

# Part

# 1

## General Course Concepts

Welcome to the American Heart Association Basic Life Support (BLS) Provider Course. BLS is the foundation for saving lives after cardiac arrest. In this course, you will learn the skills of high-quality cardiopulmonary resuscitation (CPR) for victims of all ages. You will practice delivering these skills both as a single rescuer and as a member of a multirescuer team. The skills you learn in this course will enable you to

- Recognize cardiac arrest
- Activate the emergency response system early
- Respond quickly and confidently

Despite important advances in prevention, sudden cardiac arrest remains a leading cause of death in many countries. About half of cardiac arrests are unwitnessed. Outcome from out-of-hospital cardiac arrest remains poor. Only about 10% of adult patients with nontraumatic cardiac arrest who are treated by emergency medical services (EMS) survive to hospital discharge.

This course will help you give victims the best chance of survival.

### BLS Course Objectives

The BLS Course focuses on what you need to know to perform high-quality CPR in a wide variety of settings. You will also learn how to respond to choking and other types of life-threatening emergencies.

After successfully completing the BLS Course, you should be able to

- Describe the importance of high-quality CPR and its impact on survival
- Describe all the steps in the Chains of Survival
- Apply the BLS concepts of the Chains of Survival
- Recognize the signs of someone needing CPR
- Perform high-quality CPR for an adult, a child, and an infant
- Describe the importance of early use of an automated external defibrillator (AED)
- Demonstrate the appropriate use of an AED
- Provide effective ventilation by using a barrier device
- Describe the importance of teams in multirescuer resuscitation
- Perform as an effective team member during multirescuer CPR
- Describe the technique for relief of foreign-body airway obstruction for an adult, a child, and an infant

## Course Description

This course prepares you to perform high-quality CPR skills. CPR is a lifesaving procedure for a victim who has signs of cardiac arrest (ie, unresponsive, no normal breathing, and no pulse). The 2 key components of CPR are **chest compressions** and **breaths**.

High-quality CPR improves a victim's chances of survival. Study and practice the characteristics of high-quality CPR so that you can perform each skill effectively.



### Critical Concepts: High-Quality CPR

- Start compressions within 10 seconds after recognizing cardiac arrest.
- Push hard, push fast: Compress at a rate of 100 to 120/min with a depth of
  - At least 2 inches (5 cm) for adults but no more than 2.4 inches (6 cm)
  - At least one third the depth of the chest, approximately 2 inches (5 cm), for children
  - At least one third the depth of the chest, approximately 1½ inches (4 cm), for infants
- Allow complete chest recoil after each compression. Avoid leaning on the chest between compressions.
- Minimize interruptions in compressions (try to limit interruptions to less than 10 seconds).
- Give effective breaths. Deliver each breath over 1 second, enough to make the victim's chest rise. Avoid excessive ventilation.

## Completion Requirements

To successfully complete this course and receive your BLS course completion card, you must do the following:

- Participate in hands-on interactive demonstrations of high-quality CPR skills
- Pass the Adult CPR and AED Skills Test
- Pass the Infant CPR Skills Test
- Score at least 84% on the exam in the instructor-led course (or successfully complete the online portion of the HeartCode® BLS course)

### Skills Tests

You must pass 2 skills tests to receive your BLS course completion card. During the course, you will have an opportunity to learn and practice chest compressions, bag-mask ventilation, and using an AED. After practice, your instructor will test your skills by reading a brief scenario. You will be asked to respond as you would in a real-life situation. The instructor will not coach or help you during the skills tests.

### Exam

The exam is open resource. This means that you may refer to print or digital resources while you are taking the exam. You may not, however, discuss the exam questions with other students or your instructor. Examples of resources that you may use include notes you take in class, this Provider Manual, and the American Heart Association's *Handbook of Emergency Cardiovascular Care for Healthcare Providers*.



## Your Approach to a Resuscitation Attempt

The BLS techniques and sequences you will learn offer 1 approach to a resuscitation attempt. But every situation is unique. Your response will be determined by

- Available emergency equipment
- Availability of trained rescuers
- Level of training expertise
- Local protocols

## Personal Protective Equipment

Personal protective equipment (PPE) helps protect rescuers from health or safety risks. PPE will vary based on situations and protocols. It can include a combination of items, such as medical gloves, eye protection, gowns/full-body suits, high-visibility clothing, safety footwear, and safety helmets.

Ask your local health authority or regulatory body about the PPE protocols for your role.

## The BLS Provider Manual

Read your *BLS Provider Manual* carefully. Study the skills and lifesaving sequences. During the course, you'll apply this knowledge as a rescuer in simulated emergency scenarios. Your BLS Provider Manual can serve as a resource long after you complete your course.

### Age Definitions

In this course, age definitions are as follows:

- Infants: younger than 1 year of age (excluding newly born infants in the delivery room)
- Children: 1 year of age to puberty (signs of puberty are chest or underarm hair in males; any breast development in females)
- Adults: adolescents (ie, after the onset of puberty) and older

### Callout Boxes

This manual includes Critical Concepts boxes that call attention to specific content.



#### **Critical Concepts:**

*These boxes contain important information you must know, including specific risks associated with certain interventions and additional background on key topics.*

### Review Questions

Answer the review questions provided at the end of each Part. You may use these to confirm your understanding of important BLS concepts.

# Part

# 2

## The Chain of Survival

For many years, the American Heart Association has adopted, supported, and helped develop the concept of emergency cardiovascular care. The term *Chain of Survival* provides a useful metaphor for the elements of the emergency cardiovascular care systems-of-care concept. The Chain of Survival shows the actions that must take place to give the cardiac arrest victim the best chance of survival. Each link is independent, yet connected, to the links before and after. If any link is broken, the chance for a good outcome decreases.

### Learning Objectives

At the end of this Part, you will be able to

- Describe the importance of high-quality CPR and its impact on survival
- Describe all of the steps in the Chain of Survival
- Apply the BLS concepts of the Chain of Survival

### Overview

Cardiac arrest can happen anywhere—on the street, at home, or in a hospital emergency department (ED), inpatient bed, or intensive care unit. Elements in the system of care and order of actions in the Chain of Survival differ based on the situation. Care will depend on whether the victim has the arrest outside the hospital or inside the hospital. Care also depends on whether the victim is an adult, child, or infant.

Actions in the Chain of Survival differ according to setting (in-hospital vs out-of-hospital) and age group. Here are the specific Chains of Survival (Figure 1):

- Pediatric in-hospital cardiac arrest
- Pediatric out-of-hospital cardiac arrest
- Adult in-hospital cardiac arrest
- Adult out-of-hospital cardiac arrest



**Figure 1.** The American Heart Association 2020 Chains of Survival. Links in the Chain of Survival will differ based on whether the arrest occurs in or out of the hospital and the age of the victim. **A,** Pediatric In-Hospital Chain of Survival. **B,** Pediatric Out-of-Hospital Chain of Survival. **C,** Adult In-Hospital Chain of Survival. **D,** Adult Out-of-Hospital Chain of Survival.



## Chain of Survival Elements

Although there are slight differences in the Chains of Survival based on the age of the victim and the location of the cardiac arrest, each includes the following elements:

- Prevention and preparedness
- Activating the emergency response system
- High-quality CPR, including early defibrillation
- Advanced resuscitation interventions
- Post-cardiac arrest care
- Recovery

### Prevention and Preparedness

Prevention and preparedness are the foundation of early recognition of cardiac arrest and rapid response.

**Out-of-hospital.** Most out-of-hospital adult cardiac arrests are unexpected and happen at home. Successful outcomes depend on early high-quality CPR and rapid defibrillation in the first few minutes after the arrest. Organized community programs that prepare the public to respond quickly to a cardiac arrest are critical to improving outcomes.

*Prevention* includes measures to improve the health of individuals and communities.

*Preparedness* includes public awareness programs and training to help people recognize the signs of a heart attack and cardiac arrest and take effective action. Community CPR training and emergency response system development are important.

Emergency telecommunicators (ie, call takers, dispatchers) who give CPR instructions help increase rates of bystander CPR and improve outcomes. This telecommunicator-assisted CPR (T-CPR) enables the general public to perform high-quality CPR and early defibrillation.

Mobile phone apps or text messages can be used to summon members of the public who are trained in CPR. Mobile phone apps/mapping can help rescuers locate the nearest AED.

Widespread AED availability supports early defibrillation and saves lives. Public access defibrillation (PAD) programs are designed to reduce the time to defibrillation by placing AEDs in public places and training laypeople to use them.

**In-hospital.** In the hospital setting, *preparedness* includes early recognition and rapid response to the patient who may need resuscitation. For adult patients in the hospital, cardiac arrest usually happens as a result of serious respiratory or circulatory conditions that get worse. Healthcare providers can predict and prevent many of these arrests by careful observation, preventive care, and early treatment of prearrest conditions.

Once a provider recognizes cardiac arrest, immediate activation of the emergency response system, early high-quality CPR, and rapid defibrillation are essential. Many institutions conduct ongoing training in resuscitation response. Some maintain rapid response teams or medical emergency teams.

### Activating the Emergency Response System

**Out-of-hospital.** Activating the emergency response system usually means shouting for nearby help and phoning 9-1-1 or the local emergency response number. In the workplace, every employee should know how to activate the emergency response system in their setting (Figure 2A). The sooner a rescuer activates the emergency response system, the sooner the next level of care will arrive.

**In-hospital.** Activation of the emergency response system in the hospital setting is specific to each institution (Figure 2B). A provider may activate a code, summon the rapid response team or medical emergency team, or ask someone else to do it. The sooner a provider activates the emergency response system, the sooner the next level of care will arrive.

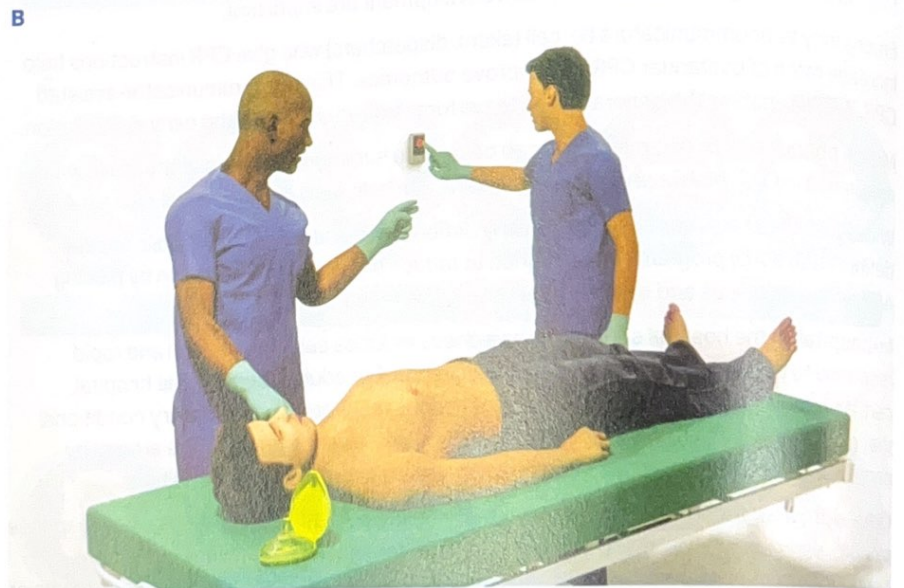


**Figure 2.** Activate the emergency response system in your setting. **A,** Out-of-hospital setting in the workplace. **B,** In-hospital setting.

**A**



**B**



### High-Quality CPR, Including Early Defibrillation

**Out-of-hospital and in-hospital.** High-quality CPR with minimal interruptions and early defibrillation are the actions most closely related to good resuscitation outcomes. High-quality CPR started immediately after cardiac arrest combined with early defibrillation can double or triple the chances of survival. These time-sensitive interventions can be provided both by members of the public and by healthcare providers. Bystanders who are not trained in CPR should at least provide chest compressions (also called *Hands-Only CPR*). Even without training, bystanders can perform chest compressions with guidance from emergency telecommunicators over the phone (T-CPR).

## Advanced Resuscitation Interventions

**Out-of-hospital and in-hospital.** Advanced interventions may be performed by medically trained providers during a resuscitation attempt. Some advanced interventions are obtaining vascular access, giving medications, and placing an advanced airway. Others are obtaining a 12-lead electrocardiogram (ECG) or starting advanced cardiac monitoring. In both settings, high-quality CPR and defibrillation are key interventions that are the foundation of a successful outcome.

**Out-of-hospital.** Lay rescuers provide high-quality CPR and defibrillation with an AED until a multirescuer team takes over the resuscitation attempt. This high-performance team will continue high-quality CPR and defibrillation and may perform advanced interventions.

**In-hospital.** The high-performance team in a hospital may include physicians, nurses, respiratory therapists, pharmacists, and others. In addition to advanced interventions, extracorporeal CPR may be used in certain resuscitation situations.

## Post-Cardiac Arrest Care

**Out-of-hospital.** After return of spontaneous circulation (ROSC), all cardiac arrest victims receive post-cardiac arrest care. Post-cardiac arrest care includes routine critical care support, such as artificial ventilation and blood pressure management. This care begins in the field and continues during transport to a medical facility.

**In-hospital.** A multidisciplinary team provides this advanced level of care. Providers focus on preventing the return of cardiac arrest and tailor specific therapies to improve long-term survival. Post-cardiac arrest care may occur in the ED, cardiac catheterization lab (cath lab), intensive care unit, or coronary care unit.

The patient may undergo a cardiac catheterization procedure. During this procedure, a catheter is inserted in an artery (most frequently the groin or wrist) and threaded through the blood vessels to the patient's heart to evaluate heart function and blood flow. Some cardiac problems, such as a blocked artery, may be fixed or other problems diagnosed.

## Recovery

Recovery from cardiac arrest continues long after hospital discharge. Depending on the outcome, the survivor of cardiac arrest may need specific interventions. Interventions may be needed to address the underlying cause of cardiac arrest or to provide cardiac rehabilitation. Some patients need rehabilitation focused on neurological recovery. Psychological support for the patient and family are important during the recovery period. Rescuers also may benefit from psychological support.

## Comparison of the In-Hospital and Out-of-Hospital Chains of Survival

Five key elements affect all Chains of Survival (Table 1). Those elements are initial support, resuscitation teams, available resources, resuscitation constraints, and level of complexity. Table 1 shows key differences in initial support, resuscitation teams, and available resources between the in-hospital and out-of-hospital settings. Resuscitation constraints and level of complexity are the same in both settings.



Table 1. Comparison of 5 Key Elements in the Chains of Survival

Element	In-hospital cardiac arrest	Out-of-hospital cardiac arrest
Initial support	Depends on an <b>in-hospital system</b> of appropriate <b>surveillance, monitoring, and prevention with responsive primary provider teams</b>	Depends on <b>community</b> and <b>EMS providers</b> for support
Resuscitation teams	Resuscitation efforts depend on <ul style="list-style-type: none"> <li>The smooth interaction of an institution's <b>various departments</b> and services (such as the patient ward, ED, cardiac cath lab, and intensive care unit)</li> <li>A <b>multidisciplinary team of professional providers</b>, which includes physicians, nurses, respiratory therapists, pharmacists, counselors, and others</li> </ul>	Resuscitation efforts depend on <ul style="list-style-type: none"> <li><b>Lay rescuers</b> who need to recognize an unresponsive victim and quickly activate the emergency response system</li> <li><b>Lay rescuers</b> who perform CPR and use an AED (if available) until a high-performance team takes over resuscitation efforts</li> <li><b>EMS</b>, who transports the victim to a medical facility for continued care</li> </ul>
Available resources	Depending on the facility, in-hospital <b>multidisciplinary teams</b> may have immediate access to additional personnel as well as resources of the <b>ED, cardiac cath lab, and intensive care unit.</b>	Available resources may be limited in the out-of-hospital settings: <ul style="list-style-type: none"> <li><b>AED access:</b> AEDs may be available through a local <b>PAD program</b> or included in emergency or <b>first aid equipment.</b></li> <li>Untrained rescuers: <b>T-CPR</b> helps untrained rescuers perform high-quality CPR.</li> <li>EMS high-performance teams: <b>The only resources may be those they brought with them.</b> Additional backup resources and equipment may take some time to arrive.</li> </ul>
Resuscitation constraints	Factors that may affect both settings include <b>crowd control, family presence, space constraints, resources, training, patient transport, and device failures.</b>	
Level of complexity	Resuscitation attempts, both in and out of the hospital, are typically <b>complex.</b> They require teamwork and coordination between rescuers and care providers.	

## Key Differences in Adult and Pediatric Chains of Survival

In adults, cardiac arrest is often sudden and frequently results from a cardiac cause. In children, however, cardiac arrest is often secondary to respiratory failure or shock. Both respiratory failure and shock can be life-threatening.

**Prevention of cardiac arrest is the first link in the pediatric Chains of Survival (Figures 1A and B).** Early identification of respiratory or circulatory problems and appropriate treatment may prevent progression to cardiac arrest. Early identification also may maximize survival.

## Review Questions

1. In which locations do most out-of-hospital cardiac arrests occur?
  - a. Healthcare clinics
  - b. Homes
  - c. Recreational facilities
  - d. Shopping centers
2. Which is the most common cause of cardiac arrest in children?
  - a. Cardiac problem
  - b. Congenital or acquired heart defect
  - c. Respiratory failure or shock
  - d. Infection and sepsis
3. What is the third link in the adult out-of-hospital Chain of Survival?
  - a. Advanced life support
  - b. High-quality CPR
  - c. Prevention
  - d. Defibrillation

See Answers to Review Questions in the Appendix.