

**Incidence and Cost of Cardiovascular Disease**

Cardiovascular disease (CVD) is one of the biggest killers in America, accounting for nearly 50% of all deaths. CVD includes stroke, rheumatic heart disease, coronary heart disease (CHD), and hypertension. The cost of treating these diseases is estimated at more than \$85 billion annually.

Basic Life Support encompasses three areas:

- 1) Early recognition of cardiac or respiratory emergencies
- 2) Action to gain prompt entry into the Emergency Medical Services (EMS) System
- 3) CPR on the cardiac or respiratory arrest victim

**Risk Factors**

There are a number of risk factors for developing CVD. Some are controllable; some are not.

The *uncontrollable risk factors* are:

- 1. Increased age
- 2. Gender
- 3. Heredity

*Major risk factors we can control* are:

- 1. Smoking
- 2. High blood pressure
- 3. High serum cholesterol levels
- 4. Physical inactivity

Other contributing risk factors: diabetes, obesity, and excessive stress. Decreasing the risk of heart disease will increase survival after a heart attack. The more risk factors that a person has, the greater risk they are for having a heart attack.

The most effective way to decrease high blood pressure is weight loss and lower sodium intake. Also by replacing animal products with fish, soy products, grains, fruits and vegetables, and an increase in physical activity we can help reduce high cholesterol levels. It is also a fact that if person quits smoking, after a period of years, the death rate from coronary heart disease is nearly as low as that of people who have never smoked.

**Respiratory Arrest**

Respiratory Arrest can be caused by several different things: Drug overdose, stroke, cardiac arrest, drowning, electrocution, suffocation, allergic reaction which causes an airway obstruction, smoke inhalation, toxic fume inhalation . . . Early intervention for victims in whom respirations have stopped or the airway is obstructed may prevent cardiac arrest. The best way to determine respiratory arrest is to look, listen and feel as follows:

- Look** - for the chest or upper abdomen to move,
- Listen** - for air movement through the nose or mouth,
- Feel** - for minimal or absent respiratory effort.

Establishing a good airway and delivering rescue breathing can save many lives in persons with inadequate respirations. The proper technique to open an unconscious victim's airway is the use the head-tilt/chin-lift. If you suspect a head or neck injury use the jaw-thrust method to open the airway.

If a victim has agonal breathing (a form of inadequate ventilations), the rescuer should open the victim's airway and attempt two breaths and continue rescue breathing while checking for a pulse regularly.

### Coronary Heart Disease

Coronary heart disease is manifested in three main categories of clinical syndromes:

- 1) **Angina Pectoris**- a transient chest pain, usually lasting for not more than a few minutes (2-15), due to a temporary lack of blood supply to the heart muscle.
- 2) **Acute Myocardial Infarction (Heart Attack)** - a sustained lack of oxygen to heart muscle that leads to tissue death. It predisposes to electrical instability which can lead to cardiac arrest, which is the greatest danger of a heart attack.
- 3) **Sudden Cardiac Death** - heartbeat stops abruptly or unexpectedly. In some victims, this may be the first manifestation of CHD.

### Symptoms of Myocardial Infarction (MI)

Because angina may progress to acute MI, and MI may progress to sudden cardiac death, it is important to recognize the symptoms of MI. Typically; they include one or more of the following:

- 1) **Pain or Pressure**, usually described as "crushing" or a tightness, located in the middle of the chest behind the breastbone. It may radiate to one or both shoulders, the neck, jaw, or back. Some victims say it feels like bad indigestion; usually lasting more than 2 minutes.
- 2) **Sweating**. The victim may experience profuse sweating. The skin may be cool or clammy.
- 3) **Nausea**. This occurs frequently. If the victim becomes unconscious, it is important to position him/her to prevent aspiration if vomiting occurs.
- 4) **Shortness of breath**. The victim may complain of difficulty breathing.

More than half of all heart attack deaths occur before the victim reaches the hospital, most within 2 hours of the onset of symptoms. Many of these deaths could be prevented by seeking medical help sooner. There is a tendency for victims to deny that they are having a heart attack, but if the symptoms persist for more than 2 minutes, even if nitroglycerin is being administered, first have the person sit or lay down comfortably and then call 9-1-1. Do not try to drive the person to the hospital yourself or call their physician. Call EMS.

### Symptoms of a Stroke

1. Loss or altered level of consciousness
2. Loss of use on one side of the body or face - paralysis or weakness
3. Head pain
4. Difficulty reasoning / loss of speech
5. Blurred or double vision
6. Unexplained dizziness or sudden falls
7. Weakness

If a rescuer suspects stroke in a victim, EMS should be activated immediately. Because of loss of muscle tone and paralysis, upper airway occlusion can occur, victim should be monitored closely.

### Clinical and Biological Death

When the heart stops beating, respirations will also stop within a few seconds. This state is termed "clinical death." IT IS REVERSIBLE in many cases, if CPR is started promptly or within the 4-6 minute window. Without intervention, permanent damage to the brain occurs. This is termed "biological death", and no amount of CPR or technology will reverse it.

**Non-Cardiac Causes of Cardiac Arrest**

Besides CHD, there are several other causes of cardiac arrest that may require CPR. These include drowning, hypothermia, allergic reactions, electric shock, suffocation, trauma, stroke, and seizures. The leading cause of death in children is injury and the most frequent cause of cardiac arrest is severe airway and breathing problems as a result of preventable accidents, (nearly half by motor vehicle trauma). In infants, the most frequent cause of cardiac arrest is respiratory arrest.

**Time Is Everything**

The longer the delay in starting CPR, the greater the chance of brain damage or death. In general, if CPR is started within:

- 0-4 minutes, survival rates are about 50%.
- 4-6 minutes, poor survival rates, probable brain damage.
- 6-10 minutes, very low survival rates, almost certain brain damage.
- Over 10 minutes, not much point in resuscitating.

Immediate CPR by a witness and defibrillation within 2-3 minutes give the best chance of survival from cardiac arrest. It is frequently not known, however, how long a victim has been pulseless or without respirations, and CPR should be attempted. Such is the case in cold water drowning. Successful resuscitation has been reported even after submersion times of up to 45 minutes. In a hypothermia victim, everything is slowed significantly, such as their pulse (only beating once every 35-45 seconds in some cases). In any event, the sooner CPR is started, the better the victim's chances of meaningful survival.

Once CPR is started, you should always continue until someone else takes over, a physician makes the decision to stop, an advance directive is presented, the person is revived, or you are physically exhausted and unable to continue.

**Performing CPR**

The first step is assessment. When assessing the airway, it is not uncommon to encounter difficulty in ventilating the victim. If the airway seems obstructed after the initial attempt to ventilate an unconscious victim, the first thing the rescuer should do is reposition the head and try again. This ensures that the airway is open properly which is commonly the cause of an obstructed airway in an unconscious victim.

CPR should only be performed on someone who needs it. It is therefore important to determine absence of breathing and/or pulse before beginning CPR. In Adults, children or infants - if the rescuer is alone and witnessed the arrest he/she should contact EMS/911 immediately. If the rescuer is alone and comes upon an unresponsive victim he/she should perform CPR for 5 cycle or 2 minutes before contacting EMS/911. If there are two rescuers, one should activate the EMS and get an AED if available, while the second performs CPR.

When performing CPR the “pump and blow” of CPR, you are providing a flow of oxygen and blood to the heart and brain by blowing oxygen into the lungs and then compressing the heart simulating breathing and a heart beat. The target compression rate for adults, children, and infants is 100 compressions per minute. When compressing the chest the best way to allow the chest to fully recoil is to take your weight off your hands without losing contact with the chest.

When performing chest compressions a rescuer should “pump hard and fast”. Compression and release time should be equal, and the chest should be allowed to return to normal position on release. The appropriate ratio of the compression-release cycle needed to achieve maximal arterial

pressure is 50% compression, 50% release. Effectiveness of compressions can be evaluated by checking for transmitted pulse during the performance of compressions. When performing chest compressions the rescuer should minimize interruption in compression to increase the victim's chances of survival.

There are a number of other problems that may be encountered while performing CPR, such as:

- 1) **Vomiting.** If this occurs, turn victim to their side, sweep out mouth, resume CPR.
- 2) **Gastric distention.** Poor airway position, breaths too quickly, or using too much force or volume to ventilate can cause more air to enter the victim's stomach instead of the lungs causing a grossly distended abdomen. When ventilating, the exhalation phase is the result of the chest's normal relaxation. If adequate time is not allowed for this, the risk of gastric distention increases. Cricoid pressure may be needed to help prevent gastric insufflation and regurgitation.
- 3) **Inadequate ventilation** may be caused by gastric distention, inadequate head-tilt, or lack of an airtight seal. Example: dentures - (if they cannot be kept in place, remove).
- 4) **Thoracic injuries.** Even with the hands properly placed on the lower half of the sternum, it is possible that the victim will suffer fractured ribs or sternum, punctured lungs, bruised heart, cartilage separation, or lacerated liver. If your hand position is correct, you should continue with CPR. Most commonly, there are no thoracic injuries due to CPR in infants and children.
- 5) **Communicable disease transmission.** In order to minimize possibility of transmission during mouth-to-mouth ventilations, a barrier device (mouth to mask always protects the rescuer and is a reliable form of ventilation because it allows two hands to create a mask seal) following OSHA universal precautions should be used.
- 6) **Mouth to mouth is not possible** - If a stoma is present, the rescuer can blow directly into the stoma opening at the same rate a volume as blowing into the mouth. If there is injury to the mouth that would prevent a tight seal while ventilating mouth to nose ventilations are used. Ventilations are done by the rescuer's mouth being placed over the nose of the victim while holding the victim's mouth closed.
- 7) **Legal Consequences.** The "Good Samaritan" legislation is in place to help *minimize the fear of possible legal consequences* for performing CPR on a victim in need.
- 8) **Hyperextension of infant's airway** - may obstruct the airway. Sniff position is recommended. Airway should be maintained during chest compressions to allow rapid coordination of compressions and ventilations.
- 9) **Neck injury** - in this case, instead of the head tilt-chin lift, the rescuer should use the jaw thrust technique with cervical spine immobilization.

### Two Rescuer CPR

In 2 rescuers CPR, it is important not to interrupt CPR for more than 10 seconds. When switching places, the change is made when the compressor calls for it. Also, please note that in 2 rescuers

CPR, the ratio of compressions to ventilations is 30:2 for adults and 15:2 for children and infants. For the exact performance standard see performance standard sheets at the end of this syllabus.

### **Recovery Position**

If a person is breathing and has a heart rate but still is unconscious, place victim in the recovery position (on their side) until the EMS arrives. When putting a victim in the recovery position, the head, shoulders and torso should move simultaneously without twisting. It is more likely that the airway will remain open while in the recovery position.

### **Automatic External Defibrillators (AED)**

Early defibrillation is critical for victims of sudden cardiac arrest. Ventricular fibrillation (VF) is the most frequent initial rhythm of witnessed cardiac arrest. The most effective treatment for VF is electrical defibrillation. Performance of CPR while awaiting the arrival of the AED appears to prolong VF and preserve heart and brain function. CPR alone will not convert VF to a normal rhythm. Early defibrillation in adults is important because successful defibrillation diminishes rapidly over time.

AEDs are automated external defibrillators. The word automated actually means semiautomated, because most commercially available AEDs will “advise” the operator that a shock is indicated but will not deliver a shock without an action by the rescuer. AEDs are designed to recognize either VF or pulseless ventricular tachycardia (VT). Early CPR and defibrillation within 3-5 minutes increases the survival rate of victims in sudden cardiac arrest by 50%.

AEDs should be used only in patients with the following 3 clinical findings: 1) Unresponsive, 2) no effective breathing, and 3) no signs of circulation. The following situations may require the operator to take additional actions before using an AED or during its operation:

- The victim is immersed in water or water is covering the victim’s chest
  - o Remove the victim from the water unto a dry space and dry the victim off
- The victim has an implanted pacemaker/defibrillator
  - o Place electrode pad to the side of the implanted device
- Transdermal medication patch is located on the surface of the victim’s skin where the AED electrode pads are placed
  - o Remove patch and wipe area clean and dry before attaching pad

Cardiac arrest is less common in children than in adults, and respiratory arrest is a far more common cause of arrest in children than sudden cardiac arrest. Several manufacturers now market AEDs that accommodate both adult electrode pads and pediatric cable-pad systems that attenuate the delivered energy to a dose more appropriate for children under the age of 8 years. AEDs may be used for children 1 to 8 years of age with no signs of circulation after 1 minute of CPR. Ideally the device should deliver a child dose. If using a pediatric defibrillator with adult pads ensure proper placement of pads without overlapping the pads.

The proper sequence in the use of an AED is as follows:

1. Turn on the AED
2. Attach AED pads to the victim as instructed on the package
3. Clear the victim and allow the AED to analyze the rhythm
4. Clear the victim and deliver a shock if advised.

If you or someone is touching the victim during the analyze phase, the AED could interpret the movement as a rhythm. If you or someone is touching the victim during the shock phase, the AED

will deliver a shock to you or the other person as well as the victim. If after the shock or if the AED does not advise to shock, the rescuer should leave the pads in place and continue CPR.

**Airway Obstruction**

**Adults** - One of the most frightening things that can happen to a conscious person is to lose the ability to breathe. If a person is coughing forcefully, with a partial airway obstruction, he should be left alone. A complete airway obstruction prevents any verbal response. Ask a conscious victim, "Are you choking?" If no response, begin the abdominal thrusts (Heimlich Manuever). If you are unsuccessful and the person becomes unconscious, he should be lowered to the ground face up. Perform a tongue-jaw lift, finger sweep, attempt to ventilate, check a pulse and perform CPR. When performing CPR on an unconscious choking victim the rescuer should check the victim's mouth before each set of ventilations. **Children/Infants** - A weak ineffective cough, high-pitched noises while inhaling, increasing respiratory difficulty, and bluish skin are signs of a partially obstructed airway with poor air exchange. The most common cause of airway obstruction in unconscious children is improper opening of the airway. Actions to follow are outlined in the performance study sheet.

**Barrier Devices**

One of the most effective techniques in reducing disease transmission during CPR is to wear gloves and use a barrier device with a one-way valve to provide ventilation.

**Performance Expectations**

To renew as a Basic Life Support Provider, you will be expected to complete the following:

- 1) Demonstrate the skills outlined on the attached performance sheets without coaching. You are expected to be ready to test at your appointment time.
- 2) Successfully complete a 25 -question written test, 84% passing.

**REMINDER:** *Bring your current BLS card to the testing session. You will be required to show it to the instructor.*

## Cardiopulmonary Resuscitation (CPR) One Rescuer

	Objectives	Actions		
		Adult (over 8 years)	Child (1 to 8 years)	Infant (under 1 year).
<b>A. Airway</b>	1. Determine unresponsiveness.	Shout, "Are you okay?" and tap or gently shake the victim.		Speak loudly while tapping soles of feet.
	2. Get help.	Call out "Help!" Anyone who comes activate EMS. If no one comes and you witnessed the arrest contact EMS immediately, if you did not witness the arrest perform CPR for 2 minutes before contacting EMS.		
	3. Position the victim.	Turn on back as a unit, supporting head and neck if necessary.		
	4. Open the airway.	Head-tilt/chin-lift. Fingers on the bony part of the chin.	Nose, sniffing position. Don't overextend neck.	
<b>B. Breathing</b>	5. Assessment: Determine breathlessness.	Maintain open airway. Place ear over mouth, observing chest. Look, listen, feel for breathing. (3-5 seconds).		
	6. If not breathing, give 2 rescue breaths.	Seal mouth to mouth.		Seal mouth around nose and mouth.
		Give 2 slow breaths, 1 second each. Observe chest rise. Allow lung deflation between breaths.		
	If air does not go in	Reposition and try again.		
	If air does not go in	See Foreign Body Airway Obstruction Management.		
<b>C. Circulation</b>	7. Determine pulselessness.	Feel for carotid pulse with one hand (5-10 seconds); maintain head-tilt with the other.		Feel for brachial pulse (5-10 sec); keep head-tilt.
	If pulse but no breathing:	Rescue Breathing: One breath every 5 seconds (12 times per minute).	Rescue Breathing: Give one breath every 3 seconds (20 times per minute).	
	If no pulse, begin chest compressions:	Place hands directly between the nipples.		Imagine a line drawn between the nipples. Place 2-3 fingers on sternum, 1 finger's width below nipple line.
	8. Landmark check.			
	9. Hand position / finger position.	Two hands directly between the victim's nipples. (For children one or two hands optional)		
	10. Compression depth.	Depress 1-1/2 to 2 inches.	Compress 1/3 to 1/2 the depth of the chest.	
11. Compression rate.	100 per minute.			
<b>CPR Cycles</b>	12. Compressions to breaths.	30 compressions to 2 breaths allowing the chest to completely rise during each compression.		
	13. Number of cycles.	5 Cycles.		
	14. Reassess pulse	Once CPR is initiated you do not stop for a pulse check unless the victim shows signs of recovery (i.e. the victim starts breathing or has movement).		

## Adult Two-Rescuer CPR

Step	Objective	Critical Performance
1. AIRWAY	<b>One rescuer (ventilator):</b> Assessment: Determine unresponsiveness.	Tap or gently shake shoulder. Shout, "Are you OK?", If no response, have second rescuer activate EMS and start CPR.
	Position the victim..	Turn on back if necessary.
	Open the airway.	Head-tilt, chin-lift.
2. BREATHING	Assessment: Determine breathlessness.	Look, listen, and feel. (3-5 seconds).
	Ventilate twice.	Each breath should last no longer than 1 second. Observe chest rise.
3. CIRCULATION	Assessment: Determine pulselessness.	Feel for carotid pulse. (5-10 seconds).
	State assessment results.	Say, "No pulse".
	<b>Other rescuer (compressor):</b> Get into position for compressions.	Hands, shoulders in correct position. Hands at landmarks directly between nipples..
4. Compression/ Ventilation	<b>Compressor:</b> Begin chest compressions.	Correct ratio compressions/ventilations: 30:2 for adults and 15:2 for children and Infants.. Compression rate: 100 per minute. Stop compression to allow time for a slow ventilation.
	<b>Ventilator:</b> Ventilate twice after every 30 (adult) or 15 (child) compressions and check compression effectiveness.	Ventilate 2 times (2 seconds). Check pulse occasionally to assess compressions. Effectiveness can be evaluated by monitoring a transmitted carotid or arterial pulse during compressions. Ventilator should assess depth and rate of compressions.
5. Call for Switch	<b>Compressor:</b> Call for switch when fatigued.	Give clear signal to change. (Switch and two, and three, and four, and five, etc.). Compressor completes 30th compression. Ventilator completes ventilation after 30th compression.
6. Switch simultaneously  Switch should take no longer than 10 seconds	<b>Ventilator:</b>	Move to chest. Become compressor. Get into position for compressions. Locate landmark notch. Start compressions
	<b>Compressor:</b>	Move to head. Become ventilator.
7. Continue CPR	Resume compression/ventilation cycles.	Resume Step 4.

- **(a)** If CPR is in progress with one rescuer (lay person), the entrance of the two rescuers occurs after the completion of one rescuer's cycle of 30 compressions and 2 ventilations. The EMS should be activated first. The two new rescuers start with Step 6.
- **(b)** If CPR is in progress with one healthcare provider, the entrance of a second healthcare provider is at the end of a cycle after check for pulse by first rescuer. The new cycle starts with compressions by the second rescuer.

During practice and testing only one rescuer actually ventilates the manikin. The other rescuer simulates ventilation.

## Foreign Body Airway Obstruction Management

	Objectives	Actions		
		Adult (over 8 years)	Child (1 to 8 years)	Infant (under 1 year)
<b>Conscious Victim</b>	1. Assessment: Determine airway obstruction.	Ask, "Are you choking?" Determine if victim can cough or speak.		Observe breathing difficulty.
	2. Act to relieve obstruction.	Perform subdiaphragmatic abdominal thrusts (Heimlich maneuver).		Give 5 back blows. Give 5 chest thrusts.
	3. Be persistent.	Repeat Step 2 until obstruction is relieved or victim becomes unconscious.		
<b>Victim Who Becomes Unconscious</b>	4. Position the victim; call for help, EMS.	Turn on back as a unit, supporting head and neck, face up, arms by sides. Call out, "Help!" Activate EMS.	Turn on back as a unit, supporting head and neck, face up, arms by sides. If anyone else is present activate EMS, otherwise EMS is not activated until after the first minute.	
	5. Check for foreign body.	Perform tongue-jaw lift and finger sweep if you can visualize the object.		
	6. Give rescue breaths.	Open the airway with head-tilt/chin-lift. Try to give rescue breaths. If unsuccessful reposition head and try breaths again.		
	7. Start CPR	Perform CPR as stated in previous performance standards.		
	8. Check for foreign body.	Perform tongue-jaw lift and look to see if you can visualize the obstructing object. If you see the object, remove it.		
	9. Try again to give rescue breaths.	Open the airway with head-tilt/chin lift. Try to give rescue breaths. If unsuccessful reposition head and try breaths again.		
10. Be persistent.	Repeat Steps 7-9 until obstruction is relieved.			

(continued)

## Foreign Body Airway Obstruction Management (cont.)

	Objectives	Actions		
		Adult (over 8 years)	Child (1 to 8 years)	Infant (under 1 year)
<b>Unconscious Victim</b>	1. Assessment: Determine unresponsiveness.	Tap or gently shake shoulder. Shout, "Are you okay?".		Tap soles of feet to arouse.
	2. Call for help; EMS; position the victim.	Turn on back as a unit, supporting head and neck, face up, arms by sides. Call out, "Help!" If others come, have them activate EMS. If no one comes and you witnessed the arrest contact EMS immediately, if you did not witness the arrest perform CPR for 2 minutes before contacting EMS.		
	3. Open the airway.	Head-tilt/chin lift.		Head-tilt/chin lift, but do not overextend.
	4. Assessment: Determine breathlessness.	Maintain an open airway. Ear over mouth; observe chest. Look, listen, feel for breathing. (3-5 seconds).		
	5. Give rescue breaths.	Make mouth-to-mouth seal.		Seal nose and mouth .
		Try to give rescue breaths.		
	6. If unsuccessful, try again to give rescue breaths.	Reposition the head and try rescue breaths again.		
	7. Start CPR	Perform CPR as stated in previous performance standards.		
	8. Check for foreign body.	Perform tongue-jaw lift. Remove foreign object only if you actually see it.		
9. Give rescue breaths.	Open the airway with head-tilt/chin-lift. Try again to give rescue breaths. If unsuccessful reposition head and try breaths again.			
<b>Special Cases: obesity or pregnancy</b>  (conscious and unconscious)	10. Be persistent	Repeat Steps 7-9 until obstruction is relieved.		
	1. Assessment	Follow step 1 as in conscious/unconscious victim.		
	2. Act to relieve obstruction.	Perform chest thrust until airway becomes unobstructed.		
	3. Next steps	Follow steps 3-10 as outlined for conscious and unconscious adult.		