

**+ 15-4** Define the following:

- acute myocardial infarction
- atherosclerosis
- cardiovascular disease
- coronary artery disease
- hypertension

Blood transports a variety of materials (e.g., protein building blocks, sugars, fats, hormones, oxygen, carbon dioxide, medicines, and waste products) from one area of the body to another. The body of a person engaging in physical activity needs more nutrients and oxygen than when it is at rest. Because of this, the heart pumps more strongly and/or more quickly to deliver more blood to the tissues. When the heart works harder, the heart muscle (myocardium) also requires more nutrients and oxygen. The coronary arteries and their branches supply the entire myocardium with blood. When the heart is pumping hard, the coronary arteries dilate to increase the amount of blood and oxygen supplied to the myocardium (Figure 15-7■).

## Cardiovascular Emergencies

Most causes of cardiovascular system failure can be traced to cardiovascular disease (CVD), a generic term that describes several diseases that affect the heart and blood vessels. CVD is the leading cause of death worldwide and the number one cause of death in the United States. According to studies by the American Heart Association and others, more than one-third of the adult population in the United States has CVD. Although the underlying causes of CVD are many, most are attributed to **coronary artery disease (CAD)**, or **atherosclerosis** of the arteries of the heart.

### coronary artery disease

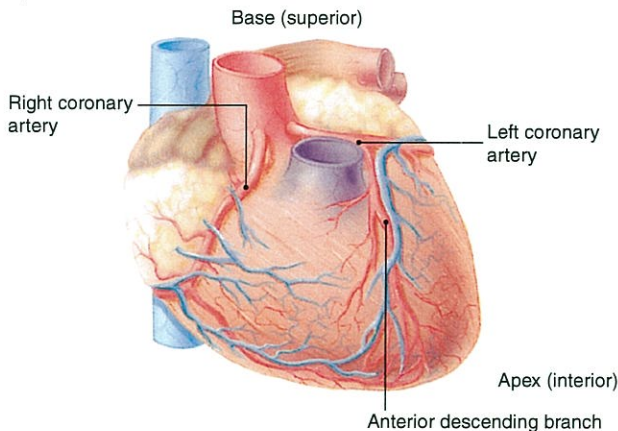
**(CAD)** narrowing of the coronary arteries, which supply blood and oxygen to the heart muscle.

**atherosclerosis** a form of arteriosclerosis in which cholesterol and lipid plaques form within the walls of arteries.

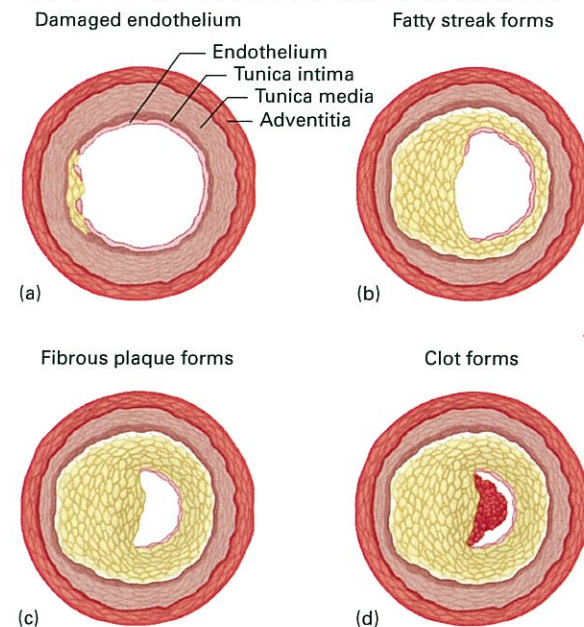
### Atherosclerosis

Atherosclerosis, or “hardening of the arteries,” is a disease in which plaques form along the inner lining of arteries. These plaques consist of cholesterol and lipids and are deposited throughout a lifetime. During their initial formation, plaque deposits typically remain undetected. However, as they grow in size, they can decrease the internal diameter of an artery, thereby decreasing blood flow to tissues (Figure 15-8■).

**Figure 15-7** The coronary arteries deliver oxygen and nutrients to the myocardium.



**Figure 15-8** The progression of artery occlusion in atherosclerosis: (a) the patient's risk factors and other factors cause the inner wall to be damaged; (b) fatty deposits develop, which lead to (c) fibrous plaque, which further occludes the vessel's internal diameter; (d) platelets aggregate in these areas, forming blood clots that nearly or completely occlude the artery.





**Table 15-1** Three Types of Angina

- **Stable angina.** Occurs when the heart is forced to work harder than normal, as during rigorous physical activity. The onset is generally predictable, and the symptoms usually subside with rest or anti-angina medications such as nitroglycerin.
- **Unstable angina.** Can occur at anytime, including while at rest, and may not be relieved by anti-angina medications.
- **Prinzmetal's angina.** A form of angina in which the patient awakens with chest pain, which resolves with anti-angina medications. It is thought to be caused by spasm of a coronary artery.

heart disease or history of angina can have an acute myocardial infarction (Figure 15-12). Another cause of MI is the gradual growth of plaques in coronary vessels until they completely prevent blood flow through the vessels.

When the heart tissue supplied by an obstructed coronary artery becomes oxygen starved, the tissue begins to die. This area of dead heart muscle is referred to as an infarct. If enough heart muscle is damaged, the heart cannot pump effectively, which can lead to a host of other life-threatening problems, including cardiac arrhythmias, congestive heart failure, cardiogenic shock, and sudden cardiac death.

### Cardiac Arrhythmias

The orderly, coordinated electrical stimulation of the myocardium is essential to healthy and efficient heart function. Any abnormality in this process, whether from an internal or external source, can lead to an irregular heart beat or heart rhythm, known as an **arrhythmia**, which can compromise normal heart function.

Some chronic arrhythmias are relatively benign, although they indicate a problem with the heart's electrical system. The primary cause of a life-threatening arrhythmia is ischemia of the heart muscle. Although the identification of cardiac arrhythmias is beyond the scope of this text, their effects are fairly straightforward: they either slow the heart rate to below 60 bpm (bradycardia), speed it up to above 100 bpm (tachycardia), or alter the regularity of the rhythm. Some arrhythmias can

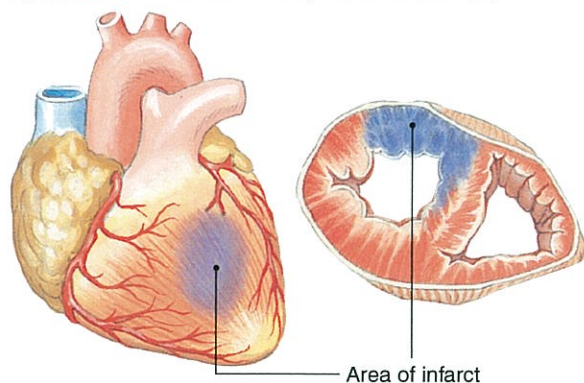
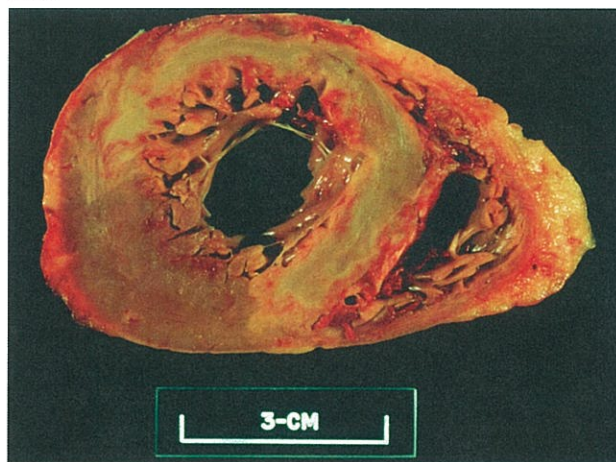
### Acute Coronary Syndrome

Acute coronary syndrome (ACS) is a group of conditions (including unstable angina and myocardial infarction) caused by a ruptured or eroded plaque within a coronary artery.

**NOTE**

- + 15-6** List the arrhythmias associated with sudden cardiac death.

**arrhythmia** abnormal heart rhythm.

**Figure 15-11** A cross section of a myocardial infarction (MI).**Figure 15-12** A cross section of a heart showing normal tissue and infarcted tissue.

## STOP, THINK, UNDERSTAND

## Multiple Choice

Choose the correct answer.

1. Atherosclerosis is best described as \_\_\_\_\_.
  - a. a deterioration of blood vessels due to aging.
  - b. a buildup of cholesterol and calcium into plaque, which forms along the inner lining of arteries.
  - c. heart failure.
  - d. an arrhythmia that causes inadequate tissue perfusion.
2. Which of the following blood pressures is considered hypertensive? \_\_\_\_\_.
  - a. 100/70
  - b. 120/80
  - c. 130/86
  - d. 140/90
3. Which of the following conditions can contribute to hypertension? (check all that apply)
 

_____ a. atherosclerosis	_____ e. lack of exercise
_____ b. high salt intake	_____ f. poor diet
_____ c. chronic kidney disease	_____ g. smoking
_____ d. artery narrowing	_____ h. obesity
4. Congestive heart failure is best described as \_\_\_\_\_.
  - a. a condition in which the heart muscle is starved for oxygen and slowly dies.
  - b. the backing up of blood because the heart can no longer pump adequately.
  - c. a sudden nonperfusing arrhythmia.
  - d. cardiac death.
5. Pulmonary edema is best described as \_\_\_\_\_.
  - a. an accumulation of fluid in the lungs.
  - b. swelling of the sac surrounding the lungs.
  - c. a collapse of one or both lungs.
  - d. a pooling of blood within the pulmonary artery.
6. Which of the following may cause pulmonary edema? \_\_\_\_\_.
 

a. direct trauma to lung tissue	c. diabetes
b. anemia	d. all of the above

## Fill in the Blank

1. A(n) \_\_\_\_\_ is a localized dilation in a blood vessel that results from the degenerative weakening of the vessel wall over time.
2. \_\_\_\_\_ is a condition characterized as chest pain or discomfort caused by myocardial ischemia or a spasm of the coronary arteries and occurs when the oxygen demands of the heart muscle tissue exceeds the available supply.

## Matching

Match each of the following conditions to its description.

- |                                      |                                                                                                                             |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| _____ 1. myocardial infarction       | a. a blood clot that breaks loose and is carried by the bloodstream until it lodges in another part of the body             |
| _____ 2. cardiac arrhythmias         | b. the abrupt cessation of effective electrical activity within the heart                                                   |
| _____ 3. cardiogenic shock           | c. a complete absence of electrical activity within the heart                                                               |
| _____ 4. sudden cardiac arrest (SCA) | d. a blockage in one or more coronary arteries resulting in ischemia and then death of the heart muscle                     |
| _____ 5. thromboembolism             | e. irregular heart beat or rhythm; bradycardia or tachycardia                                                               |
| _____ 6. pericarditis                | f. a life-threatening condition that occurs when the heart can no longer pump effectively                                   |
| _____ 7. pericardial tamponade       | g. a sac formed by local dilation in a blood vessel                                                                         |
| _____ 8. aneurysm                    | h. inflammation of the pericardial sac that surrounds the heart                                                             |
| _____ 9. aortic dissection           | i. a condition in which the innermost lining of the aorta tears away from the arterial wall                                 |
| _____ 10. ventricular fibrillation   | j. a buildup of fluid in the sac surrounding the heart that can restrict the heart's ability to pump blood effectively      |
| _____ 11. asystole                   | k. a condition in which the ventricles contract in a wildly chaotic manner that prevents the heart from pumping effectively |

## True or False

Indicate whether each of the following statements is true (T) or false (F).

- \_\_\_\_\_ a. A cardiovascular problem is not considered serious until it causes signs and symptoms such as pain, nausea, or vomiting.
- \_\_\_\_\_ b. Most cardiovascular problems are not serious and can be readily treated or controlled with diet, exercise, and medication.
- \_\_\_\_\_ c. All suspected cardiovascular disorders must be considered serious until they are evaluated by a physician.
- \_\_\_\_\_ d. Although potentially serious, most cardiac problems are not truly emergent, and thus transport need not be rushed.



# Chapter Review

## Chapter Summary

Cardiovascular disease (CVD) is a common problem that affects millions of people around the world, and it may not be apparent until an emergency occurs. Physical exertion, such as that experienced when engaging in outdoor activities, places increased demands on the heart. If the heart is unable to meet those demands, it can become ischemic and begin to fail. Risk factors such as obesity, smoking, and poor diet all contribute to the occurrence of CVD. So, too, do untreated medical disorders such as uncontrolled hypertension and diabetes, as well as the use of certain illegal drugs.

Given the prevalence of CVD, it is highly likely OEC Technicians will encounter a patient experiencing a cardiovascular-related emergency. As part of the chain of survival, it is essential that OEC Technicians recognize the signs and symptoms associated with SCA and other common CVD-related emergencies early, initiate care quickly, and summon advanced assistance. These actions, in combination with early defibrillation, ALS intervention, and rapid transportation to a definitive-care facility, can significantly improve the survival rate from cardiovascular disease.

## Remember...

1. Cardiovascular disease is the number one cause of death worldwide.
2. If a cardiovascular emergency is suspected, immediately summon ALS assistance.
3. Chest pain and shortness of breath are serious symptoms that may indicate a life-threatening problem.
4. Shortness of breath or fatigue may be the only indications that a patient is having a cardiovascular emergency.
5. Administer high-flow oxygen to any patient complaining of chest pain or shortness of breath.
6. Any patient with chest pain, shortness of breath, or fatigue should be encouraged to seek medical care at a hospital.
7. A responsive patient experiencing presumed cardiac chest pain should be given an aspirin as soon as possible if permitted by local protocol.
8. When performing CPR, "Push hard, push fast" (greater than 100 times a minute), allowing full chest recoil and minimize any interruptions in compressions.
9. AEDs may be used on patients of any age.

## Chapter Questions

### Multiple Choice

Choose the correct answer.

1. The number one cause of death in the United States is \_\_\_\_\_.
  - a. motor vehicle accidents.
  - b. influenza.
  - c. cardiovascular disease.
  - d. HIV.
2. How much blood does the average adult heart pump each day? \_\_\_\_\_.
  - a. 500 gallons
  - b. 1,000 gallons
  - c. 1,500 gallons
  - d. 2,000 gallons
3. A common finding in someone who is having a "heart attack" is \_\_\_\_\_.
  - a. diaphoresis.
  - b. a swollen calf.
  - c. difficulty swallowing.
  - d. all of the above.
4. If a second dose of nitroglycerin is not helpful for a patient with AMI, and you cannot detect his pulse, the first thing you should do is \_\_\_\_\_.
  - a. give a third dose of nitroglycerin rapidly.
  - b. assess the patient's breathing.
  - c. administer oxygen.
  - d. start compressions.