

## ► Assessment in Action

You are in a crowded mall doing some last-minute holiday shopping. You hear someone yelling for help at a nearby store. You are the first to arrive on the scene. Bystanders begin to approach and ask what is going on. The person who called for help witnessed the victim collapse.

**Directions:** Circle Yes if you agree with the statement; circle No if you disagree.

- Yes No 1. The first thing you should do is conduct a secondary check.
- Yes No 2. Your primary check of the victim includes identifying and treating immediate life-threatening conditions such as problems with the victim's breathing and severe bleeding.
- Yes No 3. When conducting the secondary check, use the AVPU scale to determine physical injuries.
- Yes No 4. The victim is responsive and alert. Ask permission from him before beginning first aid.
- Yes No 5. The victim asks you to stay until medical help arrives. You should continue to do regular checks of the victim every 15 minutes until medical help arrives.

## ► Check Your Knowledge

**Directions:** Circle Yes if you agree with the statement; circle No if you disagree.

- Yes No 1. The purpose of a primary check is to find life-threatening conditions.
- Yes No 2. A quiet, motionless victim could indicate a breathing problem.

- Yes No 3. Most injured victims require a complete secondary check.
- Yes No 4. For a secondary check, you usually begin at the head and work down the body.
- Yes No 5. If the victim is not breathing, give two breaths before giving chest compressions.
- Yes No 6. The mnemonic DOTS helps in remembering what information to obtain about the victim's history that could be useful.
- Yes No 7. For all injured and suddenly ill persons, look for a medical identification tag during a secondary check.
- Yes No 8. The mnemonic SAMPLE can remind you how to examine an area for signs of an injury.
- Yes No 9. If there is more than one victim, go to the quiet, motionless victim first.
- Yes No 10. A gurgling sound heard while checking for breathing indicates possible fluid in the throat.

# CPR

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## chapter at a glance

- ▶ Heart Attack and Cardiac Arrest
- ▶ Caring for Cardiac Arrest
- ▶ Performing CPR
- ▶ Airway Obstruction

### ▶ Heart Attack and Cardiac Arrest

A **heart attack** occurs when heart muscle tissue dies because its blood supply is severely reduced or stopped. This often occurs because of a clot in one or more coronary arteries. The signs of a heart attack and the steps for caring for a heart attack are discussed in detail in the *Automated External Defibrillation* chapter.

If damage to the heart muscle is too severe, the victim's heart can stop beating—a condition known as cardiac arrest. Sudden **cardiac arrest** is a leading cause of death in the United States.

### ▶ Caring for Cardiac Arrest

Few victims experiencing sudden cardiac arrest outside of a hospital survive unless a rapid sequence of events takes place. One way of describing the ideal sequence of care that should take place when a cardiac arrest occurs is to think about the links in a chain. Each link is dependent on the others for strength and success. In this way, the links form a **chain of survival**.

The five events (links) that must occur rapidly and in an integrated manner during cardiac arrest are as follows:

1. *Recognition and Action* Recognizing the early warning signs of cardiac arrest and immediately calling 9-1-1 to activate emergency medical services (EMS)
2. *CPR* The chest compressions delivered during **cardiopulmonary resuscitation (CPR)** circulate blood to the heart and

brain. Effective chest compressions are critical to buying time until a defibrillator and EMS personnel are available.

3. **Defibrillation** Administering a shock to the heart can restore the heartbeat in some victims. Time is a critical factor. The earlier the shock, the better the chance of success.
4. **Advanced Care** Paramedics provide advanced cardiac life support to victims of sudden cardiac arrest. This includes providing IV fluids, medications, advanced airway devices, and rapid transportation to the hospital.
5. **Post-Arrest Care** The hospital can provide lifesaving medications, surgical procedures, and advanced medical care to enable the victim of sudden cardiac arrest to survive and recover.

## ► Performing CPR

When a victim's heart stops beating, he or she needs CPR, defibrillation, and EMS professionals quickly. CPR consists of moving blood to the heart and brain by giving **chest compressions** and providing periodic breaths to place oxygen into the victim's lungs. CPR techniques are similar for infants (birth to 1 year), children (1 year to puberty), and adults (puberty and older), with just slight variations.

### Check for Responsiveness and Breathing

In a motionless victim, check for responsiveness by tapping the victim's shoulder and asking if he or she is okay. If the victim does not respond (ie, answers, moves, or moans), he or she is said to be unresponsive.

At the same time you check for responsiveness, you should look at the victim to see whether he or

she is breathing. If the victim is not breathing or is only gasping, EMS professionals are needed. Ask a bystander to call 9-1-1. If you are alone with an adult victim and a phone is nearby, call 9-1-1 yourself. If you are alone with a child or infant, give CPR for five cycles of 30 compressions and two breaths (2 minutes); then call 9-1-1.

### Give Chest Compressions

Chest compressions are the most important step in CPR and, whenever possible, should be performed on a firm, flat surface. Perform chest compressions with two hands for an adult, one or two hands for a child, and two fingers for an infant. Effective compressions require rescuers to push hard and push fast. The chest of an adult should be compressed at least 20; the chest of a child about 20; and the chest of an infant about 1½. The desired hand position for chest compressions is in the center of the chest (lower half of the sternum [breast bone]) **Figure 1**.

Give compressions at a rate of at least 100 compressions per minute for adults, children, and infants. The 100-compression rate is not the actual number of compressions given in a minute; it is the speed of compressions. Give 30 compressions in about 18 seconds and then give two rescue breaths. Continue CPR until an automated external defibrillator (AED) becomes available, the victim shows signs of life, EMS personnel take over, or you are too tired to continue. Interruptions in compressions should be kept to a minimum. If other rescuers are available, they can rotate performing chest compressions after every five

## Q&A

**For CPR purposes, what defines an adult, child, and infant victim?**

- Infants are those less than 1 year of age.
- A child ranges from 1 year to puberty. (Puberty can be recognized by hair in the armpits of males and breast development in females.)
- Adults include those at puberty and older.



**Figure 1**

The hand position for chest compressions is in the center of the chest.

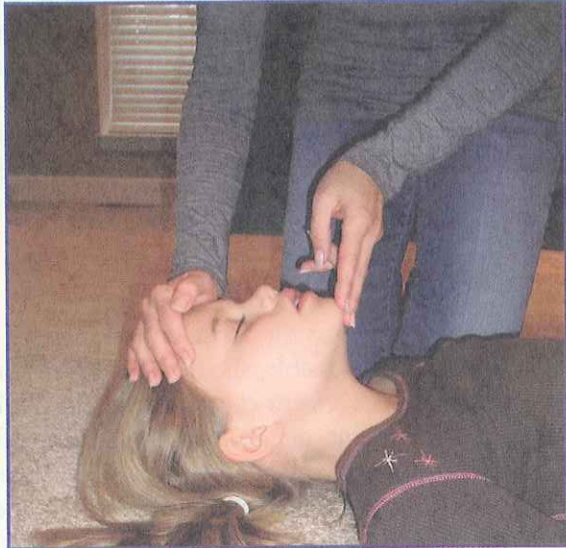


Figure 2

Tilt the victim's head back and lift the chin to open the airway.

cycles of 30 compressions and two breaths (2 minutes) or after an AED delivers a shock.

### Give Rescue Breaths

Tilt the victim's head back and lift the chin to open the airway **Figure 2**. This moves the tongue away from the back of the throat. Lay rescuers should use this method for all victims—even for those with a possible spinal injury. With the airway open, pinch the victim's nose and make a tight seal over the victim's mouth with your mouth. Give one breath lasting 1 second, take a normal breath for yourself, and then give the victim another breath lasting 1 second. Each rescue breath should make the victim's chest rise. Rescue breaths can cause stomach distention. Minimize this problem by limiting the force of your breath—you need only to make the victim's chest gently rise.

Other methods of rescue breathing are as follows:

- Mouth-to-breathing device
- Mouth-to-nose method
- Mouth-to-stoma method

### Mouth-to-Breathing Device

A breathing device is placed in the victim's mouth or over the victim's mouth and nose as a precaution



Figure 3

Barrier devices.

against disease transmission. There are several different types of barrier devices **Figure 3**.

### Mouth-to-Nose Method

If you cannot open the victim's mouth, the victim's mouth is severely injured, or you cannot make a good seal with the victim's mouth (for example, because there are no teeth), use the mouth-to-nose method. With the head tilted back, push up on the victim's chin to close the mouth. Make a seal with your mouth over the victim's nose and provide rescue breaths.

### Mouth-to-Stoma Method

Some diseases of the vocal cords may result in surgical removal of the larynx. People who have this surgery breathe through a small permanent opening in the neck called a stoma. To perform mouth-to-stoma breathing, close the victim's mouth and nose and breathe through the opening in the neck.

### Adult CPR

To perform adult CPR, follow the steps in

**Skill Drill 1**.

### Child CPR

To perform CPR on a child, follow the steps in

**Skill Drill 2**.

### Infant CPR

To perform CPR on an infant, follow the steps in

**Skill Drill 3**.

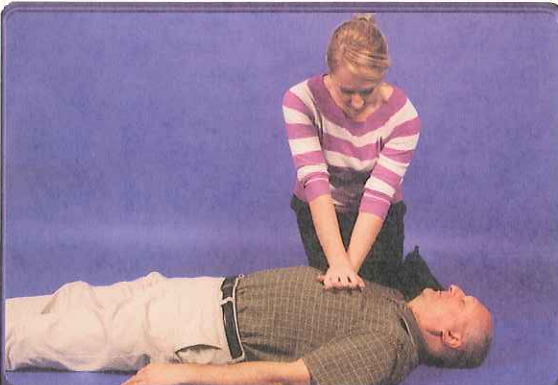
# skill drill

**1****Adult CPR**

**1** Check for responsiveness and breathing.



**2** Have a bystander call 9-1-1. If alone, call 9-1-1 yourself.



**3** If unresponsive and not breathing, provide 30 chest compressions hard and fast.

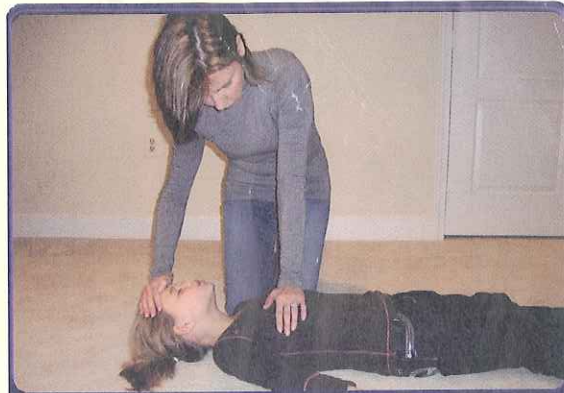


**4** Provide two rescue breaths. Repeat the compression and breath cycles until an AED is available or EMS personnel arrive.

# skill drill

**2****Child CPR**

**1** Check for responsiveness and breathing. Have a bystander call 9-1-1. If alone, give five cycles of CPR, then call 9-1-1.



**2** If unresponsive and not breathing, give 30 chest compressions using one or two hands.



**3** Provide two rescue breaths. Repeat the compression and breath cycles until an AED is available or EMS personnel arrive.

# skill drill

**3****Infant CPR**

**1** Check for responsiveness and breathing. Have a bystander call 9-1-1. If alone, give five cycles of CPR, then call 9-1-1.



**2** If unresponsive and not breathing, provide 30 chest compressions with two fingers.



**3** Provide two rescue breaths. Repeat the compression and breath cycles until an AED is available or EMS personnel arrive.

## ► Airway Obstruction

People can choke on all kinds of objects. Foods such as candy, peanuts, and grapes are major offenders because of their shapes and consistencies. Nonfood choking deaths are often caused by balloons, balls and marbles, toys, and coins inhaled by children and infants.

### Recognizing Airway Obstruction

An object lodged in the airway can cause a mild or severe **airway obstruction**. In a mild airway obstruction, good air exchange is present. The victim is able to make forceful coughing efforts in an attempt to relieve the obstruction. The victim should be encouraged to cough.

A victim with a severe airway obstruction will have poor air exchange. The signs of a severe airway obstruction include the following:

- Breathing becomes more difficult
- Weak and ineffective cough
- Inability to speak or breathe
- Skin, fingernail beds, and the inside of the mouth appear bluish gray (indicating cyanosis)

Choking victims may clutch their necks to communicate that they are choking **Figure 4**. This motion is known as the universal distress signal for choking. The victim becomes panicked and desperate.



Figure 4

The universal sign of choking.

## FYI

### The Tongue and Airway Obstruction

Airway obstruction in an unresponsive victim lying on his or her back is usually the result of the tongue relaxing in the back of the mouth, restricting air movement. Opening the airway with the head tilt–chin lift method may be all that is needed to correct this problem.

### Caring for Airway Obstruction

For a responsive adult or child with a severe airway obstruction, ask the victim “Are you choking?” If the victim is unable to respond, but nods yes, provide care for the victim. Move behind the victim and reach around the victim’s waist with both arms. Place a fist with the thumb side against the victim’s abdomen, just above the navel. Grasp the fist with your other hand and press into the abdomen with quick inward and upward thrusts (Heimlich maneuver). Continue thrusts until the object is removed or the victim becomes unresponsive. If a rescuer is unable to encircle an obese victim’s abdomen, chest thrusts should be applied. For a choking pregnant woman in the late stages of pregnancy, the rescuer should use chest thrusts instead of abdominal thrusts.

To relieve airway obstruction in a responsive adult or child who cannot speak, breathe, or cough, follow the steps in **Skill Drill 4**.

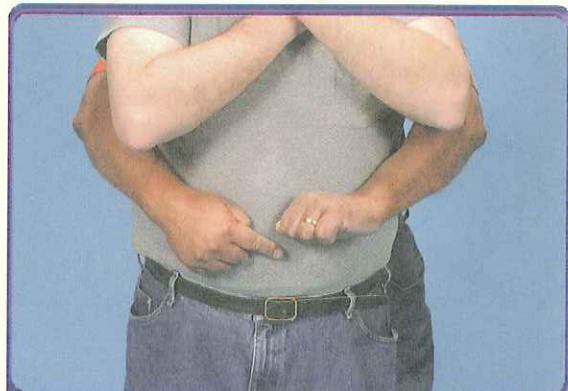
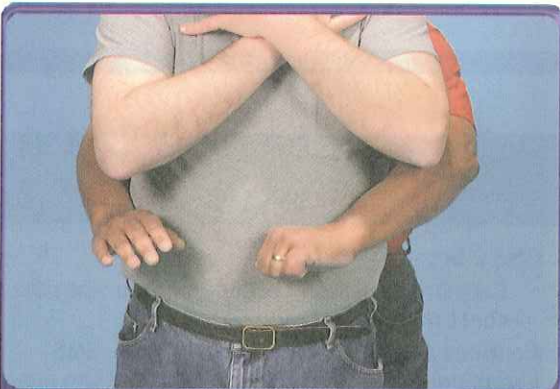
For a responsive infant with a severe airway obstruction, give back blows and chest compressions instead of abdominal thrusts to relieve the obstruction. Support the infant’s head and neck and lay the infant face down on your forearm, then lower your arm to your leg. Give five back blows between the infant’s shoulder blades with the heel of your hand. While supporting the back of the infant’s head, roll the infant face up and give five chest compressions with two fingers on the infant’s sternum in the same location used for CPR. Repeat these steps until the object is removed or the infant becomes unresponsive.

To relieve airway obstruction in a responsive infant who cannot cry, breathe, or cough, follow the steps in **Skill Drill 5**.

If a choking victim becomes unresponsive, immediately call 9-1-1 and begin CPR. Each time the airway is opened during CPR, the rescuer should look for an object in the victim’s mouth and, if seen, remove it.



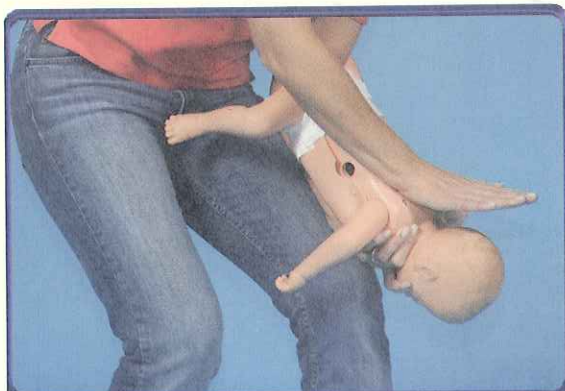
# skill drill

**4****Airway Obstruction in a Responsive Adult or Child****1** Check victim for choking.**2** Locate the navel.**3** Place thumb side of fist just above the navel.**4** Place other hand on top of first hand and give abdominal thrusts until object is removed.

## skill drill

5

### Airway Obstruction in a Responsive Infant



- 1** Support the infant's head, neck, and back. Give five back blows.



- 2** Give five chest compressions.

### CPR and Airway Obstruction Review

#### CPR

These steps are the same for all victims regardless of age:

1. Check for responsiveness and look for signs of breathing and gasping.
  - If the victim is unresponsive and has normal breathing, place the victim in the recovery position, and have someone call 9-1-1.
  - If the victim is unresponsive and has abnormal breathing (not breathing or only gasping), have someone call 9-1-1, and retrieve an AED if available. Perform Steps 2 through 5.
2. Provide chest compressions:
  - Give 30 chest compressions in the center of the victim's chest.
3. Open the airway:
  - Tilt the victim's head back and lift the chin.

#### 4. Give 2 breaths:

- Each breath lasts 1 second to produce visible chest rise.

5. Continue CPR until an AED is available, EMS personnel take over, or the victim starts to move.

#### Airway Obstruction

For responsive adults and children (anyone older than 1 year):

1. Check for choking.
2. Provide abdominal thrusts (Heimlich maneuver).

For responsive infants (birth to 1 year):

1. Support the infant's head, neck, and back.
2. Alternate five back blows followed by five chest compressions repeatedly.

**Q&A****Why change the sequence from A-B-C to C-A-B?**

Chest compressions are critical to resuscitating a cardiac arrest victim. The A-B-C sequence involved opening the airway, giving rescue breaths, and perhaps getting and placing a mouth-to-barrier device. This delayed the giving of chest compressions. The C-A-B shortens the time for giving the first chest compressions. Giving chest compressions first may also encourage rescuers to begin CPR, because most victims of out-of-hospital cardiac arrest do not receive any bystander CPR.

**Q&A****Why isn't the pulse checked?**

Studies show that lay rescuers as well as health care providers take too long to check for a pulse and have difficulty determining whether a pulse is present. Taking too long delays giving chest compressions.

## Lay Rescuer Adult CPR

Use the mnemonic RAP-CAB to remember what to do. Start as soon as possible!

R: Responsive? Tap shoulder and shout, "Are you OK?" Check for breathing and gasping.

If ...	Then ...
Unresponsive and gasping or not breathing	Go to next step (A). Gasping is a sign of cardiac arrest.
Unresponsive and breathing normally	Place victim in recovery position (on victim's side with lower arm in front of body). For a suspected spinal injury, extend arm above head and roll body to the side so victim's head rests on extended arm.

A: Activate EMS. Call 9-1-1.

If ...	Then ...
Alone	Immediately call 9-1-1 (EMS) and get AED, if available. Then, return to the victim to attach and use AED.
Second rescuer is available	While one calls 9-1-1 and gets an AED, if available, the other goes to steps (P) and (C).

P: Position victim on back, on a flat, firm surface.

C: Chest compressions. Push hard and fast.

Where to place hands?	How deep?	How fast?	How many?
Place the heel of your hand in center of chest with the other hand on top and fingers interlaced.	Push down on chest at least 2". Allow chest to recoil completely before the next compression.	Push chest at rate of at least 100 pushes per minute (the same beat of the Bee Gee's song, "Stayin' Alive").	Give 30 compressions without interruption unless AED arrives. (AED should be used immediately.)

A: Airway open. Open the victim's airway using the head tilt–chin lift method for all victims.

B: Breaths. Pinch the victim's nose and make an airtight mouth-to-mouth seal. Use a CPR mask if available. Give two breaths (1 second each) that make chest rise.

If ...	Then ...
Two breaths make chest rise	Begin CPR: <ul style="list-style-type: none"> <li>• 30 compressions (push hard and fast).</li> <li>• Two breaths (1 second each). Take a regular breath, not a deep breath, between the two breaths.</li> <li>• Continue 30:2 compression-breath ratio until AED arrives and is ready to use, or until trained person or EMS provider takes over.</li> <li>• Do not stop to check for breathing.</li> </ul>
First breath does not make chest rise; the airway may be blocked.	Retilt head, give a second breath: <ul style="list-style-type: none"> <li>• If second breath does not make chest rise, begin CPR (30 compressions and two breaths). Each time the airway is opened during CPR, look for an object in the victim's mouth and, if found, remove it.</li> </ul>

## Quick Review of Lay Rescuer Basic Life Support Using the RAP-CAB Steps

Steps/Action	Adults (at or above puberty)	Child (1 year to puberty)	Infant (<1 year)
R = Responsive?			
Technique	Tap shoulder and shout "Are you OK?" If the victim does not answer, move, or moan, he/she is unresponsive.		
Breathing?	If not breathing or only gasping, CPR is needed. If normal breathing is seen, no CPR is needed; place in recovery position and monitor breathing		
A = Activate Emergency Medical Service (EMS) and get AED (if nearby and accessible; use as soon as possible)			
When	If one rescuer: Call immediately If two rescuers: One calls immediately	If one rescuer: Call after five cycles (2 minutes) of CPR If two rescuers: One calls immediately	
Who to call	In a community: Call 9-1-1 In a facility or institution: Call its emergency number		
P = Position on back (on firm, flat surface)			
C = Chest compressions			
Where to place hand	Center of chest		Two fingers, with one touching and below nipple line
Technique: • Push hard and fast • Allow complete recoil	Two hands: Heel of one hand on breastbone; other hand on top	One hand: Heel of one hand only Two hands: Heel of one hand with second on top	Two fingers
Depth	At least 2" (5 cm)	About 2" (5 cm)	At least 1½" (4 cm)
Rate	At least 100 per minute (same beat as the Bee Gee's song, "Stayin' Alive")		
Ratio of chest compressions to breaths	30:2		
A = Airway open			
Technique	Head tilt-chin lift		
	<ul style="list-style-type: none"> <li>• Pinch nose and make airtight mouth-to-mouth seal</li> <li>• Give two breaths:               <ul style="list-style-type: none"> <li>• Each breath lasting 1 second</li> <li>• Blow enough to make chest rise</li> </ul> </li> <li>• If first breath does not cause chest to rise, retilt head and give second breath. If second breath does not make chest rise, begin CPR (30 compressions and two breaths). Each time the airway is opened, look for an object in mouth and, if seen, remove it.</li> </ul>	<ul style="list-style-type: none"> <li>• Cover the infant's mouth and nose with your mouth, making an airtight seal. If this does not work, try either mouth-to-mouth or mouth-to-nose</li> <li>• Same procedures as for an adult and child.</li> </ul>	

(continues)

Steps/Action	Adults (at or above puberty)	Child (1 year to puberty)	Infant (<1 year)
Continue CPR until:			
<ol style="list-style-type: none"> <li>1. Victim begins breathing</li> <li>2. Other rescuer(s) (ie, trained lay person, EMS personnel) take over</li> <li>3. AED arrives and is used</li> <li>4. Rescuer is physically exhausted and unable to continue</li> </ol>			
Defibrillation			
<ul style="list-style-type: none"> <li>• Use AED as soon as possible.</li> <li>• Expose chest, turn on AED, attach appropriate pads.</li> <li>• Follow voice directions</li> </ul>			
If no shock advised	Resume CPR immediately (five sets of 30 compressions and two breaths)		
If shock advised	Do not touch victim; give one shock. Or, shock as advised by AED. Resume immediately 30 compressions and two breaths.		

# prep kit

## ► Ready for Review

- A heart attack occurs when heart muscle tissue dies because the blood supply is severely reduced or stopped.
- The five links in the chain of survival are: recognition and action, CPR, defibrillation, advanced care, and post-arrest care.
- CPR consists of moving blood to the heart and brain by giving chest compressions and breathing oxygen into a victim's lungs.
- The signs of a severe airway obstruction include difficult breathing, weak and ineffective cough, inability to speak or breathe, and signs of cyanosis.

## ► Vital Vocabulary

**airway obstruction** A blockage, often the result of a foreign body, in which air flow to the lungs is reduced or completely blocked.

**cardiac arrest** Stoppage of the heartbeat.

**chain of survival** A concept involving five critical links to help improve survival from cardiac arrest.

**chest compressions** Depressing the chest and allowing it to return to its normal position as part of CPR.

**cardiopulmonary resuscitation (CPR)** The act of providing chest compressions and rescue breaths for a victim in cardiac arrest.

**heart attack** Death of a part of the heart muscle.

## ► Assessment in Action

You are having dinner in a very crowded restaurant with your family on New Year's Eve. An elderly man is pushing a piano into the restaurant as part of the entertainment that evening. As he passes your table, he clutches his chest and falls to the floor. He is not moving.

**Directions:** Circle Yes if you agree with the statement; circle No if you disagree.

- Yes No 1. If he is not breathing or is breathing abnormally, you should next call 9-1-1.
- Yes No 2. The man must be choking since he is in a restaurant.
- Yes No 3. Perform abdominal thrusts.

- Yes No 4. Perform cycles of 30 chest compressions and 2 breaths.
- Yes No 5. Check for breathing before giving any breaths to the victim.
- Yes No 6. Continue CPR until an AED becomes available or EMS personnel arrive.

## ► Check Your Knowledge

**Directions:** Circle Yes if you agree with the statement; circle No if you disagree.

- Yes No 1. Gaspings is not considered breathing.
- Yes No 2. After you determine that an adult victim is unresponsive, the next step is for someone to call 9-1-1.
- Yes No 3. Tilting the head back and lifting the chin helps move the tongue and open the airway.
- Yes No 4. If you determine that a victim is not breathing, begin chest compressions.
- Yes No 5. Do not start chest compressions until you have checked for a pulse.
- Yes No 6. For all victims (adult, child, infant) needing CPR, give 30 compressions followed by two breaths.
- Yes No 7. Use two fingers when performing CPR on an infant.
- Yes No 8. A sign of choking is that the victim is unable to speak or cough.
- Yes No 9. To give abdominal thrusts to a responsive choking victim, place your fist below the victim's navel.
- Yes No 10. When giving abdominal thrusts to a responsive choking victim, repeat the thrusts until the object is removed or the victim becomes unresponsive.

# Automated External Defibrillation

5

## chapter *at a glance*

- ▶ **Public Access Defibrillation**
- ▶ **How the Heart Works**
- ▶ **Care for Cardiac Arrest**
- ▶ **About AEDs**
- ▶ **Using an AED**
- ▶ **Special Considerations**
- ▶ **AED Manufacturers**

### ▶ **Public Access Defibrillation**

A victim's chance of survival dramatically improves through early cardiopulmonary resuscitation (CPR) and early **defibrillation** with the use of an **automated external defibrillator (AED)**. To be effective, defibrillation must be used in the first few minutes following cardiac arrest. The implementation of state public access defibrillation (PAD) laws and the Food and Drug Administration's (FDA) approval of "home use" AEDs have made this important care step available to many rescuers in many places, including the following **Figure 1**:

- Airports and airplanes
- Stadiums
- Health clubs
- Golf courses
- Schools
- Government buildings
- Offices
- Homes
- Shopping centers/malls

### ▶ **How the Heart Works**

The heart is an organ with four hollow chambers. The two chambers on the right side receive blood from the body and send it to the lungs for oxygen. The two chambers on the left side of the heart receive