cardiac arrest _____
8. fibrillation _____
9. myocardial infarction _____
10. hemorrhoid _____

G. Fill in the Blank

angiography	murmur	varicose veins	echocardiogram
pacemaker	CHF	defibrillation	angina pectoris
Holter monitor	hypertension	MI	CCU

1. Tiffany was born with a congenital condition resulting in an abnormal heart sound called a(n) _____.
2. Joseph suffered an arrhythmia resulting in cardiac arrest. The emergency team used an instrument to give electric shocks to the heart to create a normal heart rhythm. This procedure is called _____.
3. Marguerite has been placed on a low-sodium diet and medication to bring her blood pressure down to a normal range. She suffers from _____.
4. Tony has had an artificial device called a(n) _____ inserted to control the beating of his heart by producing rhythmic electrical impulses.
5. Derrick's physician determined that he had _____ after examining his legs and finding swollen, tortuous veins.
6. Laura has persistent chest pains that require medication. The term for the pain is _____.
7. La Tonya will be admitted to what hospital unit after surgery to correct her heart condition? _____
8. Stephen is going to have a coronary artery bypass graft to correct the blockage in his coronary arteries. He recently suffered a heart attack as a result of this occlusion. His attack is called a(n) _____.
9. Stephen's physician scheduled a(n) _____, an X-ray to determine the extent of his blood vessel damage.
10. Maria is scheduled to have a diagnostic procedure that uses ultrasound to produce an image of the heart valves. She is going to have a(n) _____.
11. Eric must wear a device for 24 hours that will keep track of his heart activity as he performs his normal daily routine. This device is called a(n) _____.
12. Lydia is 82 years old and is suffering from a heart condition that causes weakness, edema, and breathlessness. Her heart failure is the cause of her lung congestion. This condition is called _____.

H. Pharmacology Challenge

Fill in the classification for each drug description, then match the brand name.

Drug Description	Classification	Brand Name
1. _____ prevents arrhythmia	_____	a. tPA
2. _____ reduces cholesterol	_____	b. Coumadin
3. _____ increases force of heart contraction	_____	c. Cardizem
4. _____ increases urine production	_____	d. Nitro-Dur
5. _____ prevents blood clots	_____	e. Tambocor
6. _____ dissolves blood clots	_____	f. Lanoxin
7. _____ relaxes smooth muscle in artery wall	_____	g. Lipitor
8. _____ causes heart to beat less forcefully	_____	h. Lasix

I. Spelling Practice

Some of the following terms are misspelled. Identify the incorrect terms and spell them correctly in the blank provided.

1. cardiomiopathy _____
2. tackycardia _____
3. ischemia _____
4. auscultation _____
5. arteriosclerosis _____
6. aneurysm _____
7. catheterization _____
8. infraction _____
9. arhythmia _____
10. angitis _____

Labeling Exercises

Image A

Write the labels for this figure on the numbered lines provided.

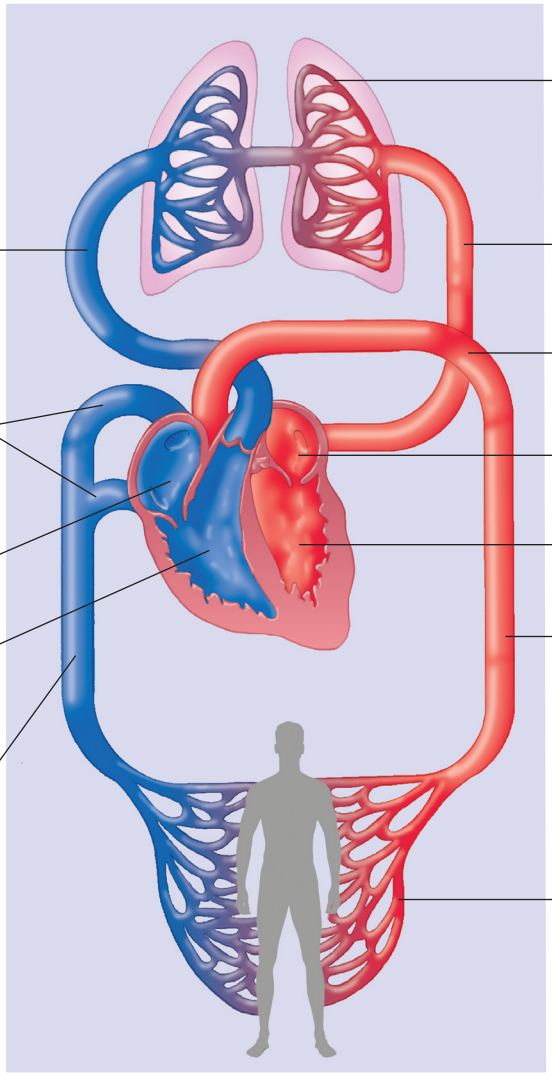


Image B

Write the labels for this figure on the numbered lines provided.