

# Basic Life Support

BLS for Healthcare Providers  
and Professional Rescuers



**AMERICAN  
SAFETY &  
HEALTH  
INSTITUTE**

## Basic Life Support BLS for Healthcare Providers and Professional Rescuers Student Book, *Version 8.0*

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First Edition—2016



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# Sudden Cardiac Arrest



Cardiac arrest is the loss of the heart's ability to pump blood through the body. The most dramatic occurrence, sudden cardiac arrest, can happen anywhere with little or no warning. Victims unexpectedly collapse. Breathing stops.

Sudden cardiac arrest occurs when the normal electrical impulses in the heart suddenly become disorganized. Normal mechanical contraction of the heart muscle is lost, and a chaotic, quivering condition known as ventricular fibrillation can occur. Blood flow to the body, along with the oxygen it carries, abruptly stops. Within minutes, brain cell death starts to occur from the lack of oxygen.

## **Cardiopulmonary Resuscitation (CPR)**

Cardiopulmonary resuscitation (CPR) is the immediate treatment for a suspected cardiac arrest. CPR can restore limited oxygen to the brain and other vital organs through a combination of chest compressions and rescue breaths. However, CPR alone is not enough.

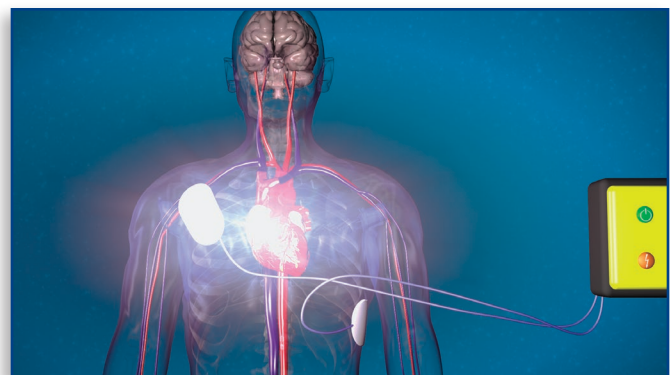
## **Early Defibrillation**

The most effective way to end fibrillation is defibrillation, using a defibrillator and electrode pads adhered to the chest. A controlled electrical shock is sent through the heart to stop ventricular fibrillation, allowing the heart's normal electrical activity to return and restore the normal pumping action of the heart.

Successful defibrillation is highly dependent on how quickly a shock can be delivered. For each minute in cardiac arrest, the chance of surviving goes down by about 10%. After as few as 10 minutes, survival is unlikely.

An automated external defibrillator (AED) is a portable, computerized device that is simple to operate. The use of AEDs by emergency responders and other healthcare personnel allows defibrillation to occur much earlier than before.

Turning on an AED is as simple as pushing a power button. Once on, an AED provides voice instructions to guide an operator through its use. An AED automatically analyzes the heart rhythm to determine if a shock is needed. If a shock is advised by the AED, the operator clears the person and pushes a button to deliver the shock.



## Ventricular Tachycardia

Ventricular tachycardia (VT) occurs when the bottom portion of the heart beats at a very fast rate. In extreme cases, it beats so fast that the heart's ability to actually move blood forward is lost, resulting in cardiac arrest. Just as with ventricular fibrillation, high-quality CPR and early defibrillation are the indicated treatments for VT.

## Chain of Survival

Immediate high-quality CPR and early defibrillation with an AED can double or even triple the likelihood for survival. Most cardiac arrests occur outside of a hospital. Most of those occur in the home.

The chain of survival is often used to describe the best approach for treating cardiac arrest. Each link in the chain is essential for a person to survive. If a single link is weak or missing, the chances for survival are greatly reduced. The greatest chance for survival exists when all the links are strong.

The chain of survival for cardiac arrests outside of a hospital consists of 5 interdependent links:

- Early recognition of cardiac arrest and prompt activation of the emergency response protocol for the setting
- Immediate CPR with high-quality chest compressions
- Rapid defibrillation, or electrical shock, to the heart
- Effective basic and advanced EMS care and transport
- Effective post-cardiac arrest care at a hospital

Cardiac arrest inside a hospital usually occurs when a known medical condition worsens. The chain of survival inside a hospital reflects how resuscitation fits into the overall picture of medical care:

- Monitoring, prevention, and treatment of prearrest conditions
- Early recognition of cardiac arrest and prompt activation of the emergency response protocol for the setting
- Immediate CPR with high-quality chest compressions
- Rapid defibrillation, or electrical shock, to the heart
- Effective post-cardiac arrest care



### Knowledge Check

What is the most effective way to end ventricular fibrillation?

# Chest Compressions



There are basic CPR skills used to provide the most effective approach to cardiac arrest.

These include the following:

- High-quality chest compressions
- High-quality rescue breaths using a CPR mask or bag-mask device
- Use of an automated external defibrillator
- Checking for life-threatening emergencies using a BLS assessment

External compression of the chest increases pressure inside the chest and directly compresses the heart, forcing blood to move from the chest to the lungs, heart, brain, and the rest of the body.

Focus on high-quality techniques:

- Compress deeply, more than 2 inches. It is likely you will not compress deep enough. While injury could occur from deeper compressions, do not let the fear of this affect compression depth.
- Compress fast, between 100 and 120 times per minute. Do not let a higher compression speed result in a shallower compression depth.
- Do not lean on the chest between compressions. Allow the chest wall to fully recoil, or rebound, at the top of each compression.
- Minimize interruptions when doing compressions. Blood pressure is created and maintained with ongoing compressions. When compressions stop, pressure is quickly lost and has to slowly be built up again.

## *CPR on a Firm Surface*

Compression of the chest increases the internal pressure of the chest and heart, forcing blood out into other areas of the body. Placing a person on a firm surface is essential for compressions to be effective. If a person is on a soft surface, such as a mattress, compression of the chest is compromised.

## *Full Recoil of the Chest*

Allowing the chest to fully return, or recoil, to its normal position at the top of each compression is a measure of high-quality compressions. Full recoil allows the heart to refill more completely between compressions and increases overall blood flow.

When compressing properly, you may hear and feel changes in the chest wall. This is normal. Forceful external chest compressions may cause chest injury but are critical if the person is to survive. Reassess your hand positioning and continue compressions.

As an alternative approach, you can grasp the wrist of one hand with the other when it is difficult to compress with the heels of both hands.

### *Compression Injury*

Minor injury could result from deeper compressions. On an adult, this begins to occur at compression depths greater than 2.4 inches.

### *Children and Infants*

The compression technique for a child is similar to that of adults, but less forceful. Push deep, straight down  $\frac{1}{3}$  depth of the chest, or about 2 inches. For smaller children, the heel of one hand can be used to compress.

Compressions on a larger child can be tiring. If needed, use both hands to perform compressions.

When doing chest compressions on an infant with 2 or more providers, encircle the sides of the chest with your hands and use your thumb tips to compress the lower third of the breastbone. Push deep, at least  $\frac{1}{3}$  depth of the chest or about  $1\frac{1}{2}$  inches.



### *Knowledge Check*

What are the 4 measures of high-quality chest compressions for an adult?



# Chest Compressions



## Adult

- Position person face up on a firm, flat surface. Kneel close to chest. Place heel of one hand on center of chest, on lower half of breastbone. Place heel of other hand on top of and parallel to first.
- Position your shoulders directly above your hands. Lock your elbows. Bending at waist, use upper body weight to push.
- Push deep, straight down at least 2 inches. Lift hands and allow chest to fully recoil. Move immediately into next compression. Compress fast, at a rate of 100–120 times per minute.



## Child

- Position child face up on a firm, flat surface. Kneel close to chest. Place heel of one hand on lower half of breastbone, just above point where ribs meet.
- Position your shoulder directly above your hand. Lock your elbow. Bending at waist, use upper body weight to push.
- Push deep, straight down  $\frac{1}{3}$  depth of chest, or about 2 inches. Lift hand and allow chest to fully recoil. Move immediately into next compression. Compress fast, at a rate of 100–120 times per minute.
- If needed, use 2 hands to compress.



## Infant

- Position infant face up on a firm, flat surface. Place 2 fingertips on breastbone just below nipple line.
- Push deep, at least  $\frac{1}{3}$  depth of chest, or about  $1\frac{1}{2}$  inches. Lift fingers and allow chest to fully recoil. Move immediately into next compression. Compress fast, at a rate of 100–120 times per minute.
- When doing chest compressions with 2 or more providers, encircle the sides of the chest with your hands and use your thumb tips to compress the lower third of the breastbone.

# BLS Assessment



The BLS assessment is a simple way to quickly identify if resuscitation is required. It is the same for all ages and is performed quickly.

**Ensure the scene is safe.** Before anything else, pause and assess the scene for hazards. If the scene is not safe, do not enter until hazards have been minimized or eliminated. Take standard precautions to prevent contact with blood or other potentially infectious materials.

**Assess responsiveness.** If it is safe, check for responsiveness. Tap or squeeze the person's shoulder and ask loudly, "Are you all right?" For an infant, tap the foot.

**Assess for breathing and pulse.** If unresponsive, quickly look at the person's chest and face for signs of normal breathing. At the same time check for a pulse.

Normal breathing is effortless, quiet, and regular. Weak, irregular gasping, snorting, or gurgling sounds, known as agonal breaths, can occur early in cardiac arrest. These actions provide no usable oxygen. This is not normal breathing.

Check the carotid pulse in the neck. Take at least 5 but no longer than 10 seconds to assess breathing and pulse. If you are unsure, assume they are absent.

**Activate the emergency response protocol for your setting and get an AED.** If not already being done, tell another person to activate the protocol and get an AED. Relay what you have found so it can be passed on.

## Checking Pulses

Locate the bony Adam's apple with your fingers. Slide them into the groove between the windpipe and the muscle on the side of the neck closest to you. For a child, check the carotid pulse or femoral pulse in the leg. Place your fingers just below the middle of the crease where the leg and torso meet. For infants, feel for the brachial pulse on the inside of the upper arm. Lay your fingers across the arm and compress inward.

## Activating Additional Resources

The need to activate additional resources is an important part of the BLS assessment. Unlike lay providers, who simply need to activate emergency medical services (EMS), the additional resources needed by BLS providers can vary, depending on the circumstance. In most cases, the actions to take are already established through emergency response protocols. Because of this, the point at which you activate additional resources in a BLS assessment is highly dependent on the situation and your local protocols.

### *When Alone*

If you are alone and have witnessed a sudden collapse, activate your emergency response protocol and get an AED yourself. Quickly return to the person. This action is the same regardless of the age of the person.

If you are alone and did not witness the collapse, or you highly suspect a secondary cause such as drowning, suffocation, or opioid overdose, provide about 2 minutes of CPR before leaving to activate your protocol and get an AED yourself. This is the most likely situation encountered with children.

### *Modification for Drowning*

Due to the hypoxic nature of drowning, the BLS assessment is modified slightly. Once a person is removed from the water, immediately assess for normal breathing and pulse. If breathing is absent or only gasping, provide 2 initial rescue breaths that make the chest visibly rise. If the pulse is clearly felt continue with rescue breathing. If a pulse is absent, or if you are not certain, begin CPR. Attach an AED as soon as one is available.

Your assessment of the person and situation will determine the care you provide. If the person is breathing normally, and uninjured, place him or her in a side-lying recovery position.

If the person is not breathing or only gasping, but definitely has a pulse, he or she is in respiratory arrest. The indicated care is rescue breathing, which is ongoing rescue breaths provided without chest compressions.

If the person is not breathing, or only gasping, and does not have a pulse, he or she is in cardiac arrest. The indicated care is CPR, a repeating combination of chest compressions and rescue breaths.

### *Recovery Position*

The recovery position helps protect the airway by using gravity to drain fluids from the mouth and keep the tongue from blocking the airway.

Frequently assess and monitor the person's breathing. The condition can quickly become worse and require additional care.



### *Knowledge Check*

You have responded to someone complaining of severe pressure in the chest. As you are talking to the person, he suddenly slumps onto the floor. You kneel next to him, squeeze his shoulder, and loudly ask, "Are you all right?" He is unresponsive, so you look closely at the face and chest for breathing and feel for a carotid pulse; he makes a brief gasping snort, but then remains still. You cannot feel a pulse within 10 seconds. What do you do next?

# BLS Assessment



## Assess Scene

- Pause and assess scene for safety.
- If unsafe, or if it becomes unsafe at any time, GET OUT!



## Check for Response

- Tap or squeeze shoulder and ask loudly, “Are you all right?”
- For an infant, tap the foot.
- If alone, shout out for help.
- Position person face-up on a firm, flat surface.



## Check Breathing and Pulse

- Look at face and chest for normal breathing. If unsure, assume breathing is not normal.
- Weak, irregular gasping, snorting, or gurgling is not normal breathing.
- At same time check for a carotid pulse. For infant, check brachial pulse.
- Take at least 5 seconds and no longer than 10 to check breathing and pulse.



## Provide Indicated Care

- If not already done, activate emergency response protocol and get an AED.
- No response, with normal breathing and pulse? Place in recovery position.
- No response with breathing absent and pulse present? Begin rescue breathing.
- No response with normal breathing and pulse absent? Begin CPR.

# Recovery Position



## Prepare

- Place arm nearest you up alongside head.
- Bring far arm across chest and place back of hand against cheek.
- Grasp far leg just above knee and pull it up so the foot is flat on ground.



## Roll

- Grasping shoulder and hip, roll person toward you in a single motion, keeping head, shoulders, and body from twisting.
- Roll far enough for face to be angled toward ground.



## Stabilize

- Position elbow and legs to stabilize head and body. Ensure there is no pressure on chest that restricts breathing.
- Make sure head ends up resting on extended arm and head, neck, and body are aligned.
- If person has been seriously injured, do not place in a recovery position unless fluids are in airway, or you need to leave to get help.

# Choking — Adults and Children



## Assess Person

- Ask, “Are you choking?”
- If person nods yes, or is unable to speak or cough, act quickly.
- If available, have someone activate your emergency response protocol.



## Position Yourself

- Stand behind person. If needed, kneel behind a child.
- Reach around and locate navel.
- Make a fist with other hand and place thumb side against abdomen, just above navel and below ribs.
- Grasp fist with other hand.



## Give Thrusts

- Quickly thrust inward and upward into abdomen.
- Repeat. Each thrust needs to be given with intent of expelling object.
- Continue until person can breathe normally.



## If Person Becomes Unresponsive

- Carefully lower person to ground.
- Begin CPR, starting with compressions.
- Look in mouth for an object before giving rescue breaths. Remove any object seen.
- Continue until another BLS provider takes over, the person shows signs of life, or you are too exhausted to continue.

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