



American Red Cross
Focused Updates and Guidelines
2020 Version

Basic Life Support

———— Participant's Manual ————



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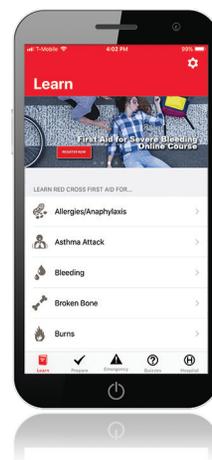
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Basic Life Support

Participant's Manual



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Printed in the United States of America

ISBN: 978-1-7367447-2-7

Science and Technical Content

The scientific content and evidence within the American Red Cross Basic Life Support (BLS) course is consistent with the American Red Cross Focused Updates and Guidelines 2020 and the most current science and treatment recommendations from:

- The International Liaison Committee on Resuscitation (ILCOR)
- The International Federation of Red Cross and Red Crescent Societies
- The Policy Statements, Evidence Reviews and Guidelines of:
 - American Academy of Pediatrics (AAP)
 - American College of Emergency Physicians (ACEP)
 - American College of Obstetrics and Gynecology (ACOG)
 - American College of Surgeons (ACS)
 - Committee on Tactical Combat Casualty Care (CoTCCC)
 - Obstetric Life Support™ (OBSL™)
 - Society of Critical Care Medicine (SCCM) and the American College of Critical Care Medicine (ACCM)
 - Surviving Sepsis Campaign (SSC)

Guidance for this course was provided by the Red Cross Scientific Advisory Council, a panel of 60+ nationally and internationally recognized experts from a variety of medical, nursing, EMS, advanced practice, allied health, scientific, educational and academic disciplines. Members of the Scientific Advisory Council have a broad range of professional specialties including resuscitation, emergency medicine, critical care, obstetrics, pediatrics, anesthesia, cardiology, surgery, trauma, toxicology, pharmacology, education, sports medicine, occupational health, public health and emergency preparedness. This gives the Scientific Advisory Council the important advantage of broad, multidisciplinary expertise in evaluating existing and new assessment methodologies, technologies, therapies and procedures--and the educational methods to teach them.

More information on the science of the course content can be found at the following websites:

- ilcor.org
- redcross.org/science

Dedication

This program is dedicated to the nurses, physicians, prehospital professionals, therapists, technicians, law enforcement, fire/rescue, advanced practice professionals, lifeguards, first responders, lay responders and all other professionals and individuals who are prepared and willing to take action when an emergency strikes or when a person is in need of care. These updates and guidelines are also dedicated to the employees and volunteers of the American Red Cross who contribute their time and talent to supporting and teaching lifesaving skills worldwide.

Acknowledgments

Many individuals shared in the development of the American Red Cross Basic Life Support program in various technical, editorial, creative and supportive ways. Their commitment to excellence made this manual possible.

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The development of this program would not have been possible without the leadership, valuable insights and dedication of the subject matter experts, who generously shared their time to ensure the highest quality program:

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Program Development

Special thanks to the program development team for their expertise and mix of patience and persistence to bring this program through to completion: Danielle DiPalma, Anna Kyle, Sarah Kyle, Maureen Pancza, Anna Pruet, Maureen Schultz, Melanie Sosnin, Laurie Willshire, Cindy Trynieszewski, Ryan Wallace, Ernst & Young, Iperdesign, Iyuno, Out of the Blue Productions, Sealworks, and Surround Mix Group.

Clinical Editors and Supporting Organizations

Thank you to the **Defense Health Agency** for their ongoing review and feedback, which has helped us improve the clarity and quality of this program.

Also, thank you to the following clinical editors and supporting organizations for assisting the Red Cross with the development of the previous edition.

- Jonathan L. Epstein, MEMS, NRP
- Jannah N. Amiel, MS, BSN, RN
- Bob Page, M.Ed., NRP, CCP, NCEE
- ETHOS Health Communications
- Fairfax County Fire and Rescue Department
- Chester County Intermediate Unit Practical Nursing Program (CCIU PNP) Learning Lab—The Technical College High School Brandywine Campus
- Independence Blue Cross Medical Simulation Center at Drexel University College of Medicine
- Jefferson Stratford Hospital
- St. Christopher's Hospital for Children

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Foundational Concepts

Introduction

This chapter reviews the foundational concepts that form the basis for responding to life-threatening emergencies, including critical thinking, problem-solving, communication, teamwork and mental health referrals for team members following a resuscitation event.

Critical Thinking and Problem Solving

Critical thinking and problem solving are essential skills in healthcare, especially in emergency situations.

Critical Thinking

Critical thinking refers to thinking clearly and rationally to identify the connection between information and actions. When you use critical thinking, you are constantly identifying new information, adapting to the information logically in order to determine your best next actions and anticipating how those actions will affect the patient.

You use critical thinking when you:

- Perform a rapid assessment and determine a course of action.
- Anticipate roles and functions as part of a team based on the patient's presentation and condition.
- Re-evaluate a situation for changes, interpret these changes and modify care accordingly.

Problem Solving

Problem solving refers to the ability to use readily available resources to find solutions to challenging situations or issues that arise. In emergency situations, problems or issues can happen at any point. For example, the automated external defibrillator (AED) may be delayed in arriving or have a low battery. A parent may be upset and interfere with care. Problem solving often requires creativity and adaptability. Use whatever resources are at hand, including equipment, other team members or other healthcare facility staff.

Communication

Communication is essential when caring for a patient who is experiencing a life-threatening emergency. You need to communicate with your team, the patient and the patient's family.

Communicating with the Team

Communication includes verbal messages (spoken words) and nonverbal messages conveyed through body language (gestures and facial expressions) (Figure 1-1).

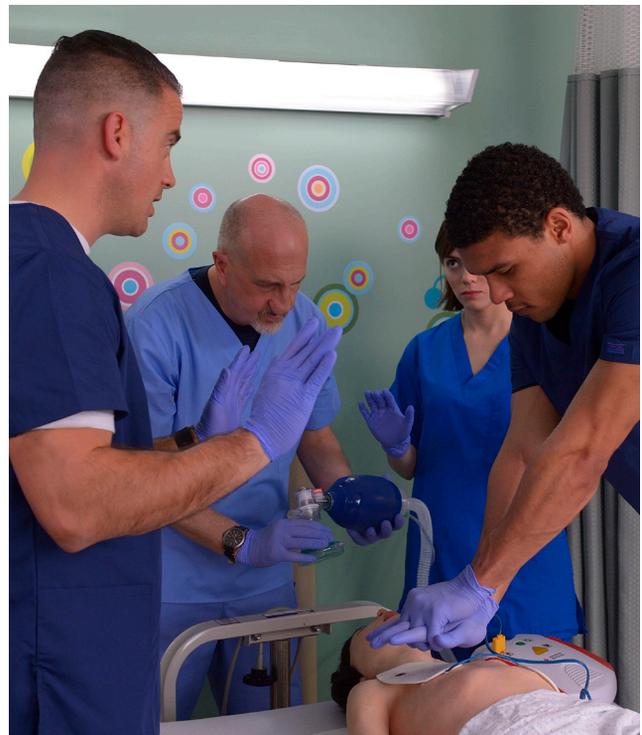


Figure 1-1 | Communicating with the team includes verbal and nonverbal cues.

Closed-loop communication is a technique used to prevent misunderstandings; it involves four key components:

- **Sender:** The person initiating the communication.
- **Message:** The content of the communication; must be expressed clearly so that everyone involved knows exactly what the message is.
- **Receiver:** The person for whom the message is intended.
- **Feedback:** The confirmation by the receiver that the message is received and understood; an essential element of closed-loop communication (Figure 1-2).

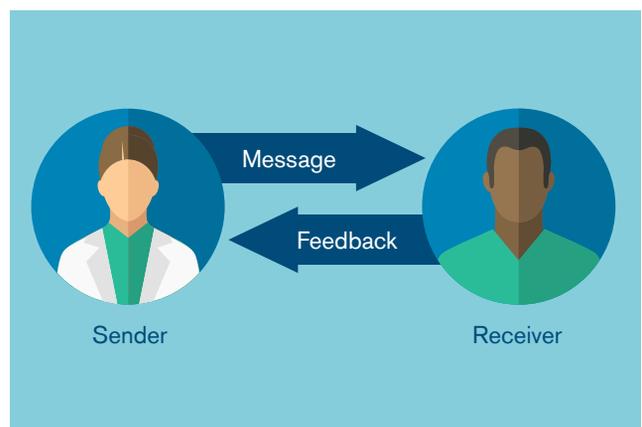


Figure 1-2 | Closed-loop communication is a process involving a sender, message, receiver and feedback.

When communicating (sending) information:

- Speak clearly and deliberately.
- Convey information in an organized fashion.
- “Close the loop” by waiting for feedback from the team member responsible for carrying out the action. If feedback is not provided, the team leader should seek it before continuing.

When receiving information:

- Provide confirmation that you have received the message and that you understand it by repeating the task back to the sender.
- Acknowledge initiation and completion of the task.
- Speak clearly in a calm tone of voice and avoid speaking over others.

Communicating with the Family

Patients requiring resuscitation may be unresponsive and may not be fully able to make decisions, making communication with the family or others who may be present very important. Remember, during emergencies, families are stressed and may not always hear or understand what you are saying (Figure 1-3).

To effectively communicate with the family, you should:

- Demonstrate credibility as well as confidence and empathy.
- Build rapport and establish trust.
- Speak slowly and in terms the family can understand.
- Be prepared to repeat information, if necessary.



Figure 1-3 | There are many components of good communication with family, including establishing trust, speaking slowly, and being open and honest.

- Be open and honest, especially about the patient's condition. Minimize family members' fears, as necessary, but avoid giving misleading information or false hope (e.g., “Everything is going to be OK”).
- Reassure the family that everything that can be done is being done.

Communicating with the Family After a Patient's Death

In basic life support situations, patients may not survive, despite the team's best resuscitation attempts. As a healthcare provider, you may be involved in communicating with the family about a patient's death (Figure 1-4).

In this situation:

- Provide the information honestly and with compassion in a straightforward manner, and include information about events that may follow.
- Allow the family to begin processing the information.
- Allow time for the family to begin the grief process.
- Ask the family if they would like to contact or have you contact anyone, such as other family members or clergy.
- Anticipate a myriad of reactions by family members, such as crying, sobbing, shouting, anger, screaming or physically lashing out.
- Wait and answer any questions that the family may have.

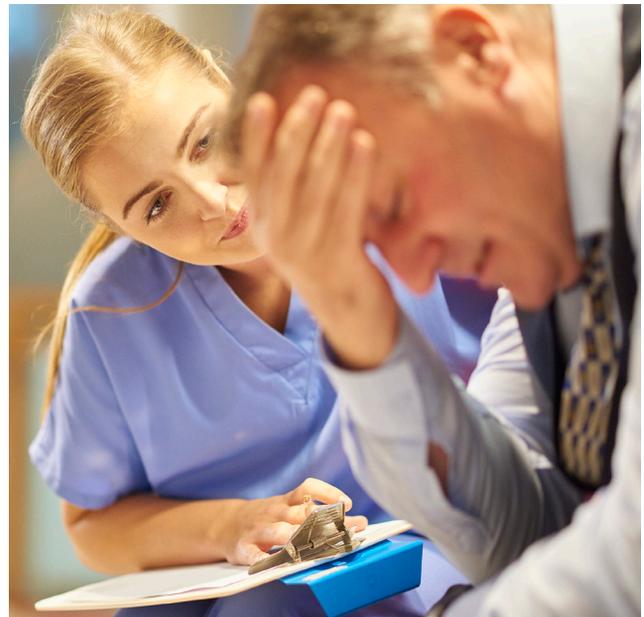


Figure 1-4 | Be compassionate, direct and honest when communicating with the family after a patient's death.

Teamwork

Teamwork involves a group of people with well-defined roles and responsibilities making a coordinated effort to achieve a common goal (Figure 1-5). Teamwork is crucial during resuscitation because the ultimate goal is to save a life, and an effective, coordinated effort by the basic life support (BLS) team improves patient outcomes. Coordination becomes even more important when emergency medical services (EMS), the **rapid response team** or the resuscitation team arrives.

As a member of the BLS team, it is important to understand the responsibilities of the team leader and other team members.

The team leader ensures that everyone works as a team to help promote the best possible outcome for the patient.

Team Leader Responsibilities

The team leader oversees the entire emergency situation and ensures that everyone works as a team to help promote the best possible outcome for the patient.

The team leader:

- Assigns and understands team roles.
- Sets clear expectations.
- Prioritizes, directs and acts decisively.
- Encourages and allows team input and interaction.
- Focuses on the big picture.
- Monitors performance while providing support.
- Acts as a role model.
- Coaches the team.
- Re-evaluates and summarizes progress.
- Leads a debriefing session.

All team members must demonstrate respect for one another and use clear, closed-loop communication.



Figure 1-5 | Each member of a team has well-defined roles and responsibilities.

Team Member Responsibilities

Team members provide care with skill and expertise.

Team members:

- Have the necessary knowledge and skills to perform their assigned role.
- Stay within their assigned role but assist others as needed, as long as they are able to maintain their own assigned responsibilities.
- Communicate effectively with the team leader if they:
 - Feel they are lacking any knowledge or skills to perform assigned roles.
 - Identify something the team leader may have overlooked.
 - Recognize a dangerous situation or need for urgent action.
- Share information with other team members.
- Focus on achieving the goals.
- Ask pertinent questions and share pertinent observations.

Crew Resource Management

Crew resource management emphasizes the use of all available resources, including people, equipment and procedures, to promote effective and efficient teamwork and reduce the likelihood of human error. Originally developed by the aviation industry in the 1970s in response to several airline disasters where human error and poor communication were found to be contributing factors, crew resource management has been adapted

for use as a tool in the healthcare setting as well. When following the principles of crew resource management, all members of the team demonstrate respect for one another and use clear, closed-loop communication.

Crew resource management centers around the team leader, who coordinates the actions and activities of team members so that the team functions effectively and efficiently. For example, when team members switch roles during an emergency, the team leader is responsible for coordinating these activities. Crew resource management also guides team members to communicate directly and openly with the team leader about dangerous or time-critical decisions.

When a problem arises, team members must get the attention of the team leader, state their concern, describe the problem as they see it and suggest a solution. The team leader then provides direction, enabling the team to work together to resolve the issue. Being a member of the team is just as important as being a team leader. Everyone on the team needs to have a voice and be encouraged to speak up if a problem arises.

Practicing and Debriefing

Members of effective high-performance teams keep their skills and knowledge current, and they practice together regularly. In addition, effective high-performance teams hold debriefing sessions after each resuscitation event (Figure 1-6). The purpose of the debriefing session is to take a closer look at the decisions that were made and the actions that were taken with the goal of identifying opportunities for improvement at the system, team and individual levels.

The team leader facilitates the debriefing session, which typically follows a consistent format:

- **Review:** The team leader provides a brief recap of the emergency and the interventions that were used.
- **Analyze:** The team reviews and evaluates the objective data obtained during the resuscitation effort.
- **Reflect:** The team reflects on the actions they took and why, discusses the pros and cons of those actions and identifies changes that could be made to improve future outcomes.
- **Summarize:** The team recaps the main takeaway points and develops a list of action items.



Figure 1-6 | Debriefing is an important strategy for improving performance and patient outcomes.

Mental Health Referrals for Team Members Following a Resuscitation

Mental health treatment can be of benefit for some healthcare professionals following a resuscitation or other stressful event. Treatment should not be perceived as a weakness but rather as an adjunct to other coping strategies (Figure 1-7).

Evidence has shown mental health treatment should only be provided by trained mental health professionals.



Figure 1-7 | A trained mental health professional can help you manage the stress and other emotional aspects of patient care.



Systematic Approach to Assessing, Recognizing and Caring for Adults

Introduction

When an emergency event occurs, it is important to perform a rapid assessment in order to recognize a life-threatening emergency and provide appropriate care. This chapter reviews the systematic approach to assessing, recognizing and caring for adults experiencing life-threatening emergencies. See Chapter 4 for more information on children and infants.

Emergencies Can Happen Anywhere

An emergency situation can happen anywhere in a healthcare facility or on scene. The interventions you provide, accessible resources and equipment, and the team members available may vary depending on the location of the emergency situation. For example, responding to an emergency situation in a common area of a healthcare facility will be distinct from responding to one occurring at the patient's bedside.

As a healthcare provider, you have a **duty to act** when a patient experiences a life-threatening emergency in a healthcare facility. Your facility may have specific protocols for how to respond to an emergency situation. These protocols may vary depending on the setting and your role. In addition, your scope and practice for your individual position may further determine appropriate actions. You may also face life-threatening emergencies outside your practice setting. Although a duty to act may not always exist when outside your practice setting, being prepared and willing to respond is essential.

Consult your state and local rules and regulations related to liability protections and other legal considerations when responding to an emergency. See *Appendix A: Common Legal Considerations* for more details.

Assess, Recognize and Care for Adults

A Systematic, Continuous Approach

The **Assess, Recognize and Care concept** is a systematic, continuous approach for rapid assessment and re-assessment, accurate recognition and immediate care in emergency situations (Figure 2-1).

An acutely ill patient's condition can change rapidly, and deterioration can follow; therefore, initial assessment and frequent re-assessment, recognition and care are critical. Some steps are completed simultaneously, and you should repeat these steps until the patient is stabilized and/or transferred to a higher level of care for further management.

For example, once you've performed an intervention, you need to reassess to identify whether that measure has been effective, then determine whether the initial

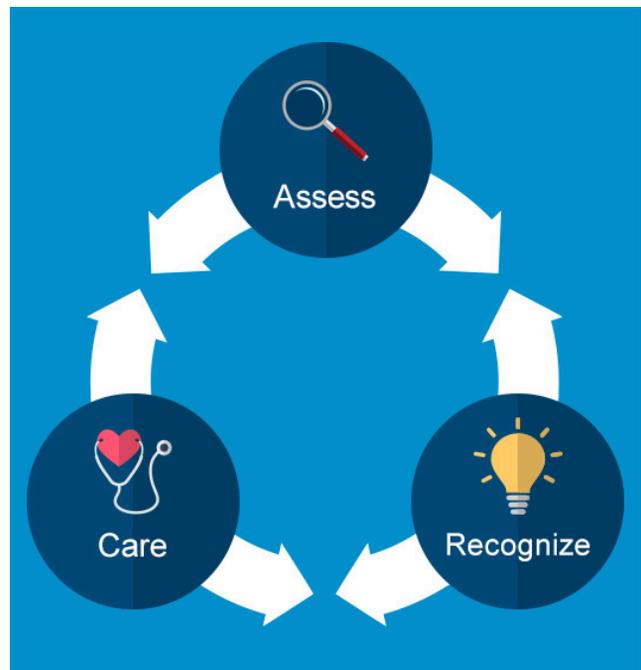


Figure 2-1 | The Assess, Recognize and Care concept is a systematic, continuous approach for responding to emergency situations.

presenting problem continues or whether any new problems are identified. This would then be followed by applying another appropriate care measure; and the cycle continues.

Rapid Assessment for Adults

An Essential First Step

The Assess, Recognize and Care concept begins with a **rapid assessment**, which includes:

- Performing a visual survey.
- Checking responsiveness.
- Opening the airway and simultaneously checking for breathing, a pulse and life-threatening bleeding.

The information gathered during the rapid assessment helps you to recognize whether a life-threatening emergency is occurring that requires care before further assessment or interventions are needed in an unresponsive person. See *Skill Sheet: Rapid Assessment for Adults*.

Always follow standard precautions when performing a rapid assessment. **Standard precautions** are safety measures to prevent disease transmission based on the assumption that all body fluids may be infectious. See *Appendix B: Standard Precautions* for further information.

Perform a Visual Survey

The visual survey includes assessing for safety, obtaining an initial impression of the patient, looking for life-threatening bleeding and determining the need for additional resources (Figure 2-2).

When responding outside a healthcare facility, it is important to conduct a thorough scene size-up. See *Learn More: Scene Size-Up*.

LEARN MORE

Scene Size-Up



Conduct a scene size-up to determine whether the situation is safe, the number of patients involved and the nature of the illness/mechanism of injury.

Safety

If you are responding to an emergency situation outside a healthcare facility, it is especially important to make sure that the environment is safe for you and any individuals present during the emergency.

Be sure to check for anything unsafe or hazardous in the area, such as the smell of gas, a chemical or biological spill, or any items that can threaten your or your patient's safety.

If you need to move the patient(s) because of immediate danger, to give proper care or because you need to reach another patient who may have a more serious illness or injury, move the patient as quickly and carefully as possible.

In all other situations, do not move a patient if you suspect head, neck, spinal or pelvic injury, or if moving the patient becomes a danger to you.

Number of Patients

It is important to determine how many patients are involved in the emergency event. Take a complete 360-degree view of the surroundings and ask individuals present whether anyone else was involved in the incident.

Nature of Illness or Mechanism of Injury

To determine the nature of the illness or mechanism of injury, look for clues to what may have caused the emergency and how the patient became ill or injured—for example, the patient's position, bleeding, broken glass or a spilled bottle of medication. Think critically about the situation and ask yourself whether what you see makes sense. Quickly ask individuals who are present what happened and use the information to determine a likely cause. Keep in mind that a patient may have moved or been moved before you arrived.

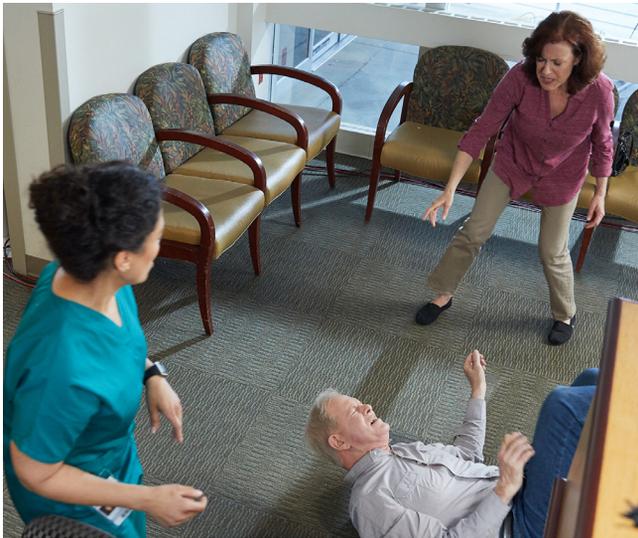


Figure 2-2 | The purpose of a visual survey is to assess for safety, formulate an initial impression of the patients and determine the need for additional resources.

In any emergency, you need to first make sure the environment is safe—for you, your team and anyone else there. When assessing for safety, ask yourself:

- Are any immediate dangers present?
- What guidance needs to be given to family members or others who may be present?

Next, form your initial impression of the patient. Remember, the initial impression is about suspicion. Ask yourself:

- Does the patient look sick or unresponsive?
- Does the patient's skin appear pale, mottled or cyanotic?
- Does the patient appear to be breathing?
- Is there life-threatening bleeding?

Then, quickly determine what additional resources are needed.

- Who is available to help?
- Do you need any additional equipment, such as an AED?

Obtain Consent

To obtain consent from an awake and alert adult patient, follow these steps:

- Identify yourself to the patient or legal guardian.
- State your level of training.
- Explain what you observe.
- Explain what you plan to do.
- Ask for permission from the patient to provide care.

If an adult patient is unresponsive, has an altered mental status, is mentally impaired or is unable to give consent verbally or non-verbally, then consent is implied.



Figure 2-3 | Use the shout-tap-shout sequence to check for responsiveness.

Check for Responsiveness

Once the visual survey is complete, the next step is to check for responsiveness. This may be obvious from your initial impression. For example, the patient may be able to speak to you or may be moaning, crying or moving around. If the patient is responsive, obtain consent and provide care as appropriate.

If the patient appears unresponsive during the initial impression, immediately check for responsiveness by using the **shout-tap-shout sequence** (Figure 2-3). Observe for the patient's response to the stimulus. It may be subtle—some slight movement or momentary eye opening. If the patient is unresponsive, activate EMS, the rapid response team or the resuscitation team (as appropriate) and call for an AED (if not already done).

If the patient is unresponsive, activate the emergency response system and get an AED.

Open the Airway

Open the adult patient's airway to a past-neutral position. Make sure the patient is in a **supine** (face-up) position. If they are face-down, roll them onto their back, taking care not to create or worsen a suspected injury. Then, open the airway using the head-tilt/chin-lift technique. Or use a modified jaw-thrust maneuver if a head, neck or spinal injury is suspected. See Skill Sheet: Opening the Airway for Adults.

Head-Tilt/Chin-Lift Technique

To perform the head-tilt/chin-lift on an adult:

- Press down on the forehead with one hand while pulling up on the bony underside of the chin with two to three fingers of the other hand.
- Tilt the head to a past-neutral position to open the airway (Figure 2-4, A).

Modified Jaw-Thrust Maneuver

When a patient has a suspected head, neck or spinal injury, use the modified jaw-thrust maneuver to open the airway. To perform the modified jaw-thrust maneuver:

- Position yourself above the patient's head.
- Put one hand on each side of the patient's head with your thumbs near the corners of the mouth and pointed toward the chin. Use your elbows for support.
- Slide your fingers under the angles of the jawbone without moving the patient's head or neck.
- Thrust the jaw up (again without moving the head or neck) to lift the jaw and open the airway (Figure 2-4, B).

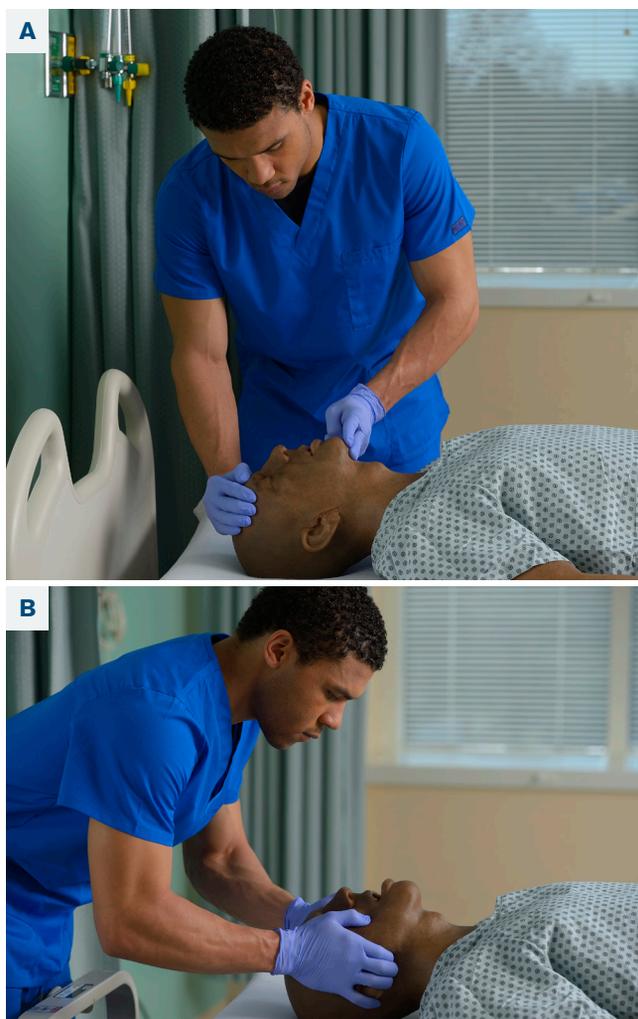


Figure 2-4 | Open the airway with (A) the head-tilt/chin-lift technique or, if necessary, (B) the modified jaw-thrust maneuver.

Simultaneously Check for Breathing, a Pulse and Life-Threatening Bleeding

Simultaneously check breathing and a carotid pulse for **no more than 10 seconds**. At the same time, scan the body for life-threatening bleeding.

When you check for breathing, look to see if the patient's chest is rising and falling, listen for escaping air and feel for breathing against the side of your cheek (Figure 2-5). Remember, normal breathing is quiet, regular and effortless. **Agonal breaths**, or isolated or infrequent gasps, are not normal breathing.



Figure 2-5 | Simultaneously check for breathing and a carotid pulse for no more than 10 seconds.

When you check the pulse of an adult patient, palpate the carotid artery by sliding two fingers into the groove of the patient's neck. Be careful not to reach across the neck and obstruct the airway.



Practice Note

Use the A-B-C mnemonic to easily recall and perform assessment, including opening of the airway (A), checking for the presence or absence of normal breathing (B), and simultaneously assessing for circulation (C) by a pulse check.



ALERT

If at any time the patient has life-threatening bleeding, control the hemorrhage with any available resource (including the use of a tourniquet or hemostatic dressing as appropriate). Then activate EMS, the rapid response team or the resuscitation team (as appropriate) and call for an AED (if not already done).

Recognize and Care for Adults

You've gathered information about the patient and the emergency throughout the rapid assessment. Now, you'll use the results of your assessment to recognize the emergency condition and determine your immediate course of action.

For example, if you find the patient is not breathing (or has ineffective ventilation) and their central pulse is present, you will implement care for **respiratory arrest** or **respiratory failure**. If you find that the patient is not breathing (or only gasping) and their central pulse is absent, you will implement care for **cardiac arrest**.

Other conditions requiring basic life support may include:

- Life-threatening injury or illness.
- Obstructed airway.
- Opioid overdose.

Implement appropriate care based on your understanding of the patient's condition. Proper care cannot be provided without effective assessment and accurate recognition of the patient's condition. The care you provide may include:

- Delivering ventilations to a patient in respiratory arrest or respiratory failure.
- Performing CPR on a patient in cardiac arrest.
- Positioning and providing care as needed for a patient with a life-threatening injury or illness.
- Clearing an obstructed airway.
- Administering naloxone to a patient experiencing an opioid overdose.

Reassess and Document

After providing care, it is important to reassess the patient and the effectiveness of your interventions to determine next steps based on your findings.

Always document to establish a record of the events that took place, the care you provided and the facts you discovered.



SKILL SHEET

Rapid Assessment for Adults

Step 1 Perform a visual survey

- Make sure the environment is safe—for you, your team and any individuals present during the emergency.
- Gather an initial impression of the patient, which includes looking for life-threatening bleeding.
- Quickly determine the need for additional resources.

Alert

If at any time the patient has life-threatening bleeding, control the hemorrhage with any available resource (including the use of a tourniquet or hemostatic dressing as appropriate).



Step 2 Check for responsiveness

- Shout, “Are you OK?” Use the patient’s name if you know it.
- Tap the patient’s shoulder and shout again (shout-tap-shout).
- If the patient is unresponsive and you are alone, call for help to activate EMS, the rapid response team or the resuscitation team, as appropriate, and call for an AED.
- If the patient is unresponsive and you are with another provider, the first provider stays with the patient. Other providers activate EMS, the rapid response team or the resuscitation team, as appropriate, and retrieve the AED, BVM and other emergency equipment.



SKILL SHEET

Rapid Assessment for Adults (*continued*)

Step 3 Simultaneously check for breathing, a pulse, and life-threatening bleeding

- Make sure the patient is in a supine (face-up) position. If they are face-down, you must roll them onto their back, taking care not to create or worsen a suspected injury.
- Open the airway to a past-neutral position using the head-tilt/chin-lift technique; or, use the modified jaw-thrust maneuver if you suspect a head, neck or spinal injury.
- Simultaneously check for breathing and a pulse (carotid) for no more than 10 seconds.
- At the same time, scan the body for life-threatening bleeding or other signs and symptoms that might not have been seen during the initial impression.



Practice Note

A-B-C Mnemonic

Use the A-B-C mnemonic to easily recall and perform assessment, including opening of the airway (A), checking for the presence or absence of normal breathing (B), and simultaneously assessing for circulation (C) by a pulse check. If necessary, CPR should then begin with delivery of chest compressions.

Step 4 Provide care based on the conditions found

SKILL SHEET

Opening the Airway for Adults

Head-Tilt/Chin-Lift Technique

To perform the head-tilt/chin lift technique:

1. Press down on the forehead while pulling up on the bony part of the chin with 2 to 3 fingers of your other hand.
2. Tilt the head to a past-neutral position for adults.



Modified Jaw-Thrust Maneuver

If you suspect head, neck and spinal injury, use the modified jaw-thrust maneuver providing you can effectively maintain an open airway. To perform the modified jaw-thrust maneuver:

1. Position yourself above the patient's head.
2. Put one hand on each side of the patient's head with your thumbs near the corners of the mouth and pointed toward the chin. Use your elbows for support.
3. Slide your fingers under the angles of the jawbone without moving the patient's head or neck.
4. Thrust the jaw up (again without moving the head or neck) to lift the jaw and open the airway.





Basic Life Support for Adults

Introduction

When the heart stops circulating blood, the patient is in cardiac arrest and CPR is needed to circulate blood containing oxygen to the patient's vital organs. Basic life support (BLS) for a patient in cardiac arrest includes high-quality CPR and the use of an AED. If the heart is still circulating blood but ventilation is either absent or ineffective, care includes the delivery of ventilations to patients. This chapter reviews BLS for adults experiencing these conditions. Variations for children and infants are discussed in Chapter 4.

Life-Threatening Injury or Illness in Adults

An adult patient may be experiencing a life-threatening injury or illness, if they are responsive (e.g., speaking, moaning, crying or moving around), unresponsive or experiencing an altered level of consciousness and they are breathing and have a central pulse (Figure 3-1).

To provide care to an adult patient with a life-threatening injury or illness, follow these steps:

- If you have not already done so, activate EMS, the rapid response team or the resuscitation team, as appropriate, and call for an AED.
- Perform primary assessment (Airway, Breathing, Circulation, Disability, Exposure) and emergent/initial interventions.
- Position patient as appropriate for clinical condition. If patient is lying down and does not have a suspected head, neck, spinal or pelvic injury, place them in a recovery position. See *Learn More: Recovery Positions*.
- Perform secondary assessment as patient condition allows.
- Reassess patient, recognize issues and provide care as needed.

For a life-threatening injury or illness caused by a suspected or known opioid overdose, consider naloxone administration per your facility's protocol (if available) and provide ongoing assessment and care for the condition found as noted above. See Chapter 6 for more information.

Use the *Basic Life Support: Adults and Adolescents* code card as a cognitive aid when caring for an adult patient with a life-threatening injury or illness. See *Appendix C: Basic Life Support Code Cards*.



Figure 3-1 | A patient experiencing a life-threatening injury or illness needs immediate care and ongoing assessment.

Respiratory Arrest or Respiratory Failure in Adults

An adult patient is in **respiratory arrest** if they are not breathing and have a central pulse. They are in **respiratory failure** if they have ineffective ventilation and a central pulse. An adult patient in respiratory failure may have some ventilation; however, this ventilation is insufficient to sustain needed gas exchange, oxygen and carbon dioxide.

To provide care to an adult patient in respiratory arrest or respiratory failure, follow these steps.

- If you have not already done so, activate EMS, the rapid response team or the resuscitation team, as appropriate, and call for an AED.
- Deliver 1 ventilation every **6 seconds**; each ventilation should last about 1 second and make the chest begin to rise (Figure 3-2). If an advanced airway is in place, the rate remains the same.
- Perform primary assessment (Airway, Breathing, Circulation, Disability, Exposure) and emergent/ initial interventions, if not already done.
- Continue to check breathing and pulse every 2 minutes; if central pulse becomes absent, start CPR immediately and use an AED when it becomes available.
- Position patient as appropriate for clinical condition.
- Perform secondary assessment as patient condition allows.
- Reassess patient, recognize issues and provide care as needed.

For a suspected or known opioid overdose, prioritize care for respiratory arrest or respiratory failure as noted above and administer naloxone per your facility's protocol (if available). See Chapter 6 for more information.

Use the *Basic Life Support: Adults and Adolescents* code card as a cognitive aid when providing care for an adult patient in respiratory arrest or respiratory failure. See *Appendix C: Basic Life Support Code Cards*.



Figure 3-2 | For an adult patient in respiratory arrest or respiratory failure, deliver 1 ventilation every **6 seconds**.

Recovery Positions



To place an adult patient in a recovery position:

- Kneel at the patient's side.
- Lift the patient's arm closest to you up next to their head.
- Place the patient's arm farthest from you next to their side.
- Grasp their leg closest to you, flex it at the hip and bend the knee toward their head.
- Place one of your hands on the patient's shoulder and your other hand on their hip farthest from you.
- Using a smooth motion, roll the patient toward you by pulling their shoulder and hip with your hands. Make sure the patient's head remains in contact with their extended arm.
- Stop all movement when the patient is on their side.
- Place their knee on top of the other knee so that both knees are in a bent position.
- Place the patient's free hand under their chin to help support their head and airway.

Always follow your facility's protocols.

Cardiac Arrest in Adults

An adult patient is in cardiac arrest if they are not breathing (or only gasping) and their central pulse is absent. Cardiac arrest is different from myocardial infarction (or heart attack); however, a myocardial infarction can lead to cardiac arrest. See *Learn More: Myocardial Infarction* for more information.

Sudden cardiac arrest claims the lives of thousands of people in United States every year. If a patient goes into sudden cardiac arrest, their heart suddenly stops beating, stopping blood flow to the brain and other vital organs. Every second counts when a person is in sudden cardiac arrest. Healthcare providers across the care continuum can make a difference and save lives!

Adult In-Hospital Cardiac Chain of Survival

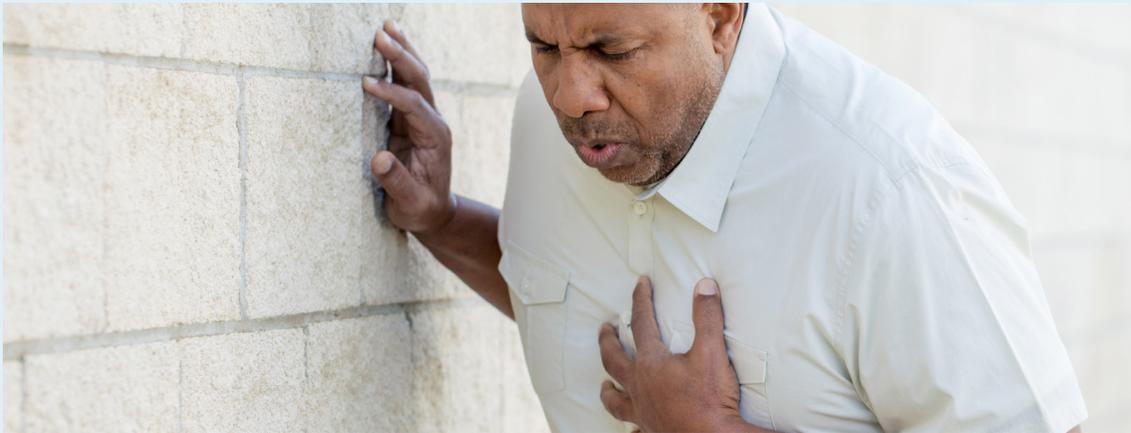
The Adult In-Hospital Cardiac Chain of Survival describes six actions that, when performed in rapid succession, increase the likelihood of a patient surviving a cardiac arrest.

While the majority of total cardiac arrests in the United States occur outside the hospital, it's important to understand these actions for an in-hospital cardiac arrest (Figure 3-3).

Surveillance and Prevention

Hospitalized patients often show changes in vital signs and other clinical parameters in the minutes and hours leading up to cardiac arrest. Closely monitoring for changes in the patient's condition that could be warning signs of impending cardiac arrest and activating the rapid response or resuscitation team as appropriate may allow providers to intervene and prevent the arrest from occurring.

Myocardial Infarction



A myocardial infarction (MI), or heart attack, refers to the necrosis (death) of heart tissue as a result of insufficient delivery of oxygenated blood to the heart. The sooner the signs and symptoms are recognized and treated, the lesser the degree of damage to the heart. Even patients who have had an MI before may not recognize the signs because each MI may present differently.

Signs and Symptoms

- Chest discomfort or pain that is severe, lasts longer than 3 to 5 minutes, goes away and comes back, or persists even during rest
- Discomfort, pressure or pain that is persistent and ranges from discomfort to an unbearable crushing sensation in the chest, possibly spreading to the shoulder, arm, neck, jaw, stomach or back, and usually not relieved by resting, changing position or taking medication
- Chest pain that comes and goes (such as angina pectoris)
- Difficulty breathing, such as at a faster rate than normal or noisy breathing
- Pale or ashen skin, especially around the face
- Sweating, especially on the face
- Dizziness or light-headedness
- Possible altered mental status or level of consciousness
- Nausea or vomiting

Although women may experience the most common signs and symptoms of MI, such as chest pain, discomfort, nausea or vomiting, they may also experience common atypical warning signs, such as:

- Shortness of breath.
- Stomach, back or jaw pain.
- Unexplained fatigue or malaise.

These warning signs may occur with or without chest pain. When women do experience chest pain, it may be atypical—sudden, sharp but short-lived pain outside the breastbone. Like women, other individuals such as those with diabetes or older adults may present with atypical signs and symptoms.

Immediate Care

In cases of suspected MI, administer two to four low-dose (81-mg) aspirin or one 325-mg adult aspirin based on your facility's protocols.



ALERT

Make sure that the patient chews the medication.

Depending on your level of training, additional care may include administration of oxygen, other medications and diagnostic tests. Each healthcare facility establishes interventions and standard protocols for adult patients who are suspected or confirmed to be experiencing an MI. It is important to be familiar with your own facility's protocols.

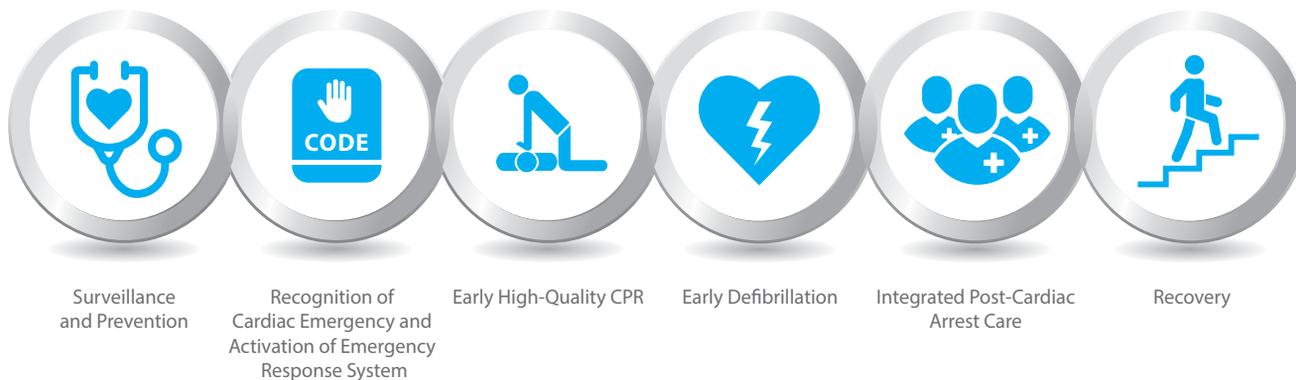


Figure 3-3 | The Adult In-Hospital Cardiac Chain of Survival

Recognition of a Cardiac Emergency and Activation of the Emergency Response System

Recognizing cardiac arrest and summoning advanced help in the form of the rapid response or resuscitation team provides the patient with access to necessary personnel, equipment and interventions as soon after arrest as possible.

Early High-Quality CPR

High-quality CPR, starting with compressions, should be initiated immediately once cardiac arrest is recognized.

Early Defibrillation

Defibrillation may restore an effective heart rhythm, increasing the patient’s chance for survival.

Integrated Post-Cardiac Arrest Care

After return of spontaneous circulation (ROSC), survival outcomes are improved when providers work to stabilize the patient, minimize complications, and diagnose and treat the underlying cause.

Recovery

Continued follow-up during the recovery process in the form of rehabilitation, therapy and support from family and healthcare providers improves outcomes.

Adult Out-of-Hospital Cardiac Chain of Survival

More than 356,000 out-of-hospital cardiac arrests occur annually in the U.S., with a survival rate of 10%. When a cardiac arrest occurs outside of the hospital, the patient relies on the community, emergency medical services and healthcare providers to provide care (Figure 3-4).

Recognition of Cardiac Emergency and Activation of the Emergency Response System

Immediate recognition of cardiac arrest and activation of the EMS system provides the patient with access to necessary personnel, equipment and interventions as soon after arrest as possible.

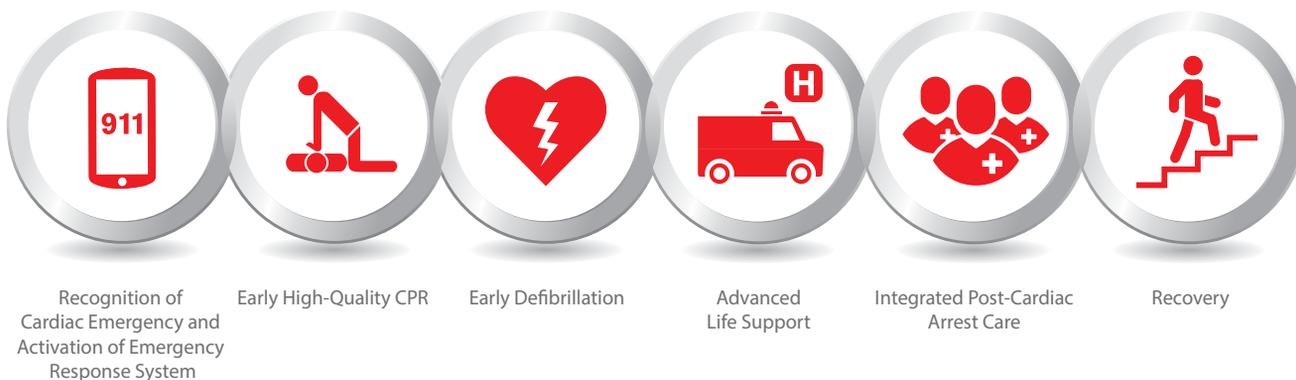


Figure 3-4 | The Adult Out-of-Hospital Cardiac Chain of Survival

Early High-Quality CPR

High-quality CPR, starting with compressions, should be initiated immediately once cardiac arrest is recognized, ideally by those at the scene prior to EMS arrival.

Early Defibrillation

Use of an AED by those at the scene prior to EMS arrival may restore an effective heart rhythm, increasing the patient's chance for survival.

Advanced Life Support

Early advanced life support provided by EMS professionals at the scene and en route to the hospital provides the patient with access to emergency medical care delivered by trained professionals.

Integrated Post-Cardiac Arrest Care

After return of spontaneous circulation (ROSC), survival outcomes are improved when providers work to stabilize the patient, minimize complications, and diagnose and treat the underlying cause.

Recovery

Continued follow-up during the recovery process in the form of rehabilitation, therapy and support from family and healthcare providers improves outcomes.

Components of High-Quality CPR

When the patient's heart stops functioning, cardiopulmonary resuscitation (CPR) is needed to circulate blood containing oxygen to their vital organs. Knowing how to correctly perform high-quality CPR helps you provide appropriate, effective care until the advanced cardiac life support team arrives.

Once you've recognized that the patient is in cardiac arrest, begin CPR high-quality immediately and use an AED when it is available.

For adult patients, high-quality CPR includes 30 chest compressions followed by 2 ventilations. Remember, smoothly transition between compressions and ventilations to minimize interruptions in compressions to less than 10 seconds. See Box 3-1 and *Skill Sheet: CPR for Adults*.

In some circumstances, you will need to modify CPR and AED use for adults as follows:

- **Advanced airways:** If an advanced airway is in place, one provider delivers 1 ventilation every 6 seconds. At the same time, a second provider

performs compressions at a rate of 100 to 120 per minute. In this case, the compression-to-ventilation ratio of 30:2 does not apply because compressions are delivered continuously without pausing for ventilations.

- **Drowning:** If drowning is the suspected cause of cardiac arrest in adults, deliver 2 initial ventilations before starting CPR.
- **Pregnancy:** For a pregnant patient with a fundus at or above the umbilicus or a fetal age known to be ≥ 20 weeks, start Obstetric Life Support™ (OBSL™). See topic *Basic Life Support for Pregnant Patients* later in this chapter.
- **Suspected or known opioid overdose:** If suspected or known opioid overdose is the cause of cardiac arrest, prioritize CPR and AED use and administer naloxone per your facility's protocol (if available). See Chapter 6 for more information.

Use the *Basic Life Support: Adults and Adolescents* code card as a cognitive aid when providing care for an adult patient in cardiac arrest. See *Appendix C: Basic Life Support Code Cards*.

Box 3-1 | Key Components of High-Quality CPR

KEY COMPONENTS OF HIGH-QUALITY CPR

- Compress the chest at a rate of 100 to 120 compressions per minute.
- Compress the chest to a depth of at least 2 inches (5 cm), but no more than 2.4 inches (6 cm).
- Allow for full chest recoil.
- Minimize interruptions to chest compressions to less than 10 seconds.
- Avoid excessive ventilations. Each ventilation should last about 1 second and make the chest begin to rise.

Chest Compressions

When providing chest compressions for an adult, proper technique is critical:

- Ensure that the patient is on a firm, flat surface. In a healthcare setting, use a bed with a CPR feature, or place a CPR board under the patient. In other settings, move the patient to the ground.
- If the patient is on a bed, adjust it to the appropriate working height or use a step stool. Lower the bed side rail closest to you. If the patient is on the ground, kneel beside them.

- Expose the patient's chest so you can ensure proper hand placement and visualize chest recoil.
- Place the heel of one hand in the center of the patient's chest on the lower half of the sternum. Place your other hand on top of the first and interlace your fingers or hold them up so that they are not resting on the patient's chest (Figure 3-5, A).
- Position yourself so your shoulders are directly over your hands (Figure 3-5, B).
- Keep your arms straight and lock your elbows.
- Compress the chest using a straight up-and-down motion. This allows you to use your body weight rather than your muscular strength, which is more effective and less tiring.
- For an adult, compress the chest to a depth of at least 2 inches (5 cm). If you are using a feedback device, make sure the compressions are no more than 2.4 inches (6 cm) deep. See *Science Note: Compression Depth*.
- Provide smooth compressions at a rate of at least 100 per minute but not more than 120 per minute.
- Allow the chest to return to its normal position after each compression, achieving complete chest recoil. Avoid leaning on the patient's chest during compressions because doing so impedes venous return and prevents the heart from filling completely. This, in turn, decreases cardiac output. Compression and recoil times should be approximately equal, as this improves the circulation generated by CPR.

Mechanical CPR

Mechanical CPR (mCPR) devices deliver high-quality chest compressions, in place of manual compressions delivered by human providers. Consider the use of mechanical CPR devices for an adult patient in cardiac arrest, if the BLS response team is practiced and adept at rapid application with less than a 10-second interruption in chest compressions. The application of mechanical CPR should not delay initiation of

manual chest compressions. Mechanical CPR may be considered for cases in which CPR will be prolonged (e.g., long transport times) or if cardiac arrest results from hypothermia, pulmonary embolism or toxicologic etiologies.

Ventilations

Like compressions, ventilations require proper technique:

- For a patient in cardiac arrest, deliver 2 ventilations that last approximately 1 second each and make the chest begin to rise; allow the air to exit before delivering the next ventilation.
- Do not hyperventilate or overventilate the patient. See *Science Note: Overventilation*.

Using CPR breathing barriers can protect you from coming in contact with a patient's blood, vomitus and saliva, or from breathing the patient's exhaled air. If a CPR breathing barrier is not available, you may provide mouth-to-mouth or mouth-to-nose ventilations.

Additionally, adjuncts to ventilations may be used to facilitate ventilations. These include supplemental oxygen, basic airways and advanced airways.

Pocket Mask Ventilations

Use of a pocket mask is recommended during single-provider CPR to limit interruptions in chest compressions. This allows you to remain at the side of the patient and limit unnecessary movement, which could delay your return to chest compressions.

Use of a pocket mask during multiple-provider CPR is also recommended when only one person is available to deliver ventilations. This will ensure a better seal and ventilation volume.

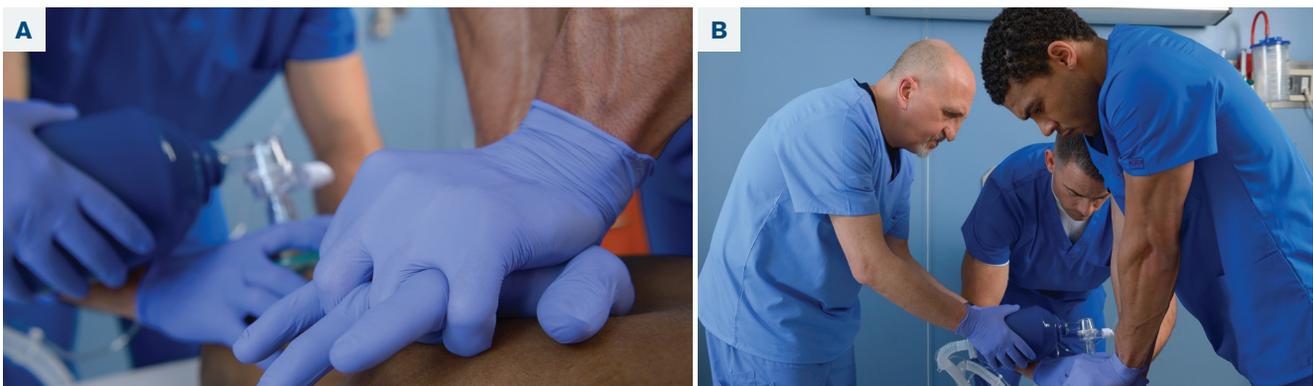


Figure 3-5 | Proper technique is critical in CPR. (A) Place your hands in the center of the patient's chest on the lower half of the sternum. Interlace your fingers or hold them up so that they are not resting on the patient's chest. (B) Position yourself so your shoulders are directly over your hands with your elbows locked.

SCIENCE NOTE



Compression Depth

Evidence shows that providing chest compressions at a rate greater than 120 per minute detrimentally affects compression depth because providers are less likely to compress the chest to the minimum depth of at least 2 inches (5 cm) for an adult. Additional evidence shows that compressing the chest to a depth greater than 2.4 inches (6 cm) leads to increased non-life-threatening injuries (such as rib fractures) in the average adult and should be avoided. The upper limits for the rate and depth of compressions exist to improve patient outcomes, but it is also critical to maintain a rate greater than 100 compressions per minute and a depth of at least 2 inches (5 cm). Both rate and depth of compressions are best measured using a feedback device if available.

SCIENCE NOTE



Overventilation

When giving ventilations, the intrathoracic pressure increases, causing atrial and ventricular filling to decrease and reducing both cardiac output and the **coronary perfusion pressure (CPP)** (i.e., the difference between the pressure in the aorta and the pressure in the right atrium during diastole).

Overventilation further increases the intrathoracic pressure, which in turn further decreases atrial and ventricular filling and further reduces cardiac output and coronary perfusion pressure (CPP). In addition, overventilation without an advanced airway leads to gastric distension, which further raises intrathoracic pressure and can increase risks of aspiration.

CPP is a reflection of myocardial blood flow; maintaining adequate CPP has been shown to increase the likelihood of return of spontaneous circulation (ROSC) and survival.

Make sure to use a pocket mask that matches the size of the patient; for example, use an adult pocket mask for an adult and an infant pocket mask for an infant. Always position and seal the mask properly before blowing into it. To use a pocket mask:

- Assemble the mask and valve.
- Starting from the bridge of the patient's nose, place the top of the mask over the patient's mouth and nose, then place the bottom of the mask below the mouth to the chin (the mask should not extend past the chin).
- To seal the mask, place the "webbing" between your index finger and thumb on the top of the mask above the valve; then place your remaining fingers on the side of the patient's face. Place the thumb of your other hand (the hand closest to the patient's chest) along the base of the mask while placing your bent index finger under the patient's chin, lifting the patient's face into the mask.
- Simultaneously, open the adult patient's airway to a past-neutral position while sealing the mask (for more information about opening the airway, see Chapter 2).
- Take a normal breath, make a complete seal over the mask valve with your mouth and blow into the mask to deliver 1 ventilation over 1 second, enough to make the chest begin to rise (Figure 3-6).
- Quickly break the seal and take a breath. Then reseal your mouth over the mask valve and deliver a second ventilation.



Figure 3-6 | When using a pocket mask, make a complete seal over the mask valve and deliver 1 ventilation over 1 second, enough to make the chest rise.

ALERT

When delivering ventilations during CPR, if the chest does not rise after the first breath, reopen the airway, make a seal and try a second ventilation. If the second ventilation is not successful, assume the patient has an obstruction. Chest compressions are used to clear an obstruction, so move directly back to compressions and check the airway for an obstruction before attempting subsequent ventilations. If an obstruction is found, remove it and attempt ventilations. Never perform a blind finger sweep.

Bag-valve-mask Ventilations

Bag-valve-mask (BVM) ventilations (also referred to as bag-mask ventilations) are performed during multiple provider CPR. A two-person technique for BVM ventilations is the preferred methodology during multiple provider CPR because it provides a better seal and ventilation volume. To perform this technique, one provider seals the mask and maintains an open airway while the other provider delivers ventilations.

When there is only one provider to deliver ventilations during multiple-provider CPR, the ventilator may consider using a pocket mask over a BVM resuscitator for a better seal and ventilation volume. However, it is recognized that factors such as limited personnel or the need to perform other time critical interventions may preclude using two-person BVM technique. Also, a BVM may be preferred to a pocket mask for supplemental oxygen, positive end-expiratory pressure (PEEP) and infection control. In these situations, one-person BVM is acceptable.

ALERT

During single-provider CPR, use of a BVM resuscitator is not recommended because it will increase the time between sets of chest compressions resulting in poor outcomes.

Supplemental oxygen should be attached to the BVM resuscitator as soon as appropriate and when enough resources are available. Doing so can increase oxygen concentration to approximately 90% to 100%.

When using the two-person BVM technique, one provider maintains the mask seal and open airway in a past-neutral position, while the second provider delivers ventilations by depressing the bag about halfway to make the chest begin to rise.

To use a BVM resuscitator when two providers are present:

- Select the appropriately sized BVM resuscitator and mask for the patient's size. Then, assemble the BVM resuscitator as needed.
- Provider 1 gets into position behind the patient's head (cephalic position).
- Provider 1 places the mask at the bridge of the nose and then lowers it over the patient's nose, mouth and chin. The mask should not extend past the patient's chin.
- To hold the mask in place, Provider 1 positions one hand around the mask, forming an "E" with the last three fingers and a "C" with the thumb and index finger—the E-C hand position (Figure 3-7).



Figure 3-7 | When two providers operate the BVM, one provider maintains the mask seal and open airway with two hands in the E-C hand position, while the other provider depresses the bag halfway to deliver ventilations.

- Provider 1 seals the mask completely around the patient's mouth and nose and opens the airway to a past-neutral position by lifting the jaw into the mask.
- Provider 1 maintains the mask seal and open airway.
- Provider 2 depresses the bag about halfway to deliver a volume of 400 to 700 mL.
- Provider 2 delivers 2 smooth, effortless ventilations that last about 1 second each and make the chest begin to rise.

When only one provider is available to operate the BVM, they maintain the mask seal and open airway with one hand in the E-C hand position. With the other hand, they depress the bag halfway to deliver ventilations (Figure 3-8).

Mouth-to-Mouth Ventilations

If a pocket mask or BVM resuscitator is not available, you may need to provide mouth-to-mouth ventilations.

- Open the airway to a past-neutral position.
- Pinch the patient's nose shut. Take a normal breath, make a complete seal over the patient's mouth with your mouth and blow into the patient's mouth to deliver 1 ventilation over 1 second until you see the chest begin to rise (Figure 3-9).
- After each ventilation, break the seal and take a breath before resealing your mouth over the patient's mouth. Then deliver the next ventilation. See *Science Note: Mouth-to-Mouth Ventilations*.

Mouth-to-Nose Ventilations

If you are unable to make a complete seal over the patient's mouth, you may need to use mouth-to-nose ventilations instead.



Figure 3-8 | When one provider operates the BVM, they maintain the mask seal and open airway with one hand in the E-C hand position. With the other hand, they depress the bag halfway to deliver ventilations.



Figure 3-9 | For mouth-to-mouth ventilations, make a seal over the patient's mouth with your mouth, pinch the nose shut and deliver ventilations as you would using a pocket mask.

- With the patient's head tilted back, close the mouth by pushing up on the chin.
- Seal your mouth around the patient's nose and breathe into the nose.
- If possible, open the patient's mouth between ventilations to allow air to escape.

Adjuncts to Ventilations

Supplemental oxygen, basic airways and advanced airways may be used to facilitate ventilations during cardiac and respiratory arrest. Always follow your facility's protocols when using adjuncts to ventilations.

A trained and authorized provider can provide supplemental oxygen or insert an airway as long as it does not delay the administration of compressions, ventilations or defibrillation. Ventilations using a BVM resuscitator deliver approximately 20% to 21% oxygen concentration to the patient. Attaching high-concentration supplemental oxygen to a BVM resuscitator can increase the oxygen concentration to approximately 90% to 100% and is recommended as soon as it is available (Figure 3-10, A).

It is important to know how to provide CPR when adjuncts to ventilations are in place. When supplemental oxygen or a basic airway (e.g., an oropharyngeal airway) is used, CPR is performed the same way. However, if an advanced airway is in place, CPR must be performed a little differently. One provider delivers 1 ventilation every 6 seconds while another provider performs continuous chest compressions. Therefore, the 30:2 compression-to-ventilation ratio does not apply. **Remember**, do not pause compressions for ventilations (Figure 3-10, B).

Mouth-to-Mouth Ventilations

With mouth-to-mouth ventilations, the air the patient receives contains approximately 16% to 17% oxygen; the oxygen concentration of ambient air is approximately 20%. Breaking the seal after each ventilation and taking a breath can help maintain an oxygen concentration of approximately 16% to 17%. If you do not break the seal and take a breath between ventilations, the second ventilation may contain a lower oxygen concentration and a high concentration of carbon dioxide.

CPR Cycles

For adult patients, cycles of CPR include 30 chest compressions followed by 2 ventilations.

During single-provider CPR, one provider performs chest compressions and delivers ventilations. However, during multiple-provider CPR, one provider performs chest compressions while one or two other providers manage the airway and deliver ventilations.

Remember, providers must smoothly transition between compressions and ventilations to minimize interruptions in compressions to less than 10 seconds.



Figure 3-10 | (A) Attaching high-concentration supplemental oxygen to a BVM resuscitator can increase the oxygen concentration to approximately 90% to 100%. (B) When an advanced airway is in place during respiratory arrest, deliver 1 ventilation every 6 seconds.

Automated External Defibrillators for Adults

An **automated external defibrillator (AED)** is a portable electronic device that automatically analyzes the patient's heart rhythm and provides **defibrillation**, an electrical shock that may help the heart re-establish a perfusing rhythm. AEDs deliver defibrillation(s) to patients with two specific arrhythmias: ventricular fibrillation (VF) and ventricular tachycardia (VT). When a patient experiences cardiac arrest, an AED should be applied as soon as it is readily available (Figure 3-11). Early use of an AED greatly increases the patient's chance of survival.

For every 1-minute delay in CPR and defibrillation, a patient's chance of survival is reduced by 7% to 10%.



Figure 3-11 | For a patient in cardiac arrest, use an AED as soon as one is available. If multiple providers are present, continue CPR until the AED is ready to analyze the rhythm.

Using an AED

AED models function differently. Always follow the manufacturer's instructions for the AED in use in your facility.

If CPR is in progress, continue CPR until the AED is turned on, the AED pads are applied and the AED is ready to analyze the heart rhythm.

If you are alone and an AED is available, you should use it once you have determined the patient is in cardiac arrest. See *Skill Sheet: AED Use for Adults*.

To use an AED:

- Turn the AED on and follow the prompts. Some AEDs turn on as soon as you open the case or lid. For others, you have to press a power button or pull a handle.
- Remove or cut away clothing and undergarments to expose the patient's chest. If the patient's chest is wet, dry it using a towel or gauze pad. Do not use an alcohol wipe to dry the skin because alcohol is flammable.



Practice Note

If a monitor defibrillator is available, it may have an AED function. Although the device may look different, follow the same steps.

- Apply pads appropriately sized for the patient's age in the proper location on the bare chest.
 - Use adult AED pads or energy levels. Never use pediatric AED pads or a pediatric electrical setting on an adult, because the shock delivered will not be sufficient.
 - Place one pad on the upper right chest, below the right clavicle to the right of the sternum. Place the other pad on the left side of the chest, on the midaxillary line a few inches below the left armpit. This is an anterior/lateral placement. If the AED pads have a feedback device, make sure it's placed in the center of the chest.
 - Some AED models use an anterior/posterior pad placement for adult patients. In this case, place one pad to the center of the patient's chest—on the sternum—and one pad on the patient's back between the scapulae. Always follow the manufacturer's instructions.
- Plug in the connector and push the analyze button, if necessary. Most AEDs available today have pads that are already connected and will automatically analyze once the pads are applied to the chest. Make sure you understand how the AED you are using operates.

- Tell everyone to “clear” while the AED is analyzing to ensure accurate analysis. Make sure that no one, including you, is touching the patient while the AED is analyzing the heart rhythm because this could result in a faulty reading.
 - During the AED analysis, the compressor should prepare to begin compressions immediately after a shock is delivered or if the AED advises that a shock is not indicated. Remaining in position with the hands a few inches above the patient's chest, or **hovering**, during analysis and while delivering the shock minimizes interruptions to chest compressions (Figure 3-12).
 - When the AED is analyzing the rhythm, pause compressions and ventilations, even when using devices with artifact-filtering algorithms.
 - Some AEDs and manual defibrillators allow for compressions after the device analyzes the rhythm, while it is charging. Providers may perform compressions from the time the shock-advised prompt is noted through the time that the *clear* prompt occurs, just before depressing the shock button. Be sure to follow the manufacturer's recommendations and your facility's protocols.
- If the AED advises that a shock is indicated, tell everyone to “clear” prior to depressing the shock button. The AED delivers an electrical current that could injure anyone in contact with the patient.
- After the shock is delivered or if no shock is advised, immediately resume CPR, starting with chest compressions. Based on the clinical situation, you may consider performing rhythm analysis after defibrillation, recognizing that this may not be possible on all AEDs.
- Perform about 2 minutes of CPR (about 5 cycles of 30 compressions to 2 ventilations) until the AED prompts that it is reanalyzing, the patient shows



Figure 3-12 | During the analysis and while delivering the shock, the compressor hovers their hands a few inches above the patient's chest to minimize interruptions in chest compressions.

signs of ROSC, or the team leader or other trained providers instruct you to stop.

- If you are working as a team, smoothly switch positions approximately every 2 minutes (which usually occurs at the time of AED analysis) to prevent fatigue.

It is important to check AEDs regularly according to the manufacturer's instructions or your facility's policy to ensure that they are in good working order and ready to use whenever they are needed.

AED Safety

Patient Considerations

- **Pregnancy.** It is safe to use an AED on a patient who is pregnant. However, AED pads should not incorporate any breast tissue.
- **Pacemakers and implantable cardioverter-defibrillators (ICDs).** You should use an AED if a patient is in cardiac arrest and has a pacemaker or ICD. However, you should adjust the pad placement to avoid placing the AED pads directly over the device, because doing so may interfere with the delivery of the shock. Note: A pacemaker or ICD may be placed in the right upper chest near the clavicle or in the abdomen.
- **Transdermal medication patches.** Before applying AED pads, remove any medication patches with a gloved hand and wipe away any remaining medication from the skin.
- **Chest hair.** Time is critical in a cardiac arrest situation and chest hair rarely interferes with pad adhesion. However, if the patient has a great deal of chest hair that could interfere with pad-to-skin contact, quickly shave the areas where the pads will be placed before attaching the AED pads.
- **Jewelry and body piercings.** A patient's jewelry or body piercings do not need to be removed before using an AED, but avoid placing the AED pads directly over any metallic jewelry or piercings. Adjust pad placement if necessary.

Environmental Considerations

- **Flammable or combustible materials.** Do not use an AED around flammable or combustible materials such as free-flowing oxygen.

- **Metal surfaces.** It is safe to use an AED when a patient is lying on a metal surface, as long as appropriate precautions are taken. Do not allow the AED pads to contact the metal surface, and ensure that no one is touching the patient when the shock is delivered.
- **Water.** If the patient is lying in a large puddle or submerged in water, remove them from the water before using an AED. However, if they are lying in a small puddle or wet surface, you do not need to remove them—providing you and the AED are not in the small puddle. Also, remove a patient's wet clothing from the chest and wipe the patient's chest dry before placing the AED pads. Avoid getting the AED or AED pads wet.
- **Inclement weather.** AEDs are safe to use in all weather conditions, including rain and snow. Provide a dry environment if possible, but do not delay defibrillation to do so. Remove a patient's wet clothing from the chest and wipe the patient's chest dry before placing the AED pads. Avoid getting the AED or AED pads wet.

AED Maintenance

As with any biomedical device, routine maintenance is necessary to ensure that the device performs properly and safely. AEDs require minimal maintenance, but it is important to check them regularly according to the manufacturer's instructions or your facility's policy to ensure that they are in good working order and ready to use whenever they are needed.

To provide routine maintenance:

- Familiarize yourself with the owner's manual and follow the manufacturer's instructions for maintaining the equipment.
- Familiarize yourself with the method the AED uses to indicate the status of the device. Many AEDs have a status indicator that displays a symbol or illuminates to indicate that the AED is in proper working order and ready to respond.
- Make sure the battery is properly installed and within its expiration date.
- Make sure AED pads are adequately stocked, stored in a sealed package and within their expiration date.
- After using the AED, make sure that all supplies are restocked and that the device is in proper working order.
- If at any time the AED fails to work properly or warning indicators illuminate or beep, take the AED out of service based on manufacturer's recommendations and contact the manufacturer or the appropriate person at your facility, according to your facility's policy.

Single and Multiple Providers

When you are the only provider present, you must complete the rapid assessment, perform CPR (30:2) and use the AED, if one is available. CPR can be exhausting, so you should attempt to find additional resources as soon as possible during the rapid assessment.

When multiple providers are available, the first provider performs the rapid assessment and initiates CPR (30:2), starting with chest compressions. Meanwhile, the other providers call for additional resources and get and prepare the AED, if available. If sufficient providers are available, they assist with ventilations. Providers smoothly switch positions about every 2 minutes. This should take less than 10 seconds. The compressor calls for a position change by saying “switch” in place of the number 1 in the compression cycle.

You should continue CPR/AED use until:

- The team leader tells you to stop.
- Other trained providers arrive and relieve you.
- You see signs of return of spontaneous circulation (ROSC), such as spontaneous movement or breathing.
- You are presented with a valid do not resuscitate (DNR) order.
- You are too exhausted to continue.
- The situation becomes unsafe.

If the patient shows signs of ROSC:

- Stop CPR/AED use.
- Check for breathing and a pulse. It is appropriate to check the carotid or femoral pulse when the patient shows signs of ROSC and multiple providers are present.
- Monitor the patient until the advanced cardiac life support team takes over.

Cardiac Arrest in Pregnancy

Management of cardiac arrest during pregnancy presents unique challenges and considerations for resuscitation. Because the likelihood of a positive outcome for the fetus is increased when there is a positive outcome for the pregnant patient, the basic life support team should stay focused on resuscitation of the pregnant patient.

Causes of Cardiac Arrest in the Pregnant Patient

The mnemonic BAACC TO LIFE™ can be used to remember causes of cardiac arrest in pregnancy.

BAACC

- Bleeding
- Anesthesia
- Amniotic fluid embolism
- Cardiovascular/cardiomyopathy
- Clot/cerebrovascular

TO

- Trauma
- Overdose (opioids, magnesium sulfate, other)

LIFE

- Lung injury/acute respiratory distress syndrome
- Ions (glucose, potassium)
- Fever (sepsis)
- Eclampsia/ emergency hypertension

High-Quality CPR for Pregnant Patients

Gestational age is an important consideration when determining the approach to a pregnant patient in cardiac arrest.

- If the fundus is below the umbilicus or gestational age is known to be < 20 weeks, follow the *Basic Life Support: Adults and Adolescents* code card.
- If the fundus is at or above the umbilicus or gestational age known to be ≥ 20 weeks, follow the *Basic Life Support: Pregnant Patients* code card.

See *Appendix C: Basic Life Support Code Cards*.

Additionally, there are unique considerations for CPR of a pregnant patient in cardiac arrest with a fundus at or above umbilicus or fetal age known to be ≥ 20 weeks.

- **Activate maternal and neonatal resuscitation teams early.** Remove fetal monitors, if present, immediately after cardiac arrest is recognized. In a pregnant patient with out-of-hospital cardiac arrest, prioritize transport over care at the scene following local protocols for destination decision.
- **Resuscitation Team CPR Roles.** For a pregnant patient in cardiac arrest, at least three (and preferably four) team members are needed to perform high-quality CPR: One to provide compressions, one to provide continuous left uterine displacement and one (preferably two) to manage the airway and breathing.
- **Left Uterine Displacement.** When the fundus is at or above the umbilicus or gestational age is known to be 20 weeks or later, left uterine displacement (LUD) must be provided continuously throughout the resuscitation effort and until the infant is delivered, even if return of spontaneous circulation (ROSC) is achieved. LUD relieves pressure placed on the

inferior vena cava by the gravid uterus, increasing venous return to the heart to maximize cardiac output. To provide LUD:

- Position yourself on the patient's left side. Reach across the patient, place both hands on the right side of the uterus, and pull the uterus to the left and up. (Figure 3-13 A)
- Alternatively, position yourself on the patient's right side. Place two hands on the right side of the uterus and push the uterus to the left and up. (Figure 3-13 B)
- In most cases one will need two hands to sufficiently displace the uterus.

■ **Resuscitative Cesarean Delivery.** Resuscitative cesarean delivery (RCD) should be performed by a trained provider within 5 minutes from the time of arrest. RCD may be performed earlier than 5 minutes from the time of arrest and as soon as possible when the rhythm is nonshockable or ROSC has not been achieved or is intermittent after 2 cycles of CPR. In a pregnant patient with out-of-hospital cardiac arrest, RCD should be performed immediately upon the patient's arrival to the emergency department if the patient has not achieved ROSC.

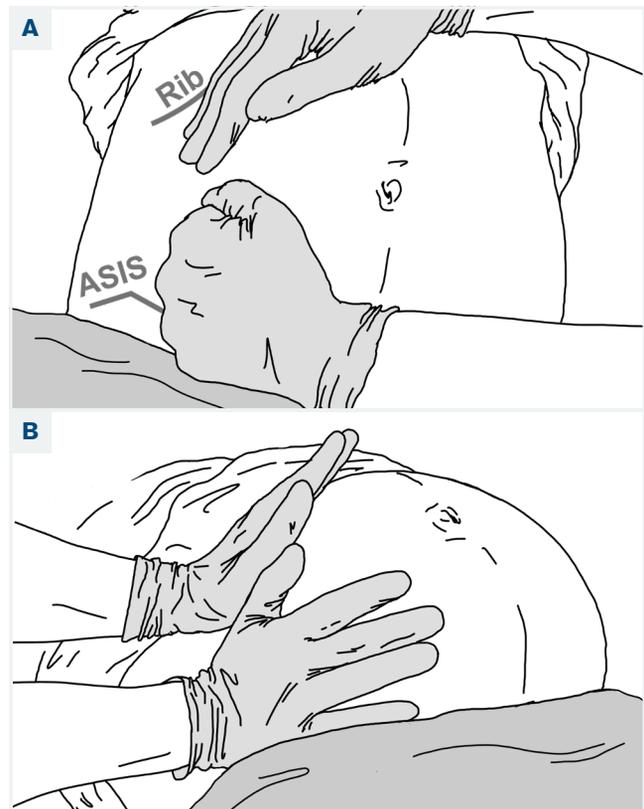


Figure 3-13 | How to provide Left Uterine Displacement (LUD). (A) Reach across from the patient's left side. Put both hands on the right side of the uterus. Pull it to the left and up. (B) Or, from the patient's right side, place both hands on the right side of the uterus. Push it to the left and up.

High-Performance Resuscitation Teams

High-performance resuscitation teams work together in a well-organized effort to provide high-quality CPR, improve patient outcomes and deliver expert care (Figure 3-14). Characteristics of a high-performance team include well-defined roles and responsibilities; clear, closed-loop communication; and respectful treatment of others.

Think about all of the activities performed during a resuscitation. For example:

- AED pads are applied.
- AED must charge.
- Pocket mask or BVM may need to be repositioned.
- Airway may need to be reopened.
- Other personnel arrive on scene.
- Providers switch positions.
- Advanced airway may need to be inserted.
- Pulse checks might be done.

All of these activities could affect your ability to maintain contact with the patient's chest.



Figure 3-14 | A high-performance team provides high-quality CPR, improves patient outcomes and delivers expert care.

Team Roles

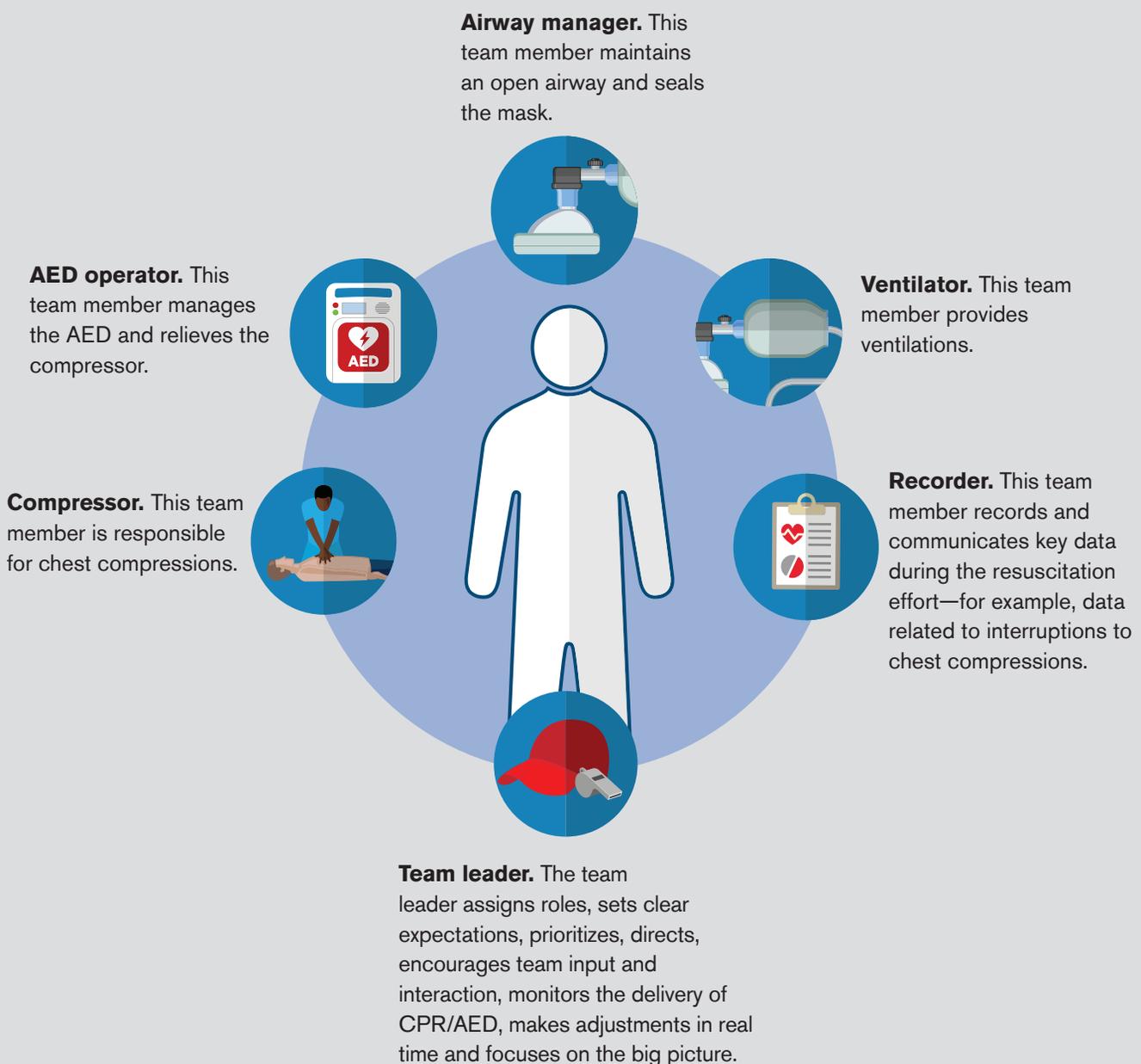
During resuscitation, numerous team members might be involved in an emergency response. When the team leader and all of the team members, in their assigned roles, work together as a high-performance team, they deliver expert care and improve outcomes.

Depending on the number of available resources, team members might perform more than one role (e.g., the airway manager might also operate the AED or ventilate the patient).

Integration of Other Trained Providers

Coordination becomes even more important when other trained providers, such as an advanced life support team or code team, arrive to take over care (Figure 3-15). This coordination of all involved is necessary to:

- Ensure that all individuals involved work as a team to help promote the best outcome for the patient.
- Promote effective perfusion to the vital organs.



- Minimize interruptions of chest compressions to less than 10 seconds, which has been shown to improve survival.

Ultimately, the team leader is responsible for this coordination. When other trained providers arrive, the team leader communicates with them, providing them with a report of the patient's status and events.

Continuous Quality Improvement

Healthcare providers and their employers have a responsibility to ensure that they provide the highest quality CPR throughout every resuscitation event. To achieve this goal, it is necessary to gather data and use that data to inform improvements in individual and team performance. Methods of evaluating CPR quality include visual observation and the use of feedback devices, calculations such as the chest compression fraction, and capnography. Additionally, debriefing after the resuscitation event allows the team to make any necessary changes in order to positively affect the outcome of future resuscitation events.

SCIENCE NOTE

Minimize Interruptions



Current research indicates that survival following resuscitation is significantly affected by the quality of CPR performed. One important aspect is to minimize interruptions in chest compressions to less than 10 seconds, which helps to maximize the blood flow generated by the compressions.



Figure 3-15 | Good team coordination is extremely important when other trained providers, such as the code team, arrive on the scene.

Data collected about the effectiveness of CPR allows for continuous improvement, both “in the moment” and during future resuscitation events.

Visual Observation

Visual observation is an important qualitative measure of high-quality CPR. Visual observation allows for in-the-moment adjustments to technique based on feedback from the team leader or another team member. For example, the team leader may observe that the provider giving compressions is tiring or that compressions are not being delivered at the correct rate or depth. These observations allow the team leader to redirect the team as necessary to get back on track.

Feedback Devices

Feedback devices use technology to gather data about CPR performance and provide real-time feedback. These devices collect objective data such as the rate at which compressions and ventilations are being delivered, the depth of compressions and the amount of chest recoil. Many different types of feedback devices are available, ranging from apps on smartwatches to self-contained systems, some with attachments to place on the patient. All feedback devices are designed to act as “virtual coaches,” guiding providers to adjust technique in order to perform effective, high-quality CPR. In addition, most feedback devices record data that can be analyzed after the resuscitation event, enabling improvements to be implemented for future resuscitation events (Figure 3-16).

Chest Compression Fraction

The **chest compression fraction (CCF)** represents the amount of time spent performing compressions, and it is another way to gain objective feedback about the quality of CPR. It is calculated by dividing the time that providers are in contact with the patient’s chest by the total duration of the resuscitation event, beginning with the arrival of the resuscitation team and ending with the achievement of ROSC or the cessation of CPR. According to expert consensus, a CCF of at least 60% is needed to promote optimal outcomes, and the goal should be 80%. Many feedback devices are able to calculate the CCF based on the data they collect. When

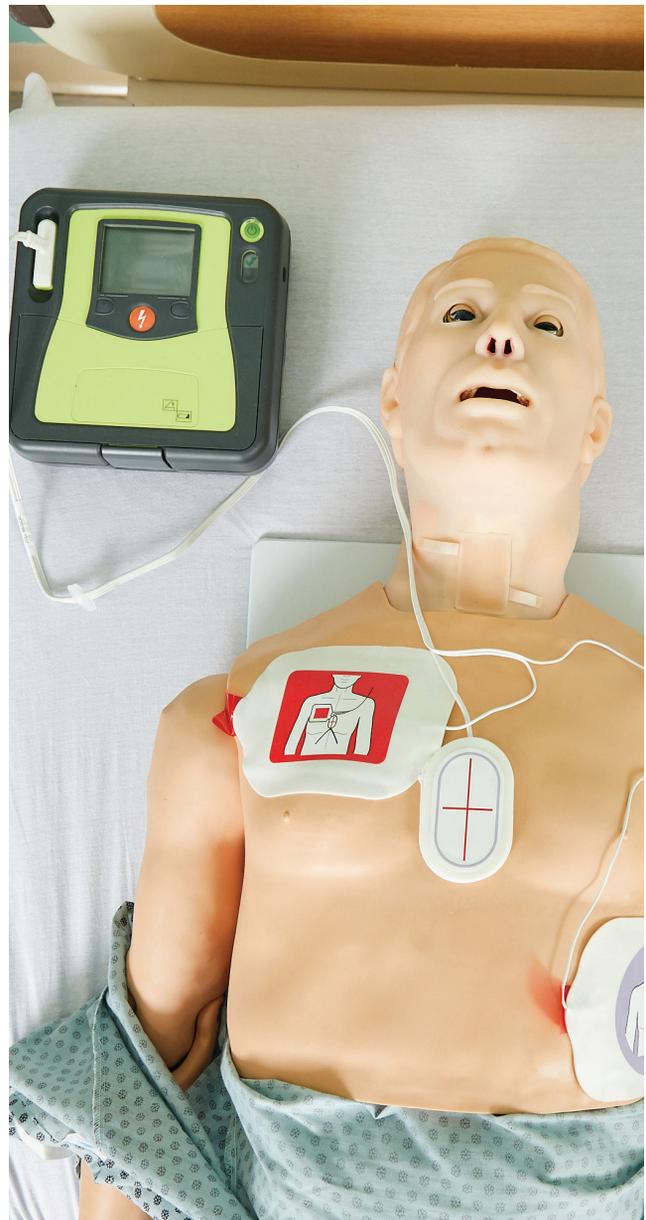


Figure 3-16 | Feedback devices are designed to act as “virtual coaches,” guiding providers to adjust technique in order to perform effective, high-quality CPR. The feedback device shown here is placed in the center of the patient’s chest. When compressed, data is sent to the defibrillator and communicated in real-time to the providers.

a feedback device is not in use, a team member may be assigned to record data that can be used to calculate the CCF, such as the duration of interruptions to CPR and the duration of the entire resuscitation event.

Capnography

Capnography, which measures the end-tidal carbon dioxide (ETCO₂) level, is a noninvasive way of obtaining an objective measure of compression quality with every ventilation (Figure 3-17). An adapter attached to a BVM

or advanced airway, or a nasal cannula uses sensors to detect ETCO_2 levels, which are displayed as waveforms on a monitor.

Carbon dioxide delivery to the lungs depends on cardiac output. When circulation is adequate, a predictable amount of carbon dioxide should be exhaled. So, the end-tidal carbon dioxide (ETCO_2) level is a quantitative measure of cardiac output—and by extension, the effectiveness of compressions. An end-tidal carbon dioxide level in the expected range also suggests that ventilations are effective.

The ETCO_2 level can be measured using an adapter attached to a BVM resuscitator or advanced airway, or a nasal cannula can be applied under a mask.

Normally, end-tidal carbon dioxide levels are in the range of 35 to 45 millimeters of mercury (mmHg). But in low-perfusion states such as cardiac arrest, the levels are much lower. When high-quality CPR is provided, end-tidal carbon dioxide levels should be in the range of 15 to 20 mmHg. If the levels fall below 10 mmHg, there could be a problem with the rate of ventilations or with the rate or quality of compressions.

Capnography is also an effective tool to determine ROSC and to help the resuscitation team decide when to discontinue CPR. A spike in ETCO_2 levels (up to 40 mmHg) is a strong indicator that the patient has achieved ROSC. Conversely, if ETCO_2 levels remain less than 10 mmHg in an intubated patient who has been receiving high-quality chest compressions for at least 20 minutes, the likelihood that the patient will achieve ROSC is decreased, and the decision may be made to terminate the resuscitation effort. If, however, ETCO_2 levels remain greater than 15 mmHg, the patient has an increased chance to achieve ROSC and resuscitation efforts should continue.

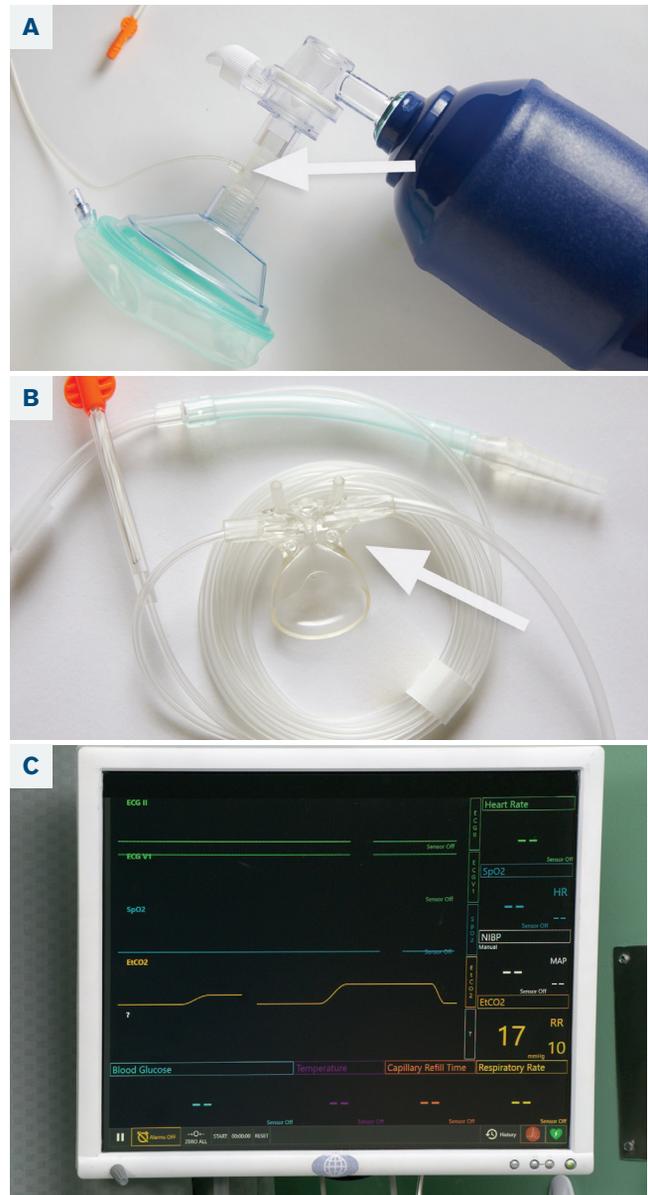


Figure 3-17 | Capnography is a noninvasive way to objectively measure compression quality. (A) To measure the ETCO_2 level, attach an adapter to a BVM. (B) Alternatively, attach an adapter to the nasal cannula and place it under the mask. (C) When high-quality CPR is provided, ETCO_2 levels should be in the range of 15 to 20 mmHg.



SKILL SHEET

CPR for Adults

Step 1 Conduct a rapid assessment

- Perform a quick visual survey looking for life-threatening bleeding.
- Check for responsiveness.
- Open the airway and simultaneously check for breathing and a pulse (carotid) for no more than 10 seconds. At the same time, scan the body again for life-threatening bleeding.
- If the patient is not breathing (or only gasping) and their central pulse is absent, begin CPR.



Step 2 Place the patient on a firm, flat surface

- In a healthcare setting, use a bed with a CPR feature, or place a CPR board under the patient.
- Adjust the bed to an appropriate working height or use a step stool. Lower the bed side rail closest to you.
- In other settings, move the patient to the floor or ground and kneel beside them.



Step 3 Position your hands correctly

- Expose the patient's chest to ensure proper hand placement and visualize chest recoil.
- Place the heel of one hand in the center of the patient's chest on the lower half of the sternum.
- Place your other hand on top of the first and interlace your fingers or hold them up so that they are not resting on the patient's chest.



SKILL SHEET

CPR for Adults *(continued)*

Step 4 Position your body effectively

- Position yourself so your shoulders are directly over your hands. This position lets you compress the chest using a straight up-and-down motion.
- To help keep your arms straight, lock your elbows.



Practice Note

If drowning is the suspected cause of cardiac arrest, deliver 2 initial ventilations before starting CPR.



Step 5 Perform 30 chest compressions

- For an adult, compress the chest to a depth of at least 2 inches (5 cm). If you are using a feedback device, make sure the compressions are no more than 2.4 inches (6 cm) deep.
- Provide smooth compressions at a rate of 100 to 120 per minute.
- Allow the chest to fully recoil after each compression. Avoid leaning on the patient's chest at the top of the compression. Compression and recoil times should be approximately equal as this improves the circulation generated by CPR.



Practice Note

Consider the use of mechanical CPR (mCPR) devices for an adult patient in cardiac arrest, if the BLS response team is practiced and adept at rapid application with less than a 10-second interruption in chest compressions.



SKILL SHEET

CPR for Adults *(continued)*

Step 6 Seal the mask and open the airway

- Use an adult pocket mask for single-provider CPR or a BVM for multiple-provider CPR. Remember, a two-person technique for BVM ventilation is the preferred methodology.
- Seal the mask and simultaneously open the airway to a past-neutral position using the head-tilt/chin-lift technique.
- Or, use the modified jaw-thrust maneuver if you suspect a head, neck or spinal injury.



Practice Note

Attach supplemental oxygen to the BVM resuscitator as soon as appropriate and when enough resources are available.

Step 7 Provide 2 ventilations

- While maintaining the mask seal and open airway, provide smooth, effortless ventilations. Each ventilation should last about 1 second and make the chest begin to rise; allow the air to exit before delivering next ventilation. Avoid excessive ventilation.
- If you do not have a pocket mask or BVM, provide mouth-to-mouth or mouth-to-nose ventilations.



SKILL SHEET

CPR for Adults *(continued)*

Practice Note

If an advanced airway is in place, one provider delivers 1 ventilation every 6 seconds. If an advanced airway is in place, the 30:2 ratio does not apply. In this case, one provider delivers 1 ventilation every 6 seconds, while the other provider delivers continuous chest compressions without pausing for ventilations.

Step 8 Switch positions every 2 minutes

- When providing CPR with multiple providers, smoothly switch positions about every 2 minutes. This should take less than 10 seconds.
- The compressor calls for a position change by saying “switch” in place of the number 1 in the compression cycle.



Step 9 Continue CPR

Continue providing CPR until:

- The team leader tells you to stop
- Other trained providers arrive to relieve you
- You see signs of ROSC
- You are presented with a valid DNR order
- You are too exhausted to continue
- The situation becomes unsafe



Practice Note

Upon achieving ROSC, supplemental oxygen should be used based on your facility's protocols to maintain a normal oxygen saturation level while avoiding hyperoxygenation. Providers should use a pulse oximeter to monitor oxygen saturation.

SKILL SHEET

AED Use for Adults

Step 1 Turn on the AED and follow the prompts

- Because AED models function differently, follow your facility's protocols and the manufacturer's instructions for the AED you have.

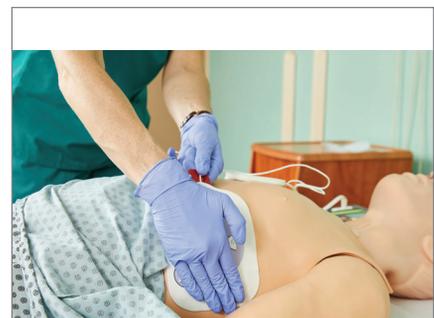


Step 2 Expose the chest

- Expose the chest and wipe it dry, if necessary.

Step 3 Attach the pads

- Use an anterior/lateral pad placement, according to the manufacturer instructions:
 - Place one pad on the upper right chest, below the right clavicle to the right of the sternum.
 - Place the other pad on the left side of the chest along the midaxillary line a few inches below the armpit.
- Or, use an anterior/posterior placement, according to the manufacturer instructions:
 - Place one pad to the center of the patient's chest—on the sternum.
 - Place one pad to the patient's back between the scapulae.



Alert

Do not use pediatric AED pads or pediatric levels of energy on an adult or on a child older than 8 years or weighing more than 55 pounds.

SKILL SHEET

AED Use for Adults *(continued)*



Practice Note

It is safe to use an AED on a pregnant patient. However, AED pads should not incorporate any breast tissue.

Step 4

Prepare to let the AED analyze the heart's rhythm

- If necessary, plug in the connector and push the analyze button.
- Instruct everyone to stand clear while the AED analyzes. No one, including you, should be touching the patient.
- If you are working as a team, prepare to smoothly switch positions to prevent fatigue. The provider giving compressions should hover their hands above the patient's chest.



Practice Note

When the AED is analyzing the rhythm, pause compressions and ventilations, even when using devices with artifact-filtering algorithms.



Step 5

Deliver a shock, if the AED determines one is needed

- If the AED advises a shock, again instruct everyone to stand clear. The compressor should continue to hover their hands over the patient's chest in preparation for CPR.
- Press the shock button to deliver the shock.



SKILL SHEET

AED Use for Adults *(continued)*

Step 6 After the AED delivers the shock, or if no shock is needed —

- Immediately begin CPR.
- Continue for about 2 minutes until:
 - The AED prompts that it is reanalyzing.
 - The patient shows signs of return of spontaneous circulation.
 - The team leader or other trained providers instruct you to stop.
- If you are working as a team, smoothly switch positions approximately every 2 minutes (which usually occurs at the time of AED analysis) to prevent fatigue.



Practice Note

After a shock is delivered, immediately resume CPR for 2 minutes before pausing compressions for the AED to analyze the heart rhythm. However, based on the clinical situation, you may consider performing rhythm analysis after defibrillation, recognizing that this may not be possible on all AEDs.



Basic Life Support for Children and Infants

Introduction

Children and infants, just like adults, may experience cardiac, respiratory and other life-threatening emergencies that require basic life support (BLS) . However, children and infants are not small adults. Therefore, they need to be cared for differently in a life-threatening emergency. This chapter reviews the key differences when providing BLS to children and infants. See *Appendix D: Basic Life Support Differences Among Adults, Children and Infants*.

Rapid Assessment

Rapid assessment for a child or infant is similar to rapid assessment for an adult with a few key differences. See *Skill Sheet: Rapid Assessment for Children and Infants*.

Practice Note

Remember, use the A-B-C mnemonic to easily recall and perform assessment.

Perform a Visual Survey

Performing a visual survey for the child or infant is similar to performing a visual survey for adults—assess for safety, obtain an initial impression of the patient, look for life-threatening bleeding and determine the need for additional resources.

Obtain Consent

Legally, adults who are awake and alert can consent to treatment; if they are not alert, consent is implied. However, for most infants and children up to the age of 17 years, you must obtain consent from the child's parent or legal guardian if they are present regardless of the child's level of consciousness.

To gain consent, state who you are, what you observe and what you plan to do when asking a parent or legal guardian permission to care for their child. If no parent or legal guardian is present, consent is implied in life-threatening situations. Always follow your local laws and regulations as they relate to the care of minors.

Check for Responsiveness

If the child or infant appears unresponsive, use the shout-tap-shout sequence to check for responsiveness. Shout, "Are you OK?" or use the child or infant's name if known, as you do with an adult. Tap the child on the shoulder similar to an adult (Figure 4-1, A); however, tap the infant on the bottom of the foot. Then shout again. (Figure 4-1, B).

Additional Resources

As with an adult, if a child or infant is unresponsive follow these steps:

- Call or tell someone to activate EMS, the rapid response team or the resuscitation team, as appropriate and retrieve the AED and other resuscitation equipment.
- If you are alone with a child or infant and do not have a mobile phone or other form of communication, you must decide to call first or care first. See *Learn More: Call First or Care First?*



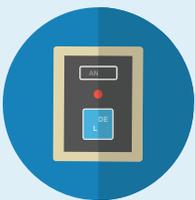
Figure 4-1 | If a child or infant appears unresponsive, use the shout-tap-shout sequence to check for responsiveness. (A) For a child, tap the shoulder as you do for an adult. (B) For an infant, tap the bottom of the foot instead.



Call First or Care First?

Although it is rare as a professional healthcare provider to be alone with a child or infant or to be unable to call for additional resources, you should follow certain steps if this is ever the case.

If you are alone and do not have a mobile phone or other method of communication, you must decide to call first or care first.



Call First

For a child or an infant whom you witnessed suddenly collapse, or for an unresponsive child or infant with a known cardiac condition:

- Call for help to activate EMS, the rapid response team or the resuscitation team, as appropriate, and call for an AED.
- Then, provide care based on the conditions found.



Care First

For an unresponsive child or infant whom you did not see collapse:

- Provide 2 minutes of care based on the conditions found.
- Then, call for help to activate EMS, the rapid response team or the resuscitation team, as appropriate, and call for an AED.



ALERT

If you are caring for an infant, bring them with you to get additional resources.

Open the Airway

Subtle differences in positioning are applied when opening the airway of a child or infant compared with an adult. To open the airway of a child or infant, use the same head-tilt/chin-lift technique or jaw-thrust maneuver as for an adult. However, when using the head-tilt/chin-lift technique, only tilt the head to a slightly past-neutral position for a child (Figure 4-2, A) or a neutral position for an infant (Figure 4-2, B). Take care to avoid any hyperextension or flexion in the neck. Be careful not to place your fingers on the soft tissues under the chin or neck to open the airway.



Figure 4-2 | Use the head-tilt/chin-lift to open the airway. (A) For a child, tilt the head to a slightly past-neutral position. (B) For an infant, only tilt the head to a neutral position.

Simultaneously Check for Breathing, a Pulse and Life-Threatening Bleeding

As with an adult, simultaneously check breathing and a pulse for **no more than 10 seconds**. At the same time, scan the body for life-threatening bleeding. Check the carotid pulse for a child (Figure 4-3, A).

However, for an infant, check the brachial pulse with two fingers on the inside of the upper arm. Do not use your thumb because it has its own detectable pulse. You will need to expose the arm to accurately feel a brachial pulse (Figure 4-3, B).

After completing your rapid assessment, provide care based on conditions found following your facility's protocols.



Figure 4-3 | As part of rapid assessment, simultaneously check for breathing and a pulse. (A) For a child, check at the carotid artery, as you do for an adult. (B) For an infant, check at the brachial artery.

ALERT

Remember, assess for life-threatening bleeding during the initial impression and the breathing and pulse check. If at any time the child or infant has life-threatening bleeding, control the hemorrhage with any available resource (including the use of a tourniquet or hemostatic dressing as appropriate). Then activate EMS, the rapid response team or the resuscitation team (as appropriate) and call for an AED and resuscitation equipment (if not already done).

Life-Threatening Injury and Illness in Children and Infants

Similar to an adult, care for a pediatric patient with a life-threatening injury or illness includes:

- Activating EMS, rapid response or resuscitation team.
- Performing a primary assessment and implementing emergent/initial interventions.
- Positioning as appropriate for the patient's condition.
- Performing a secondary assessment as patient condition allows.
- Reassessing the patient, recognizing issues and providing care as needed.

For a suspected or known opioid overdose, consider naloxone administration per your facility's protocol (if available). See Chapter 6 for more information.

Use the *Basic Life Support: Children and Infants* code card as a cognitive aid when providing care for a pediatric patient with a life-threatening injury or illness. See *Appendix C: Basic Life Support Code Cards*.

Respiratory Arrest and Respiratory Failure in Children and Infants

Care for a child or infant in respiratory arrest or respiratory failure differs slightly from an adult. Follow these steps:

- If you have not already done so, activate EMS, the rapid response team or the resuscitation team, as appropriate, and call for an AED.
- Deliver ventilations; each ventilation should last about 1 second and make the chest begin to rise (Figure 4-4).



Figure 4-4 | For a child or infant in respiratory arrest, deliver 1 ventilation every 2 to 3 seconds.

- If their central pulse is > 60 bpm, deliver 1 ventilation every **2 to 3 seconds**. If an advanced airway is in place, the rate remains the same. If at any time central pulse decreases to ≤ 60 bpm with poor perfusion despite adequate ventilation and oxygen, start CPR.
- If their central pulse is ≤ 60 bpm with signs of poor perfusion, start CPR. If at any time central pulse and perfusion improve to > 60 bpm, stop CPR and deliver 1 ventilation every **2 to 3 seconds** until the patient is ventilating sufficiently.
- Perform a primary assessment (Airway, Breathing, Circulation, Disability, Exposure) and emergent/initial interventions, if not already done.
- Continue to check breathing and pulse every 2 minutes.
 - If central pulse becomes absent, start CPR immediately and use an AED when it becomes available.
- Position patient as appropriate for clinical condition.
- Perform secondary assessment as patient condition allows.
- Reassess the patient, recognize issues and provide care as needed.



Practice Note

Signs of poor perfusion in a child or infant include cool, moist skin; pallor, mottling or cyanosis; a weak or thready pulse; decrease in behavior or reactivity; decreased capillary refill; and hypotension.

For a suspected or known opioid overdose, prioritize care for respiratory arrest or respiratory failure and administer naloxone per your facility's protocol (if available). See Chapter 6 for more information.

Use the *Basic Life Support: Children and Infants* code card as a cognitive aid when providing care for a pediatric patient in respiratory arrest or respiratory failure. See *Appendix C: Basic Life Support Code Cards*.

Cardiac Arrest in Children and Infants

Unlike in adults, cardiac arrest in children and infants is less likely to be a primary cardiac event. Regardless of the etiology, high-quality CPR and use of an AED remains the basis for every successful pediatric cardiac arrest resuscitation.



Figure 4-5 | CPR/AED guidelines are age dependent. An infant is someone under age 1. A child is someone from age 1 to the onset of puberty. An adolescent is someone from the onset of puberty through adulthood.

Age-Dependent CPR/AED Guidelines

It is essential to identify which age-dependent CPR and AED guidelines to follow when caring for children and infants. (Figure 4-5). When determining which CPR/AED protocol to follow, use these guidelines:

- An infant is defined as someone under the age of 1. When providing CPR and using an AED, follow infant guidelines and use appropriately sized equipment.
- A child is defined as someone from the age of 1 to the onset of puberty as evidenced by breast development in girls and underarm hair development

in boys (usually around the age of 12). When providing CPR and using an AED, follow child guidelines and use appropriately sized equipment. The use of pediatric versus adult AED pads or settings for children varies by age and weight.

- An adolescent is defined as someone from the onset of puberty through adulthood. When providing CPR and using an AED, follow adult guidelines and use appropriately sized equipment.

Pediatric Cardiac Chain of Survival

The six links in the pediatric Cardiac Chain of Survival vary slightly, depending on where the cardiac arrest occurs.

Pediatric In-Hospital Cardiac Chain of Survival

The Pediatric In-Hospital Cardiac Chain of Survival (Figure 4-6) is similar to the Adult In-Hospital Cardiac Chain of Survival with slight modifications.

Surveillance and Prevention

This includes recognizing an emergency early and an efficient and rapid response. In children and infants, cardiac arrest most often arises from respiratory failure or shock. Although primary cardiac causes are rare in children, they more commonly contribute to in-hospital cardiac arrest.

Recognition of Cardiac Emergency and Activation of Emergency Response System

Immediate recognition of cardiac arrest and activation pediatric rapid response or pediatric resuscitation team quickly gives the patient access to necessary personnel, equipment and interventions as soon as possible after arrest.



Figure 4-6 | The Pediatric In-Hospital Cardiac Chain of Survival

Early High-Quality CPR

High-quality CPR should be initiated immediately after recognizing cardiac arrest.

Pediatric Advanced Life Support

Effective, pediatric advanced life support gives the patient access to emergency medical care delivered by specially trained professionals.

Integrated Post-Cardiac Arrest Care

After return of spontaneous circulation (ROSC), survival outcomes are improved when providers work to stabilize the patient, minimize complications, and diagnose and treat the underlying cause.

Recovery

A sixth link has been added to highlight the importance of recovery including continued follow-up during the recovery process in the form of rehabilitation, therapy and support from family and healthcare providers

Pediatric Out-of-Hospital Cardiac Chain of Survival

The Pediatric Out-of-Hospital Cardiac Chain of Survival (Figure 4-7) is similar to the Adult Out-of-Hospital Cardiac Chain of Survival but it includes prevention and pediatric advanced life support.

Prevention

Community prevention is key. As the most common causes of cardiac arrest in children and infants include respiratory emergencies, shock and preventable injury (e.g., trauma, drowning, choking or electrocution), efforts to reduce these events and manage them are key. In addition, establishing systems to respond, such as CPR education, public awareness of what to do in an emergency and telecommunicator CPR is important.

Recognition of Cardiac Emergency and Activation of Emergency Response System

Immediate recognition of cardiac arrest and activation of EMS quickly gives the patient access to necessary personnel, equipment and interventions as soon as possible after arrest.

Early High-Quality CPR

High-quality CPR should be initiated immediately after recognizing cardiac arrest.

Pediatric Advanced Life Support

Effective, pediatric advanced life support gives the patient access to care delivered by specially trained professionals.

Integrated Post-Cardiac Arrest Care

After return of spontaneous circulation (ROSC), survival outcomes are improved when providers work to stabilize the patient, minimize complications, and diagnose and treat the underlying cause.

Recovery

A sixth link has been added to highlight the importance of recovery including continued follow-up during the recovery process in the form of rehabilitation, therapy and support from family and healthcare providers.

High-Quality CPR for Children and Infants

Performing high-quality CPR for children and infants is similar to performing high-quality CPR for adults, but there are some subtle differences including compression technique, compression depth, ventilations, use of appropriately sized breathing barriers, CPR with an



Figure 4-7 | The Pediatric Out-of-Hospital Cardiac Chain of Survival

advanced airway in place, CPR when drowning or other primary respiratory etiologies are the cause of cardiac arrest and when an opioid overdose is the suspected or known cause of cardiac arrest. See *Skill Sheet: CPR for Children* and *Skill Sheet: CPR for Infants*.

Use the *Basic Life Support: Children and Infants* code card as a cognitive aid when providing care for a pediatric patient in cardiac arrest. See *Appendix C: Basic Life Support Code Cards*.

Compression Technique for Children

The technique for providing chest compressions are similar for an adult and child: Position one hand on top of the other with your fingers interlaced and off the chest centered on lower half of the sternum (Figure 4-8, A). However, for a smaller child, you may opt to use the one hand technique to deliver compressions (Figure 4-8, B).

Compression Technique for Infants

The technique of providing compressions to an infant is different from an adult and child because of the infant's smaller size.

When initiating CPR for an infant, use a firm, flat surface. Obtain a CPR board or use a CPR-ready crib or bed. Make sure the crib is at an appropriate working height or use a step stool. Lower the crib side rail closest to you. If you are not at the infant's bedside, use a stable surface such as a table or countertop because it is usually easier to perform compressions from a standing position rather than kneeling at the infant's side.

If you are a single provider or working with a team of multiple providers, use the encircling thumbs technique. For single provider CPR, stand or kneel to the side of

the infant with your hips at a slight angle so you can easily transition between compressions and ventilations. For multiple-provider CPR, stand at the infant's feet. Deliver compressions as follows:

- Place both thumbs (side-by-side) on the center of the infant's chest, just below the nipple line.
- Use the other fingers to encircle the infant's chest toward the back, providing support (Figure 4-9, A).
- Using both thumbs at the same time, compress the chest about 1 1/2 inches at a rate of at least 100 but no more than 120 compressions per minute. Let the chest return to its normal position after each compression.

If you are a single provider, you may alternatively consider using the two-finger technique. Using your hand closest to the infant's feet, place two fingers in the center of the exposed chest, just below the nipple line on the sternum. The fingers should be oriented so that they are parallel, not perpendicular, to the sternum (Figure 4-9, B). You can use your index and middle fingers or your middle and fourth fingers to provide compressions. Fingers that are more similar in length tend to make compressions easier to deliver. If the required depth cannot be achieved with either technique, you may consider using a one-hand technique.

Compression Rate, Depth and Recoil for Children

The compression rate of 100 to 120 per minute is the same for a child as for an adult. The depth of compression, however, is different. For an adult, compress the chest at least 2 inches but no more than 2.4 inches; however, for a child, compress the chest about 2 inches (or one-third the anterior-posterior diameter of the chest). Make certain you compress



Figure 4-8 | (A) Compressions technique for a child is the same as for an adult. (B) The one-hand technique may be a better method for smaller children.

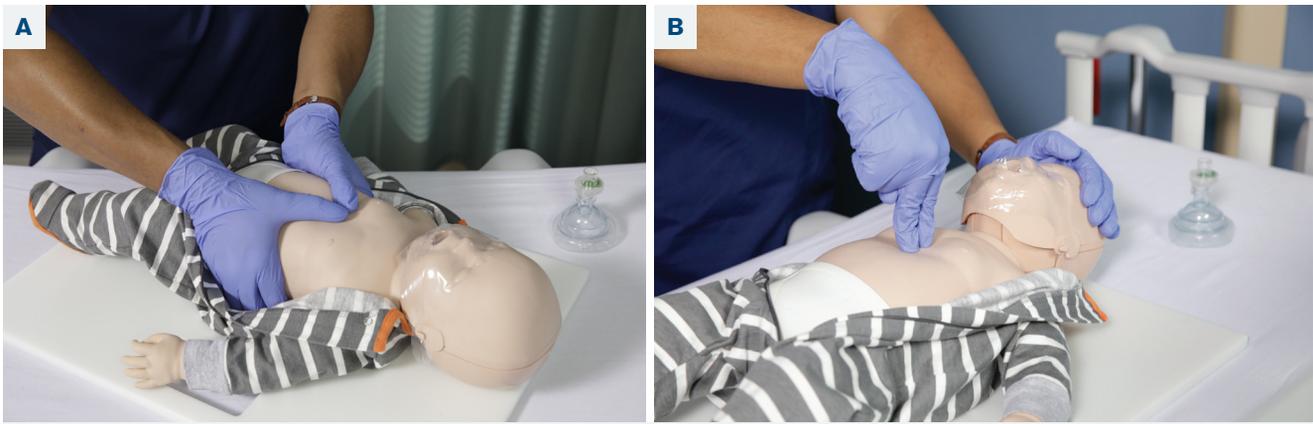


Figure 4-9 | A. Use the encircling thumbs technique when you are performing single-provider or multiple-provider CPR. B. Alternatively, single providers can use the two-finger technique.

the chest with sufficient depth. Use a feedback device during CPR to objectively measure your compression rate and depth. Allow for complete chest recoil; compression and recoil times should be approximately equal, as this improves the circulation generated by CPR. For more information on feedback devices, see Chapter 3.

Compression Rate, Depth and Recoil for Infants

Compressions are delivered at the same rate used for adults and children—that is, between 100 and 120 compressions per minute. However, for an infant, only compress the chest about 1 ½ inches (or one-third the anterior-posterior diameter of the chest). Allow for complete chest recoil; compression and recoil times should be approximately equal, as this improves the circulation generated by CPR.

Ventilation Technique for Children and Infants

The technique for providing ventilations to a patient in cardiac arrest is the same for adults, children and infants. Provide smooth, effortless ventilations that last about 1 second and make the chest begin to rise; allow the air to fully exit before delivering the next ventilation.

Appropriately Sized Breathing Barriers

When providing BLS care to a child or infant, it is essential that you use appropriately sized equipment. Always follow the manufacturer's guidelines and your facility's protocols.

Practice Note

In children and infants, additional factors must be considered when opening the airway and using the device. The back, lower portion of the head is larger in children than it is in adults, which means there is more flexion of the neck. Other considerations include larger tongues and possible lack of teeth, which may impede ventilation.

Pocket Masks

If you are using a pocket mask, make sure it is sized appropriately (Figure 4-10). Some pocket masks are one-size-fits-all for adults and children. In this case, the mask can be rotated so that the narrow end fits over the child's chin. In other instances, separate pocket masks are available for use with children. For infants, you must use a specifically sized infant pocket mask. However, do not delay care while searching for a barrier device.

Bag-Valve-Mask Resuscitators

One of the most difficult aspects of bag-valve-mask (BVM) ventilation can be ensuring an effective seal. Therefore, you must use an appropriately sized BVM. You may select from sizes for a newborn, infant and child, or options may include small, medium and large. A circular mask may be more appropriate for children and infants.

Verify that you have selected the correct size by checking that the mask does not cover the patient's eyes and that it does not extend beyond the chin. Like the pocket mask, the narrow end of the BVM device fits over the nose. The bags on the device also deliver smaller volumes for infants and young children.



Figure 4-10 | To ensure an effective seal, choose an appropriately sized pocket mask.

Some BVMs for children and infants also include a pressure relief or “pop-off” valve that helps to prevent excessive pressure during ventilation. In a resuscitation situation, it is essential to deactivate the pop off valve to ensure adequate ventilation.

When delivering ventilations with a BVM, maintain the mask seal and open airway in a slightly past-neutral position for children or a neutral position for infants. Avoid any hyperextension or flexion in the neck. Do not place your fingers on the soft tissues under the chin or neck to open the airway.

As with adults, the two-person technique for BVM ventilations is the preferred methodology when providing multiple-provider CPR for children and infants (Figure 4-11). When there is only one provider to deliver ventilations during multiple-provider CPR, the ventilator may consider using a pocket mask over a BVM resuscitator for a better seal and ventilation volume. However, it is recognized that in specific clinical situations use of a pocket mask may be precluded. In these cases, one-person BVM is acceptable.

Compression-to-Ventilation Ratio for Children

When you are the only provider, the ratio of compressions to ventilations for a child is the same as for an adult—that is, 30 compressions to 2 ventilations (30:2). However, in multiple-provider CPR, this ratio changes to 15 compressions to 2 ventilations (15:2).

Compression-to-Ventilation Ratio for Infants

When you are the only provider, the ratio of compressions to ventilations for an infant is the same as for an adult and child—that is, 30:2. In multiple-provider CPR, however, this ratio changes to 15:2, which is the same as for a child.

Advanced Airways

When an advanced airway is in place during cardiac arrest, one provider delivers 1 ventilation every 2 to 3 seconds while another provider performs compressions at a rate of 100 to 120 compressions per minute. In this case, the compression-to-ventilation ratio does not apply because compressions and ventilations are delivered continuously without pausing for ventilations.

Drowning or Other Primary Respiratory Etiologies

If drowning is suspected as the cause of cardiac arrest in a child or infant, deliver 2 initial ventilations before starting CPR. You may also consider delivering 2 initial ventilations before starting CPR in a child or infant with a primary respiratory etiology.

Suspected or Known Opioid Overdose

If suspected or known opioid overdose is the cause of cardiac arrest, prioritize CPR and AED use and administer naloxone per your facility’s protocol (if available). See Chapter 6 for more information.

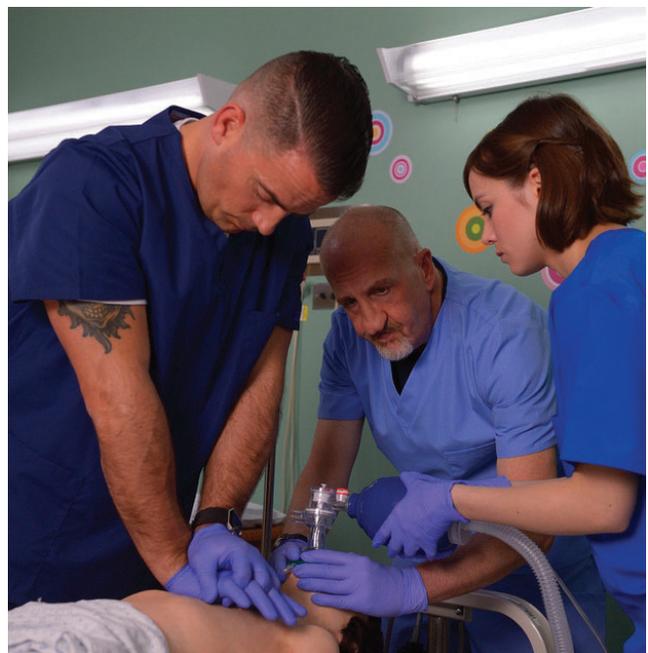


Figure 4-11 | The two-person technique for BVM ventilations is the preferred methodology when providing multiple-provider CPR for children and infants.

AED Use for Children and Infants

Although defibrillation is needed less often for a child or an infant than for an adult, the use of an AED remains a critical component of child and infant cardiac arrest care. See *Skill Sheet: AED Use for Children and Infants* for more information.

Regardless of the patient's age, AEDs work the same way. However, the pads used for children and infants, how these pads are placed, and the energy delivered can differ based on the age and size of the child or infant. (Figure 4-12).

- **Children 8 years of age or younger (including infants) or weighing 55 pounds (25 kg) or less:** Use pediatric AED pads or electrical settings, if available. Pediatric AED pads are smaller and designed specifically to deliver a lower level of energy. If pediatric AED pads are not available or the AED does not have a pediatric setting, it is safe to use adult AED pads or adult levels of energy on a child or infant.
- **Children over the age of 8 years or weighing more than 55 pounds (25 kg):** Use adult AED pads. You should not use pediatric AED pads or the pediatric setting on an adult or child over the age of 8 years or weighing more than 55 pounds (25 kg) because the shock delivered will not be sufficient. In these cases, always use adult AED pads and energy level.



ALERT

Never use pediatric AED pads or a pediatric electrical setting on a child older than 8 or weighing more than 55 pounds (25 kilograms).



Figure 4-12 | Some AED models come with pediatric AED pads that are smaller and deliver lower levels of energy, whereas others have a pediatric setting or key instead of specific pediatric pads. As always, follow the manufacturer's recommendations and your facility's protocols.

For children, position the pads in the same way you would for an adult (i.e., use the anterior/lateral or anterior/posterior position according to the manufacturer's instructions). The AED pads should never touch each other when applied (Figure 4-13, A). If it appears that the AED pads would touch each other based on the size of the child's chest, use an anterior/ posterior pad placement as an alternative. Apply one pad to the center of the child's chest on the sternum and one pad to the child's back between the scapulae.

When using an AED on an infant, always use the anterior/ posterior pad placement (Figure 4-13, B).



Practice Note

For children and infants, follow the guidelines for rhythm analysis during CPR described previously.

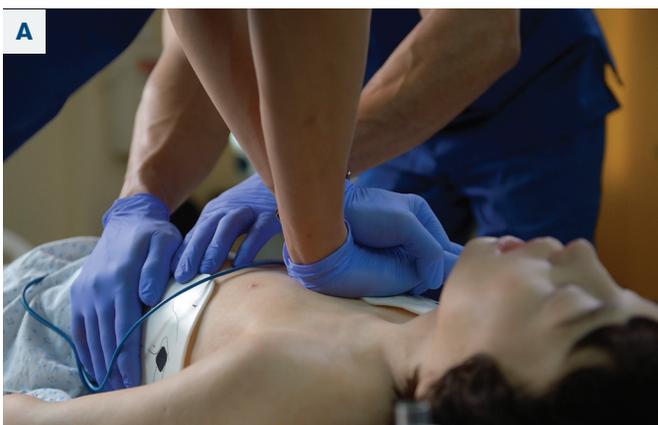


Figure 4-13 | (A) When using the anterior/lateral pad placement on a child, make sure the AED pads do not touch. (B) For an infant, always use the anterior/posterior AED pad placement.

SKILL SHEET

Rapid Assessment for Children and Infants

Step 1 Perform a visual survey

- Make sure the environment is safe—for you, your team and any individuals present during the emergency.
- Gather an initial impression of the child or infant (follow the Pediatric Assessment Triangle [PAT]), which includes looking for life-threatening bleeding.
- Quickly determine the need for additional resources.

Alert

If at any time the child or infant has life-threatening bleeding, control the hemorrhage with any available resource (including the use of a tourniquet or hemostatic dressing as appropriate).

Step 2 Check for responsiveness

- Shout, “Are you OK?” Use the child’s or infant’s name if you know it.
- Tap the *child’s shoulder* or the *bottom of the infant’s foot* and shout again (shout-tap-shout).
- If the child or infant is unresponsive and you are alone, call for help to activate EMS, the rapid response team or the resuscitation team, as appropriate, and call for an AED.
- If the child or infant is unresponsive and you are with another provider, the first provider stays with the child or infant. Other providers activate EMS, the rapid response team or the resuscitation team, as appropriate, and retrieve the AED, BVM and other emergency equipment.



SKILL SHEET

Rapid Assessment for Children and Infants *(continued)*

Step 3

Simultaneously check for breathing, a pulse, and life-threatening bleeding

- Make sure the child or infant is in a supine (face-up) position. If they are face-down, you must roll them onto their back, taking care not to create or worsen a suspected injury.
- Open the airway to a *slightly past-neutral* position for a child or to a *neutral* position for an infant using the head-tilt/chin-lift technique; or, use the modified jaw-thrust maneuver if you suspect a head, neck or spinal injury.
- Simultaneously check for breathing and a pulse (*carotid* for a child, *brachial* for an infant) for no more than 10 seconds.
- At the same time, scan the body for life-threatening bleeding or other signs and symptoms that might not have been seen during the initial impression.



Practice Note

A-B-C Mnemonic

Use the A-B-C mnemonic to easily recall and perform assessment, including opening of the airway (A), checking for the presence or absence of normal breathing (B), and simultaneously assessing for circulation (C) by a pulse check. If necessary, CPR should then begin with delivery of chest compressions.

Step 4

Provide care based on the conditions found

- Obtain consent from a parent or legal guardian, if present.

SKILL SHEET

Opening the Airway for Children and Infants

Head-Tilt/Chin-Lift Technique

To perform the head-tilt/chin lift technique:

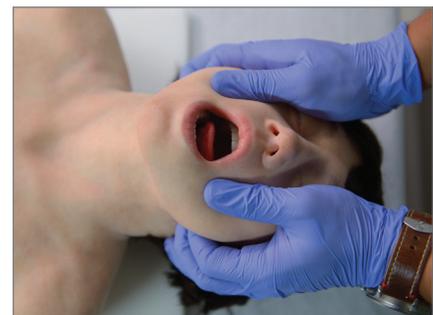
1. Press down on the forehead while pulling up on the bony part of the chin with 2 to 3 fingers of your other hand.
2. Tilt the head to a slightly past-neutral position for children and to a neutral position for infants. Avoid hyperextension of the neck.
3. In infants, be careful not to place your fingers on the soft tissues under the chin or neck to open the airway.



Modified Jaw-Thrust Maneuver

If you suspect head, neck and spinal injury, use the modified jaw-thrust maneuver providing you can effectively maintain an open airway. To perform the modified jaw-thrust maneuver:

1. Position yourself above the patient's head.
2. Put one hand on each side of the patient's head with your thumbs near the corners of the mouth and pointed toward the chin. Use your elbows for support.
3. Slide your fingers under the angles of the jawbone without moving the patient's head or neck.
4. Thrust the jaw up (again without moving the head or neck) to lift the jaw and open the airway.



SKILL SHEET

CPR for Children

Step 1 Conduct a rapid assessment

- Perform a quick visual survey looking for life-threatening bleeding.
- Check for responsiveness.
- Open the airway and simultaneously check for breathing and a pulse (carotid) for no more than 10 seconds. At the same time, scan the body again for life-threatening bleeding.
- If the patient is not breathing (or only gasping) and their central pulse is absent, begin CPR.



Step 2 Place the child on a firm, flat surface

- In a healthcare setting, use a bed with a CPR feature, or place a CPR board under the child.
- Adjust the bed to an appropriate working height or use a step stool. Lower the bed side rail closest to you.
- In other settings, move the child to the floor or ground and kneel beside them.



Practice Note

If drowning is the suspected cause of cardiac arrest, deliver 2 initial ventilations before starting CPR. You may also consider delivering 2 initial ventilations before starting CPR in a child or infant with a primary respiratory etiology.

SKILL SHEET

CPR for Children (*continued*)

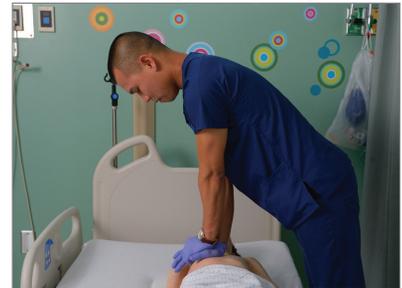
Step 3 Position your hands correctly

- Expose the child's chest to ensure proper hand placement and visualize chest recoil.
- Place the heel of one hand in the center of the child's chest on the lower half of the sternum.
- Place your other hand on top of the first and interlace your fingers or hold them up so that they are not resting on the child's chest.
- Alternatively, for a small child, you may only need to use one hand, instead of two. Place the heel of one hand in the center of the child's chest.



Step 4 Position your body effectively

- Position yourself so your shoulders are directly over your hands. This position lets you compress the chest using a straight up-and-down motion.
- To help keep your arms straight, lock your elbows.



Step 5 Perform chest compressions

- For a child, compress the chest to a depth of about 2 inches (5 cm).
- Provide smooth compressions at a rate of 100 to 120 per minute.
- Allow the chest to fully recoil after each compression. Avoid leaning on the patient's chest at the top of the compression. Compression and recoil times should be approximately equal as this improves the circulation generated by CPR.
- If you are a single provider, perform 30 chest compressions.
- If you are working with a team of providers, perform 15 chest compressions for a child.



SKILL SHEET

CPR for Children (*continued*)

Step 6 Seal the mask and open the airway

- Use an appropriately sized pocket mask for single provider CPR or a BVM for multiple-provider CPR. Remember, a two-person technique for BVM ventilation is the preferred methodology.
- Seal the mask and simultaneously open the airway to a slightly past-neutral position using the head-tilt/chin-lift technique. Avoid any hyperextension or flexion of the neck.
- Or, use the modified jaw-thrust technique if you suspect head, neck or spinal injury.



Practice Note

Attach supplemental oxygen to the BVM resuscitator as soon as appropriate and when enough resources are available.

Step 7 Provide 2 ventilations

- While maintaining the mask seal and open airway, provide smooth, effortless ventilations. Each ventilation should last about 1 second and make the chest begin to rise; allow the air to exit before delivering next ventilation. Avoid excessive ventilation.
- If you do not have a pocket mask or BVM, provide mouth-to-mouth or mouth-to-nose ventilations.



Practice Note

If an advanced airway is in place, the 30:2 ratio for single-provider CPR and the 15:2 ratio for multiple-provider CPR do not apply. In this case, one provider delivers 1 ventilation every 2 to 3 seconds, while the other provider delivers continuous chest compressions without pausing for ventilations.

Step 8 Switch positions every 2 minutes

- When providing CPR with multiple providers, smoothly switch positions about every 2 minutes. This should take less than 10 seconds.
- The compressor calls for a position change by saying “switch” in place of the number 1 in the compression cycle.



SKILL SHEET

CPR for Children (*continued*)

Step 9 Continue CPR

Continue providing CPR until:

- The team leader tells you to stop
- Other trained providers arrive to relieve you
- You see signs of ROSC
- You are presented with a valid DNR order
- You are too exhausted to continue
- The situation becomes unsafe



Practice Note

Upon achieving ROSC, supplemental oxygen should be used based on your facility's protocols to maintain a normal oxygen saturation level while avoiding hyperoxygenation. Providers should use a pulse oximeter to monitor oxygen saturation.

SKILL SHEET

CPR for Infants

Step 1 Conduct a rapid assessment

- Perform a quick visual survey looking for life-threatening bleeding.
- Check for responsiveness.
- Open the airway and simultaneously check for breathing and a pulse (brachial) for no more than 10 seconds. At the same time, scan the body again for life-threatening bleeding.
- If the patient is not breathing (or only gasping) and their central pulse is absent, begin CPR.



Step 2 Place the infant on a firm, flat surface

- In a healthcare setting, use a crib with a CPR feature, or place a CPR board under the infant.
- Adjust the crib to an appropriate working height or use a step stool. Lower the crib side rail closest to you.
- In other settings, move the infant to a stable surface above the ground, such as a table or countertop.



Practice Note

If drowning is the suspected cause of cardiac arrest, deliver 2 initial ventilations before starting CPR. You may also consider delivering 2 initial ventilations before starting CPR in a child or infant with a primary respiratory etiology.

Step 3 Position your hands correctly

- Expose the infant's chest to ensure proper hand placement and visualize chest recoil.
- **If you are a single provider or working with a team of multiple providers, use the encircling thumbs technique:**
 - For single provider CPR, stand or kneel to the side of the infant with your hips at a slight angle so you can easily transition between compressions and ventilations. For multiple-provider CPR, stand at the infant's feet.
 - Place both thumbs (side-by-side) on the center of the infant's chest just below the nipple line.
 - Then use the other fingers to encircle the infant's chest toward the back, providing support.



SKILL SHEET

CPR for Infants (*continued*)

Practice Note

Alternatively, during single provider CPR, you may consider using the two-finger technique (two or three fingers placed in the middle of the chest). If the required depth cannot be achieved with either the encircling thumbs technique or the two-finger technique in infants, you may consider using a one-hand technique.



Step 4 Perform chest compressions

- For an infant, compress the chest to a depth of about 1½ inches (3.8 cm) or one-third the anterior-posterior diameter of the chest.
- Provide smooth compressions at a rate of 100 to 120 per minute.
- Allow the chest to fully recoil after each compression. Avoid leaning on the infant's chest at the top of the compression. Compression and recoil times should be approximately equal as this improves the circulation generated by CPR.
- If you are a single provider, perform 30 chest compressions. If you are working with a team of providers, perform 15 chest compressions for an infant.

Step 5 Seal the mask and open the airway

- Use an infant pocket mask for single-provider CPR or a BVM for multiple-provider CPR. Remember, a two-person technique for BVM ventilation is the preferred methodology.
- Seal the mask and simultaneously open the airway to a neutral position using the head-tilt/chin-lift technique. Avoid any hyperextension of flexion of the neck.
- Or, use the modified jaw-thrust technique if you suspect head, neck or spinal injury.



Practice Note

Attach supplemental oxygen to the BVM resuscitator as soon as appropriate and when enough resources are available.

SKILL SHEET

CPR for Infants (*continued*)

Step 6 Provide 2 ventilations

- While maintaining the mask seal and open airway, provide smooth, effortless ventilations. Each ventilation should last about 1 second and make the chest begin to rise; allow the air to exit before delivering next ventilation. Avoid excessive ventilation.
- If you do not have a pocket mask or BVM, provide mouth-to-mouth or mouth-to-nose ventilations.



Practice Note

If an advanced airway is in place, the 30:2 ratio for single-provider CPR and the 15:2 ratio for multiple-provider CPR do not apply. In this case, one provider delivers 1 ventilation every 2 to 3 seconds, while the other provider delivers continuous chest compressions without pausing for ventilations.



Step 7 Switch positions every 2 minutes

- When providing CPR with multiple providers, smoothly switch positions about every 2 minutes. This should take less than 10 seconds.
- The compressor calls for a position change by saying “switch” in place of the number 1 in the compression cycle.
- Remember, during multiple-provider CPR, the compressor will stand at the infant’s feet, the ventilator will stand at the infant’s side, and the provider maintaining the airway will stand at the infant’s head.



SKILL SHEET

CPR for Infants *(continued)*

Step 8 Continue CPR

Continue providing CPR until:

- The team leader tells you to stop
- Other trained providers arrive to relieve you
- You see signs of ROSC
- You are presented with a valid DNR order
- You are too exhausted to continue
- The situation becomes unsafe



Practice Note

Upon achieving ROSC, supplemental oxygen should be used based on your facility's protocols to maintain a normal oxygen saturation level while avoiding hyperoxygenation. Providers should use a pulse oximeter to monitor oxygen saturation.

SKILL SHEET

AED Use for Children and Infants

Step 1 Turn on the AED and follow the prompts

- Because AED models function differently, follow your facility's protocols and the manufacturer's instructions for the AED you have.

Step 2 Expose the chest

- Expose the chest and wipe it dry, if necessary.

Step 3 Attach the pads

- **For infants up to 1 year old:**
 - Use pediatric pads if available. If pediatric pads *aren't* available—or the AED doesn't have a pediatric setting—it's safe to use adult AED pads or adult levels of energy.
 - Always use an anterior/posterior pad placement. To do this, apply one pad to the center of the infant's chest—on the sternum—and one pad to the infant's back between the scapulae.
- **For children 8 or younger or weighing 55 pounds (25 kg) or less:**
 - Use pediatric pads if available. If pediatric pads *aren't* available—or the AED doesn't have a pediatric setting—it's safe to use adult AED pads or adult levels of energy.
 - Use an anterior/lateral placement, according to the manufacturer instructions: Place one pad to the right of the sternum and below the right clavicle. Place the other on the left side of the chest on the mid-axillary line, a few inches below the left armpit.
 - Or, use an anterior/posterior pad placement, if the AED pads risk touching each other on the child's chest or the manufacturer recommends.



SKILL SHEET

AED Use for Children and Infants (*continued*)

- **For children older than 8 years or weighing more than 55 pounds (25 kg):**
 - Use adult AED pads.
 - Use an anterior/lateral or anterior/posterior placement, according to manufacturer instructions.

Alert

Never use pediatric AED pads or a pediatric electrical setting on a child older than 8 years or weighing more than 55 pounds (25 kg). That's because the shock delivered will not be sufficient. In these cases, always use adult AED pads and energy levels.

Practice Note

Some AEDs come with pediatric AED pads. These are smaller and designed specifically to deliver a lower level of energy. Also, some AEDs use a switch or key on the device itself instead of changing pads.



Step 4 Prepare to let the AED analyze the heart's rhythm

- If necessary, plug in the connector and push the analyze button.
- Instruct everyone to stand clear while the AED analyzes. No one, including you, should be touching the patient.
- If you are working as a team, prepare to smoothly switch positions to prevent fatigue. The provider giving compressions should hover their hands above the patient's chest.

Practice Note

When the AED is analyzing the rhythm, pause compressions and ventilations, even when using devices with artifact-filtering algorithms.



SKILL SHEET

AED Use for Children and Infants *(continued)*

Step 5 Deliver a shock, if the AED determines one is needed

- If the AED advises a shock, again instruct everyone to stand clear. The compressor continues to hover their hands over the patient's chest in preparation for CPR.
- Press the shock button to deliver the shock.



Step 6 After the AED delivers the shock, or if no shock is needed

- Immediately begin CPR.
- Continue for about 2 minutes until:
 - The AED prompts that it is reanalyzing.
 - The patient shows signs of return of spontaneous circulation.
 - The team leader or other trained providers instruct you to stop.
- If you are working as a team, smoothly switch positions approximately every 2 minutes (which usually occurs at the time of AED analysis) to prevent fatigue.



Practice Note

After a shock is delivered, immediately resume CPR for 2 minutes before pausing compressions for the AED to analyze the heart rhythm. However, based on the clinical situation, you may consider performing rhythm analysis after defibrillation, recognizing that this may not be possible on all AEDs.



Obstructed Airway

Introduction

Airway obstructions are a common emergency. You need to assess the situation and recognize that a patient who cannot cough, speak, cry or breathe requires immediate care. If the patient does not receive quick and effective care, an **airway obstruction** can lead to respiratory arrest, which in turn can lead to cardiac arrest. This chapter reviews care for an adult, child or infant with an obstructed airway.

Responsive Patients with an Obstructed Airway

Choking occurs when the airway becomes either partially or completely blocked by a foreign object (e.g., a piece of food, a small toy, or bodily fluids, such as vomit or blood). The technique for clearing the airway of a responsive adult or child is similar; however, the technique for clearing the airway of a responsive infant is different.

Use the *Obstructed Airway: Adults, Children and Infants* code card as a cognitive aid when providing care for a responsive patient with an obstructed airway. See *Appendix C: Basic Life Support Code Cards*.

Caring for a Responsive Adult or Child with an Obstructed Airway

A patient who is choking typically has a panicked, confused or surprised facial expression. They may run about, flail their arms or try to get another's attention. The patient may place one or both hands on their throat. This act of clutching the throat is commonly referred to as the **universal sign of choking** (Figure 5-1).

You may hear stridor as the patient tries to breathe, or you may hear nothing at all. Stridor is a high-pitched squeaking noise during inspiration. It is caused by narrowing or obstruction of the upper airway. Stridor is not exclusive to choking and may be a sign of another respiratory disorder (e.g., anaphylaxis, croup).

The patient's skin may initially appear flushed, but it will become pale or cyanotic as the body is deprived of oxygen.



Figure 5-1 | Clutching the throat with one or both hands is commonly referred to as the universal sign of choking.

Encourage the adult or child who is coughing forcefully to continue coughing until they are able to breathe normally and be prepared to intervene if their condition changes. If the patient cannot breathe or has a weak or ineffective cough, summon additional resources and obtain consent. For a child, obtain consent from the parent or guardian. If the parent or guardian is not available, consent is implied. Then, perform a series of five back blows and five abdominal or chest thrusts. Alternatively, you can use a combination of basic and advanced airway management techniques based on your training and availability. See *Skill Sheet: Obstructed Airway Care for Adults and Children*.

If a responsive adult or child cannot breathe or has a weak or ineffective cough, perform a series of 5 back blows and 5 abdominal thrusts.

Back Blows

To give back blows:

- Position yourself to the side and slightly behind the patient.
 - If the patient is a young child or is in a wheelchair, you may need to kneel.
- Provide support by placing one arm diagonally across the patient's chest.
- Bend the patient forward at the waist so the upper body is parallel to the ground or as close as it can be.
- Using the heel of your other hand, give 5 firm back blows between the patient's scapulae; make each blow a separate and distinct attempt to dislodge the object (Figure 5-2).



Figure 5-2 | For effective back blows, bend the patient forward at the waist so that the patient's upper body is parallel to the ground. Give 5 firm back blows between the patient's scapulae.



Figure 5-3 | (A) Stand behind the patient, with one foot in front of the other and if possible, between the patient's feet. (B) Place the thumb side of your fist against the middle of the abdomen, just above the navel, and grab the fist with your other hand.

Abdominal Thrusts

To give abdominal thrusts:

- Stand behind the patient, with one foot in front of the other for balance and stability; if possible, place your front foot in between the patient's feet (Figure 5-3, A).
 - If the patient is a young child or is in a wheelchair, you may need to kneel.
- Using one or two fingers to find the patient's navel, make a fist with your other hand and place the thumb side of your fist against the middle of the abdomen, just above the navel.
- Grab your fist with your other hand (Figure 5-3, B).
- Give 5 quick **inward and upward** thrusts.
- Be sure to make each thrust a distinct attempt to dislodge the object.

Chest Thrusts

For an adult or child, perform chest thrusts if you cannot reach far enough around the patient to perform abdominal thrusts, if the patient might be pregnant, if the patient is in a bed or wheelchair with features that make abdominal thrusts difficult to do or if back blows and abdominal thrusts are not effective in dislodging the object.

To give chest thrusts:

- Position yourself behind the patient as you would for abdominal thrusts.
 - If the patient is a young child or is in a wheelchair, you may need to kneel.
- Place the thumb side of your fist against the center of the patient's chest on the lower half of the sternum.
- Then cover your fist with your other hand and pull straight back, providing 5 quick **inward** thrusts into the patient's chest (Figure 5-4).

- Be sure to make each thrust a distinct attempt to dislodge the object.

Airway Management Techniques

If you are in a healthcare facility and back blows, abdominal or chest thrusts are not effective or possible, use a combination of basic or advanced airway management techniques based on your level of training and experience. Remember, follow your facility's protocols when implementing alternate techniques.



Figure 5-4 | For effective chest thrusts, pull straight back, providing a quick inward thrust into the patient's chest.

Continue Care

Continue giving 5 back blows and 5 abdominal/chest thrusts until:

- The patient can cough forcefully, speak, cry or breathe.
- The patient becomes unresponsive.

Caring for a Responsive Infant with an Obstructed Airway

If the infant is crying or coughing forcefully, allow the infant to keep coughing but be prepared to clear the infant's airway if the infant's condition changes.

If the infant is unable to cry or is coughing weakly, call for additional resources and to obtain an AED. Obtain consent from the parent or guardian. If the parent or guardian is not available, consent is implied. Then, perform a series of 5 back blows and 5 chest thrusts. See *Skill Sheet: Obstructed Airway Care for Infants*.

For a responsive choking infant, perform a series of five back blows and five chest thrusts.

Back Blows

To give back blows:

- Place your forearm along the infant's back, cradling the back of the infant's head with your hand.
- Place your other forearm along the infant's front, supporting the infant's jaw with your thumb and fingers (Figure 5-5).
- Turn the infant face down. Hold them along your forearm and use your thigh for support keeping the infant's head lower than their body.
- Use the heel of your hand to give back blows between the infant's scapulae; keep your fingers up to avoid hitting the infant's head or neck (Figure 5-6).
- Give 5 firm back blows, with each one separate from the others.

Chest Thrusts

To give chest thrusts:

- Position the infant between your forearms, support the head and neck, and turn the infant face-up.
- Lower the infant onto your thigh with their head lower than their chest.



Figure 5-5 | For obstructive airway care, hold the infant in a face-down position along your forearm, using your thigh for support. Keep the infant's head lower than their body.

- Place two fingers in the center of the infant's chest, just below the nipple line (Figure 5-7).
- Give 5 quick chest thrusts about 1 ½ inches deep; let the chest return to its normal position, keeping your fingers in contact with the breastbone; each chest thrust should be separate from the others.

Continue Care

Continue giving 5 back blows and 5 chest thrusts until:

- The infant can cough forcefully, speak, cry or breathe.
- The infant becomes unresponsive.



Figure 5-6 | Use the heel of your hand to give 5 back blows between the infant's scapulae.



Figure 5-7 | Give 5 quick chest thrusts, about 1½ inches deep. Each should be separate from the others.

Caring for an Unresponsive Patient

If the patient becomes unresponsive or if they are found unresponsive and assessed with obstructed airway:

- Ensure they are on a firm, flat surface and immediately begin CPR, starting with chest compressions.
- After each set of compressions and before ventilations, open the patient's mouth and look for the object.
 - If seen, remove it using a finger sweep (adults and children) or a pinky sweep (infants); do not perform a blind sweep (Figure 5-8).
- Attempt 2 ventilations; never try more than 2 ventilations during one cycle of CPR, even if the chest does not rise.
- Continue performing cycles of compressions and ventilations, checking for an object before each set of ventilations.
- Check breathing and pulse every 2 minutes.

Use the *Obstructed Airway: Adults, Children and Infants* code card as a cognitive aid when providing care for an unresponsive patient with an obstructed airway. See *Appendix C: Basic Life Support Code Cards*.

Compressions may help clear the airway by moving the blockage into the upper airway and the oropharynx (mouth), where it can be seen and removed.

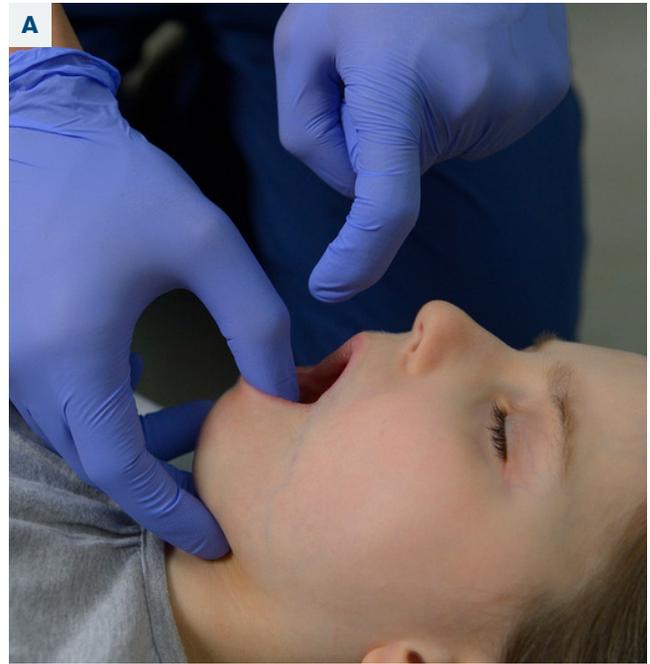


Figure 5-8 | (A) For an adult or child, use a finger sweep to remove an object, if seen. (B) For an infant, use a pinky sweep to remove an object, if seen.

SKILL SHEET

Obstructed Airway Care for Adults and Children

Step 1 Recognize an airway obstruction

If the patient is able to speak to you or is coughing forcefully, they may have a partial airway obstruction:

- Encourage them to keep coughing but be prepared to intervene if their condition changes.
- Reassess the patient, recognize issues and provide care as needed.

If the patient is unable to speak to you or is coughing weakly, they may have a complete airway obstruction:

- Activate EMS, rapid response or resuscitation team and call for an AED.
- Provide care as noted below.

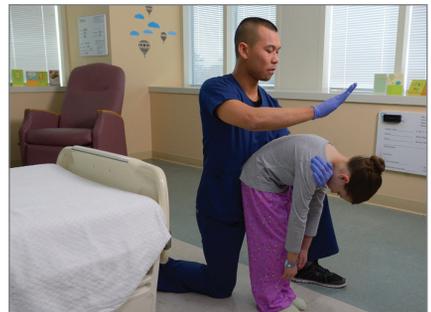


Step 2 Obtain consent

- **For the adult:** Obtain consent from the patient.
- **For the child:** Obtain consent from the parent or legal guardian if present. If they're not available, consent is implied.

Step 3 Give 5 back blows

- Position yourself to the side and slightly behind the patient.
 - If the patient is a young child or is in a wheelchair, you may need to kneel.
- Provide support by placing one arm diagonally across the patient's chest.
- Bend the patient forward at the waist so the upper body is parallel to the ground or as close as it can be.
- Using the heel of your other hand, give 5 firm back blows between the patient's scapulae; make each blow a separate and distinct attempt to dislodge the object.



SKILL SHEET

Obstructed Airway Care for Adults and Children (continued)

Step 4a Give 5 abdominal thrusts

Give abdominal thrusts, if back blows are not effective:

- Stand behind the patient, with one foot in front of the other for balance and stability; if possible, place your front foot in between the patient's feet.
- Using one or two fingers to find the patient's navel, make a fist with your other hand and place the thumb side of your fist against the middle of the abdomen, just above the navel.
- Grab your fist with your other hand.
- Give 5 quick inward and upward thrusts.
- Be sure to make each thrust a distinct attempt to dislodge the object.



Step 4b Give 5 Chest thrusts

Give chest thrusts if you cannot reach far enough around the patient to perform abdominal thrusts, if the patient might be pregnant, if the patient is in a bed or wheelchair with features that make abdominal thrusts difficult to do or if back blows and abdominal thrusts are not effective in dislodging the object:

- Position yourself behind the patient as you would for abdominal thrusts. If the patient is a young child or is in a wheelchair, you may need to kneel.
- Place the thumb side of your fist against the center of the patient's chest on the lower half of the sternum.
- Then cover your fist with your other hand and pull straight back, providing 5 quick inward thrusts into the patient's chest.
- Be sure to make each thrust a distinct attempt to dislodge the object.



SKILL SHEET

Obstructed Airway Care for Adults and Children (continued)

Step 5 Continue to clear the airway

Continue to clear the airway until:

- The patient can cough forcefully, speak, cry or breathe.
- The patient becomes unresponsive.



Practice Note

Use a combination of basic and advanced airway management techniques based on your training and availability.

Step 6 Care for an unresponsive patient with an obstructed airway

If the patient becomes unresponsive or if they are found unresponsive and assessed with obstructed airway:

- Ensure they are on a firm, flat surface and immediately begin CPR, starting with chest compressions.
 - Adults: Use a ratio of 30:2
 - Children and Infants: 30:2 (single-provider CPR) or 15:2 (multiple-provider CPR)
- After each set of compressions and before ventilations, open the patient's mouth and look for the object.
 - If seen, remove it using a finger sweep (adults and children)
- Attempt 2 ventilations; never try more than 2 ventilations during one cycle of CPR even if the chest does not rise.
- Continue performing cycles of chest compressions and ventilations; checking for an object; do not perform a blind finger sweep before each set of ventilations.
- Check breathing and pulse every 2 minutes.



SKILL SHEET

Obstructed Airway Care for Infants

Step 1 Recognize an airway obstruction

If the infant is crying or is coughing forcefully, they may have a partial airway obstruction:

- Allow the infant to keep coughing but be prepared to intervene if their condition changes.
- Reassess the patient, recognize issues and provide care as needed.

If the patient is unable to cry or is coughing weakly, they may have a complete airway obstruction:

- Activate EMS, rapid response or resuscitation team and call for an AED.
- Provide care as noted below.

Step 2 Obtain consent

- Obtain consent from the parent or legal guardian if present. If they're not available, consent is implied.

Step 3 Position the infant for back blows

- Place your forearm along the infant's back, cradling the back of the infant's head with your hand.
- Place your other forearm along the infant's front, supporting the infant's jaw with your thumb and fingers.
- Turn the infant face down. Hold them along your forearm and use your thigh for support and keep the infant's head lower than their body.



Step 4 Give 5 back blows

- Use the heel of your hand to deliver back blows between the infant's scapulae. Keep your fingers up to avoid hitting the infant's head or neck.
- Give 5 firm back blows, with each one separate from the others.



SKILL SHEET

Obstructed Airway Care for Infants (continued)

Step 5 Give 5 Chest Thrusts

If back blows aren't effective, perform chest thrusts:

- Position the infant between your forearms, support the head and neck, and turn the infant face-up.
- Lower the infant onto your thigh with their head lower than their chest.
- Place two fingers in the center of the infant's chest, just below the nipple line.
- Give 5 quick chest thrusts about 1½ inches deep. Let the chest return to its normal position, keeping your fingers in contact with the breastbone. Each chest thrust should be separate from the others.



Practice Note

Use a combination of basic and advanced airway management techniques based on your training and availability.

Step 6 Care for an unresponsive patient with an obstructed airway

Continue giving 5 back blows and 5 chest thrusts until:

- The infant can cough, cry or breathe.
- The infant becomes unresponsive.

If the infant becomes unresponsive or if they are found unresponsive and assessed with obstructed airway:

- Ensure they are on a firm, flat surface and immediately begin CPR, starting with chest compressions.
 - 30:2 (single-provider CPR) or 15:2 (multiple-provider CPR)
- After each set of compressions and before ventilations, open the patient's mouth and look for the object.
 - If seen, remove it using a pinky sweep.
- Attempt 2 ventilations; never try more than 2 ventilations during one cycle of CPR even if the chest does not rise.
- Continue performing cycles of chest compressions and ventilations; checking for an object; do not perform a blind finger sweep before each set of ventilations.
- Check breathing and pulse every 2 minutes.





Opioid Overdose

Introduction

As the number of opioid overdose-associated deaths continues to rise in the United States, it is more important than ever that healthcare providers quickly assess and recognize a potential opioid overdose and provide immediate care. This chapter reviews the basic life support care for a suspected or known opioid overdose, including the administration of naloxone, to help prevent opioid overdose associated fatalities.

The Opioid Crisis

As a healthcare provider, you must be prepared to respond to opioid-associated life-threatening emergencies. According to the CDC, overdoses involving opioids killed nearly 47,000 people in 2018, and 32% of those deaths involved prescription opioids. Figure 6-1 depicts opioid overdose by types between 1999 and 2018.

The opioid crisis in the United States was officially declared a public health emergency in 2017.

Assess for Opioid Overdose

To quickly assess for an opioid overdose, use the opioid overdose triad:

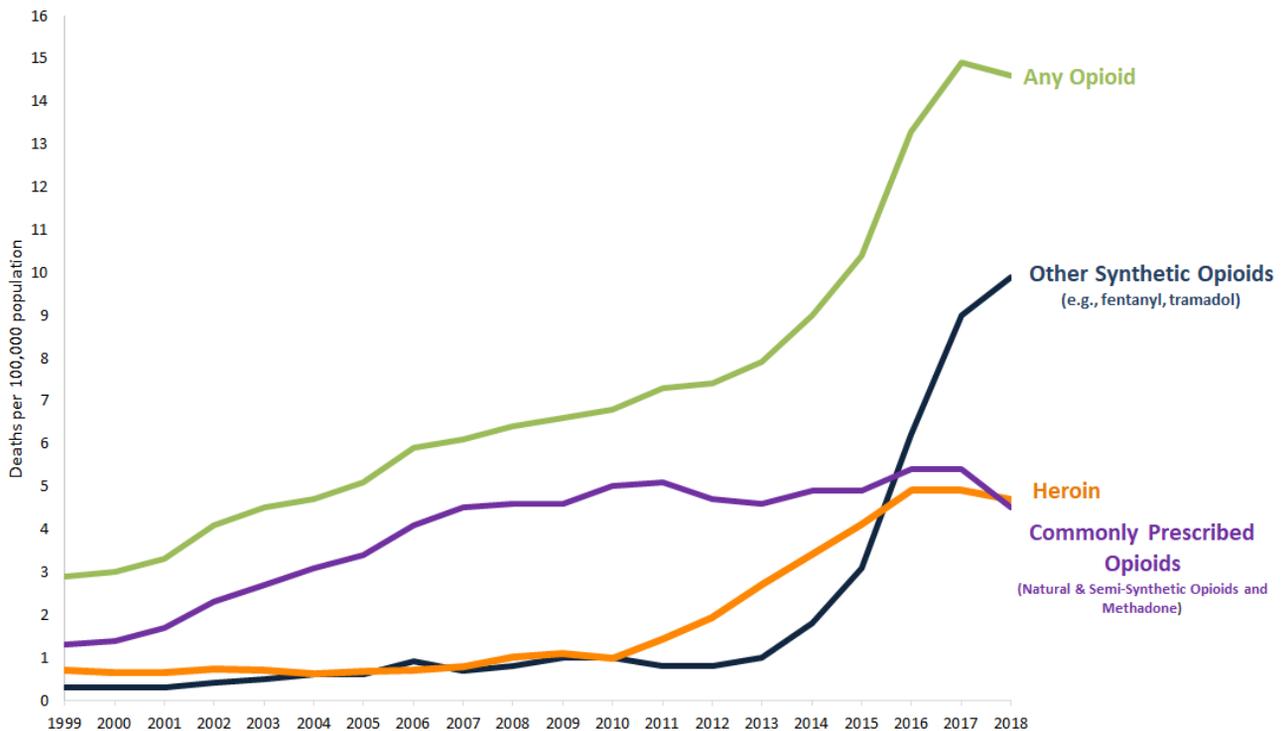
- Pinpoint pupils (Figure 6-2, A).
- Respiratory depression.
- Unconsciousness or severe sleepiness.

Other indicators of opioid overdose include:

- Cyanosis.
- Track marks from intravenous drug use (Figure 6-2, B).
- Prescription pill bottles, pipes, needles, syringes, pill powder or other drug-related items.
- History of opioid drug abuse.

When assessing a patient with suspected or known opioid overdose, consider the use of more objective assessments to assess breathing, such as capnography. A normal ETCO_2 value rules out respiratory depression.

Overdose Death Rates Involving Opioids, by Type, United States, 1999-2018



SOURCE: CDC/NCHS, National Vital Statistics System, Mortality. CDC WONDER, Atlanta, GA: US Department of Health and Human Services, CDC; 2020. <https://wonder.cdc.gov/>.

www.cdc.gov
Your Source for Credible Health Information

Figure 6-1 | The United States has seen a dramatic increase in opioid-related deaths in recent years.



Figure 6-2 | (A) Signs of opioid overdose may include pinpoint pupils. (B) Track marks also may be an indicator of opioid use.

Recognize the Emergency and Provide Care

If the patient is experiencing a suspected or known opioid overdose, activate EMS, the rapid response team or the resuscitation team, as appropriate, and call for an AED, additional resources and naloxone. Then, provide care for the condition found and administer naloxone as soon as it is available based on your facility's protocols and available resources.

Use the *Suspected or Known Opioid Overdose: Adults, Children and Infants* code card as a cognitive aid when providing care. See *Appendix C: Basic Life Support Code Cards*.

ALERT

Avoid white powder or other potential hazards near or on the patient and use **personal protective equipment (PPE)** according to your facility's protocols.

Altered Mental Status

Consider administering naloxone if you suspect an opioid overdose and the patient is:

- Unresponsive.
- Responsive but experiencing an altered level of consciousness with risk of progressing to a life-threatening condition (e.g., unstable airway, respiratory compromise).
- Breathing and has a central pulse.

If not already done:

- Perform primary assessment (Airway, Breathing, Circulation, Disability, Exposure) and emergent/initial interventions.
- Position patient as appropriate for clinical condition.
- Perform secondary assessment as patient condition allows.
- Reassess patient, recognize issues and provide care as needed.

Respiratory Arrest or Respiratory Failure

For respiratory arrest or respiratory failure provide care as follows:

- Deliver ventilations as follows:
 - Adults: Deliver 1 ventilation every **6 seconds**. If pulse becomes absent, start CPR.
 - Children and infants with central pulse > 60 bpm: Deliver 1 ventilation every **2 to 3 seconds**.
 - Children and infants with central pulse ≤ 60 bpm: Start CPR.
- If facility protocol allows, administer naloxone as soon as it is available. Remember, providing ventilations is the priority over administering naloxone during respiratory arrest or respiratory failure.
- Reassess responsiveness and breathing.
- Administer additional dose(s) of naloxone as needed.
- If not already done:
 - Perform primary assessment (Airway, Breathing, Circulation, Disability, Exposure) and emergent/initial interventions.
 - Position patient as appropriate for clinical condition.

- Perform secondary assessment as patient condition allows.
- Reassess patient, recognize issues and provide care as needed.

Cardiac Arrest

Once cardiac arrest is recognized, begin CPR immediately and use an AED when it is available. If your facility protocol allows, administer naloxone. Remember, providing high-quality CPR is the priority over administering naloxone during cardiac arrest.

Administering Naloxone

Proper Administration

Naloxone may be administered to adult and pediatric patients via the intravenous (IV), intraosseous (IO), intramuscular (IM), subcutaneous (SC) or intranasal (IN) route (Figure 6-3).

Follow the manufacturer's instructions or your facility's protocol for naloxone administration. Subsequent doses of naloxone may be repeated every 2 to 3 minutes as needed. Do not delay or disrupt other interventions, such as ventilations or CPR, while waiting for naloxone to work.

Prioritize care for respiratory arrest/failure or cardiac arrest over the administration of naloxone.

Adverse Effects and Efficacy of Naloxone

Naloxone can temporarily reverse the effects of opioid overdose. Serious side effects from naloxone are very uncommon, including allergic reaction. In rare cases naloxone may cause acute opioid withdrawal symptoms such as body aches, increased heart rate, irritability, agitation, vomiting, diarrhea or convulsions.



Figure 6-3 | Intranasal administration of naloxone

When the Patient Responds

After administering naloxone, check for responsiveness and assess for breathing and a pulse.

If the patient responds, place them in a recovery position providing you do not suspect a head, neck, spinal, hip or pelvic injury. If they vomit, suction their airway or call for help to provide suctioning. Reassess the patient for any changes in condition until EMS, the rapid response team or the resuscitation team arrives (Figure 6-4). If the patient stops responding, immediately reassess breathing and pulse. Then, begin care as appropriate. Repeat naloxone administration every 2 to 3 minutes as needed.



ALERT

Monitor the patient for 4 to 6 hours after last dose of naloxone. Consider longer observation times if extended-release or long-acting opioid. Consider admission and initiation of a continuous naloxone infusion if potential for recurrence of respiratory depression due to opioid.



Figure 6-4 | When the patient responds, assess for breathing and a pulse.

Appendices

Appendix A: Common Legal Considerations

Appendix B: Standard Precautions

Appendix C: Basic Life Support Code Cards

Appendix D: Basic Life Support Differences Among Adults, Children and Infants

Appendix E: Glossary

Appendix F: Bibliography

Common Legal Considerations

Duty to Act	The duty to respond to an emergency and provide care. Failure to fulfill these duties could result in legal action.
Scope of Practice	The range of duties and skills you have acquired in training that you are authorized to perform by your certification to practice.
Standard of Care	The public's expectation that personnel summoned to an emergency will provide care with a certain level of knowledge and skill.
Negligence	Failure to follow a reasonable standard of care, thereby causing or contributing to injury or damage.
Refusal of Care	A competent patient's refusal of care from a healthcare provider. Refusal of care must be honored, even if the patient is seriously injured or ill or desperately needs assistance. A patient can refuse some or all care. If a witness is available, have the witness listen to any refusal of care, and document it in writing.
Advance Directives	Written instructions that describe a patient's wishes (or the wishes of the parent or legal guardian) regarding medical treatment or healthcare decisions. Guidance for advance directives, including any required identification and verification process, is documented in state, regional or local laws, statutes and/or protocols, and must be followed. Advance directives include: <ul style="list-style-type: none"> ■ Do Not Resuscitate (DNR) orders, also called Do Not Attempt Resuscitation (DNAR) orders. ■ Physician Orders for Life-Sustaining Treatment (POLST).
Battery	The unlawful, harmful or offensive touching of a patient without the patient's consent.
Abandonment	Discontinuing care once it has begun. You must continue care until someone with equal or more advanced training takes over.
Confidentiality	While providing care to a patient, you may learn details about the patient that are private and confidential. Do not share this information with anyone except personnel directly associated with the patient's medical care.

Consent

To obtain consent from a patient or legal guardian, follow these steps:

- Identify yourself to the patient or legal guardian.
- State your level of training.
- Explain what you observe.
- Explain what you plan to do.
- Ask for permission from the patient or legal guardian to provide care.

If an adult patient is unresponsive, has an altered mental status, is mentally impaired or is unable to give consent verbally or through a gesture, then consent is implied.

For most infants and children up to the age of 17 years, you must obtain consent to provide care from the child's parent or legal guardian if they are present regardless of the child's level of consciousness. If a parent or legal guardian is not present, consent is implied in life-threatening emergencies. Always follow your local laws and regulations as they relate to the care of minors.

Standard Precautions

Always follow standard precautions when performing a rapid assessment. Standard precautions are safety measures to prevent disease transmission based on the assumption that all body fluids may be infectious.



Applying Standard Precautions

You must wear appropriate personal protective equipment (PPE) and follow standard precautions for the particular situation.

Always make sure to review your facility's protocols for standard precautions.

Additionally, maintain good health habits (such as maintaining currency with all required and suggested immunizations, getting adequate sleep and exercise, and following a healthy diet) to lower your susceptibility to infection and prevent the spread of infection to others.

Standard precautions include the use of:

- **Personal protective equipment (PPE):** Specialized clothing, equipment and supplies that prevent direct contact with potentially infectious materials. PPE includes gloves, CPR breathing barriers, gowns, face shields, protective eyewear and biohazard bags.
- **Hand hygiene:** Hand washing is the most effective measure to prevent the spread of infection. Alcohol-based hand sanitizers allow you to clean your hands when soap and water are not readily available and your hands are not visibly soiled.
- **Engineering controls:** Objects used in the workplace that isolate or remove a hazard, reducing the risk of exposure.
- **Work practice controls:** Methods of working that reduce the likelihood of an exposure incident by changing the way a task is carried out.
- **Proper equipment cleaning:** After providing care, the equipment and surfaces used should always be cleaned and disinfected or properly disposed.
- **Proper spill cleanup procedures:** If a spill occurs, appropriate measures should be taken to limit and reduce exposure to possible contaminants.

Your Role During an Exposure Incident

Even with the best use of standard precautions, exposures do occur. When an exposure incident occurs, follow these steps as well as any steps outlined by your healthcare facility:

- Wash needlestick injuries, cuts and exposed skin.
- If blood or other body fluids are splashed around the mouth or nose, flush the area with water.
- If eyes are involved, irrigate with clean water, saline or sterile irrigant solution for 20 minutes.
- Clean the contaminated area thoroughly with soap and water.

Your Role After an Exposure Incident

After the exposure incident has occurred, it is important to:

- Report the incident immediately to the appropriate person identified in your facility's infection/exposure control plan.
- Write down what happened, including the time, date and circumstances, actions taken and any other information required by your employer.
- Seek immediate follow-up care according to your facility's infection/exposure control plan.

Basic Life Support Code Cards

Basic Life Support: Adults and Adolescents

Basic Life Support: Pregnant Patients

Basic Life Support: Children and Infants

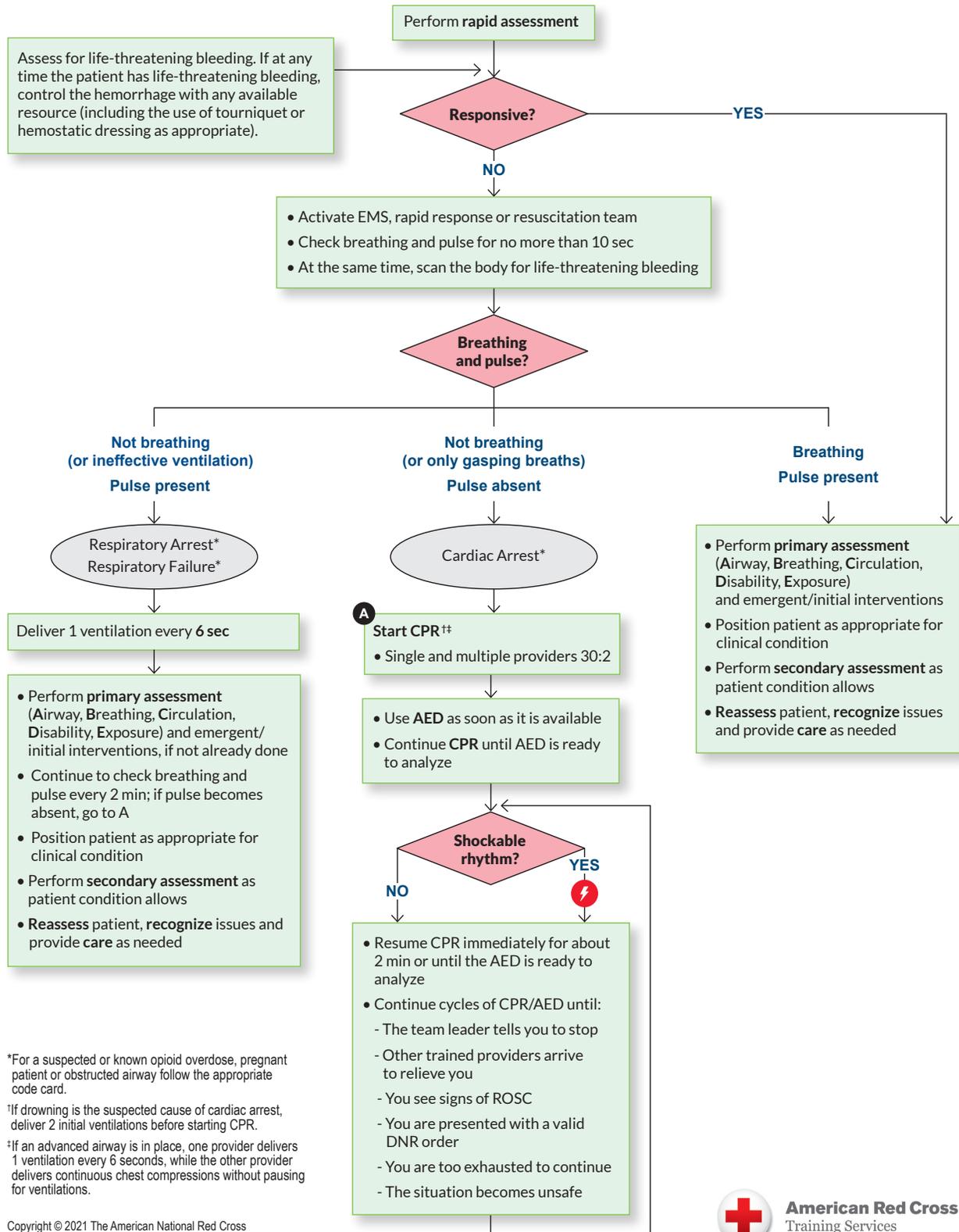
Obstructed Airway: Adults, Children and Infants

Suspected or Known Opioid Overdose: Adults, Children and Infants

BASIC LIFE SUPPORT: ADULTS AND ADOLESCENTS

BLS - 2020 VERSION

 Shock



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BASIC LIFE SUPPORT: ADULTS AND ADOLESCENTS

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CPR Technique		
<p>Compression-to-ventilation ratio: 30:2</p>	 Compressions	<ul style="list-style-type: none"> • Hand position: Centered on the lower half of the sternum • Depth: At least 2 inches (5 cm) • Rate: 100 to 120 per min • Full chest recoil: Compression and recoil times should be approximately equal
<p>Switch CPR compressors</p> <ul style="list-style-type: none"> • Every 2 min • During rhythm check • If provider is fatigued 	 Ventilations	<ul style="list-style-type: none"> • Open airway to past-neutral position. Use modified jaw-thrust maneuver instead if you suspect head, neck or spinal injury. • Each ventilation should last about 1 sec and make the chest begin to rise; allow the air to exit before delivering next ventilation. • If an advanced airway is in place, one provider delivers 1 ventilation every 6 seconds, while the other provider delivers continuous chest compressions without pausing for ventilations.



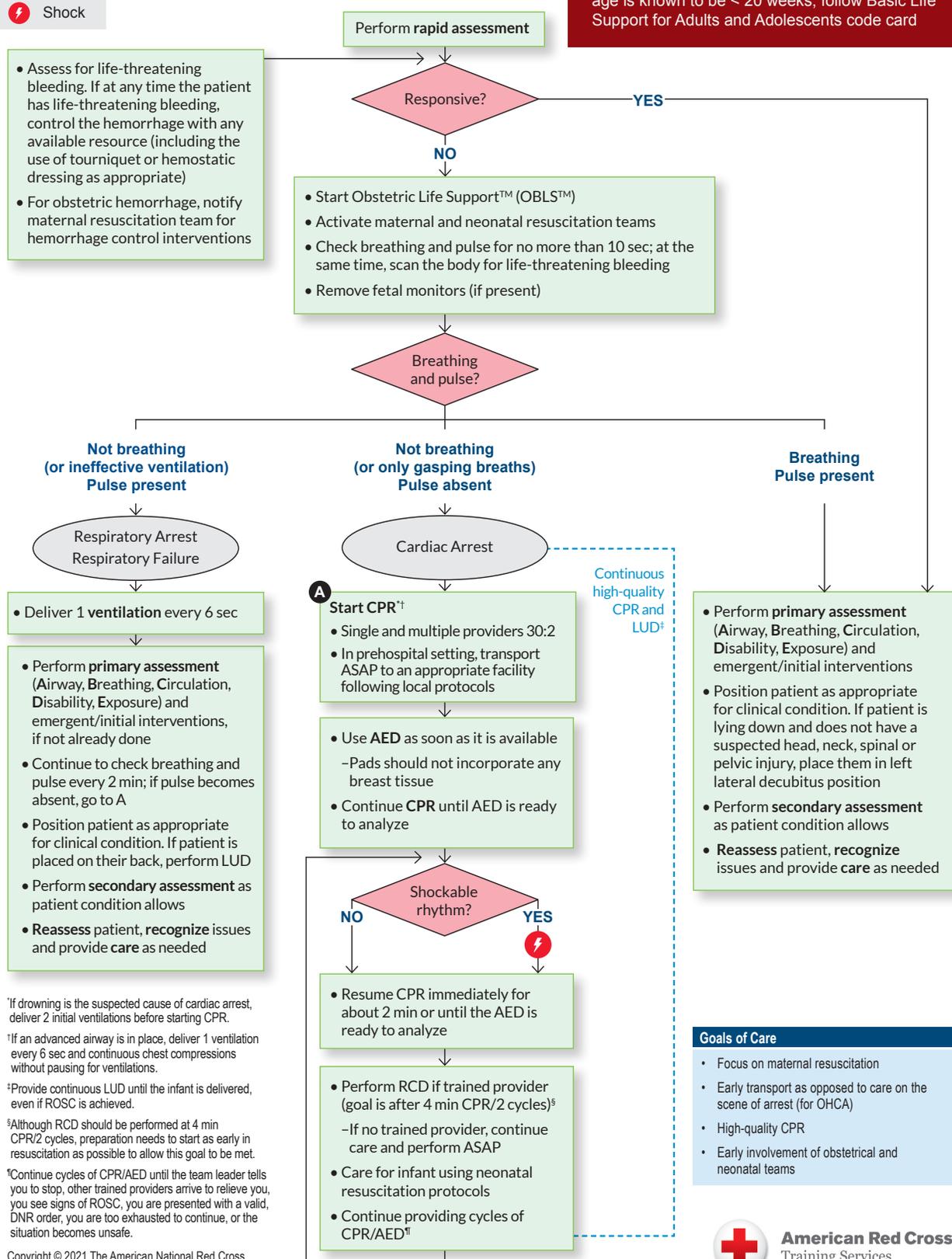
BASIC LIFE SUPPORT: PREGNANT PATIENTS

Supported by science reviews and guidelines of Obstetric Life Support™ (OBSL™)

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Note: If the fundus is below the umbilicus or fetal age is known to be < 20 weeks, follow Basic Life Support for Adults and Adolescents code card

 Shock



[†]If drowning is the suspected cause of cardiac arrest, deliver 2 initial ventilations before starting CPR.

^{††}If an advanced airway is in place, deliver 1 ventilation every 6 sec and continuous chest compressions without pausing for ventilations.

[‡]Provide continuous LUD until the infant is delivered, even if ROSC is achieved.

[§]Although RCD should be performed at 4 min CPR/2 cycles, preparation needs to start as early in resuscitation as possible to allow this goal to be met.

[¶]Continue cycles of CPR/AED until the team leader tells you to stop, other trained providers arrive to relieve you, you see signs of ROSC, you are presented with a valid, DNR order, you are too exhausted to continue, or the situation becomes unsafe.

Goals of Care

- Focus on maternal resuscitation
- Early transport as opposed to care on the scene of arrest (for OHCA)
- High-quality CPR
- Early involvement of obstetrical and neonatal teams



BASIC LIFE SUPPORT: PREGNANT PATIENTS

Supported by science reviews and guidelines of Obstetric Life Support™ (OBSL™)

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Prehospital Assessment and Care

- Prioritize transport over care at the scene (follow local protocols for destination decision)
- Provide high-quality CPR, including airway management and continuous LUD during transport. Provide continuous LUD until the infant is delivered, even if ROSC is achieved
- Alert receiving hospital and follow protocols for maternal cardiac arrest arrival

Causes of Cardiac Arrest in Pregnancy (BAACC TO LIFE™)

B: bleeding	T: trauma	L: lung injury/acute respiratory distress syndrome
A: anesthesia	O: overdose (opioids, magnesium sulfate, other)	I: ions (glucose, potassium)
A: amniotic fluid embolism		F: fever (sepsis)
C: cardiovascular/cardiomyopathy		E: eclampsia/emergency hypertension
C: clot/cerebrovascular		

Indications for Resuscitative Cesarean Delivery (RCD)

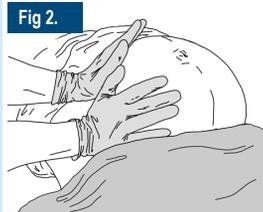
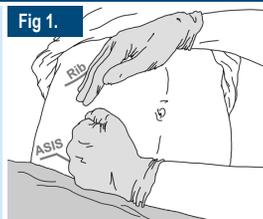
- No ROSC after 2 cycles of CPR in a pregnant patient with a fundus at or above umbilicus or fetal age known to be ≥ 20 weeks
- Intermittent ROSC after 2 cycles of CPR
- Nonshockable rhythm
- Immediately upon arrival to an emergency department without ROSC (for OHCA)

CPR Technique for Adults and Adolescents

Compression-to-ventilation ratio: 30:2	 Compressions	<ul style="list-style-type: none"> • Hand position: Centered on the lower half of the sternum • Depth: At least 2 inches (5 cm) • Rate: 100 to 120 per min • Full chest recoil: Compression and recoil times should be approximately equal
	 Ventilations	<ul style="list-style-type: none"> • Open airway to past-neutral position. Use modified jaw-thrust maneuver instead if you suspect head, neck or spinal injury. • Each ventilation should last about 1 sec and make the chest begin to rise; allow the air to exit before delivering next ventilation. • If an advanced airway is in place, one provider delivers 1 ventilation every 6 seconds, while the other provider delivers continuous chest compressions without pausing for ventilations.

Left Uterine Displacement (LUD)

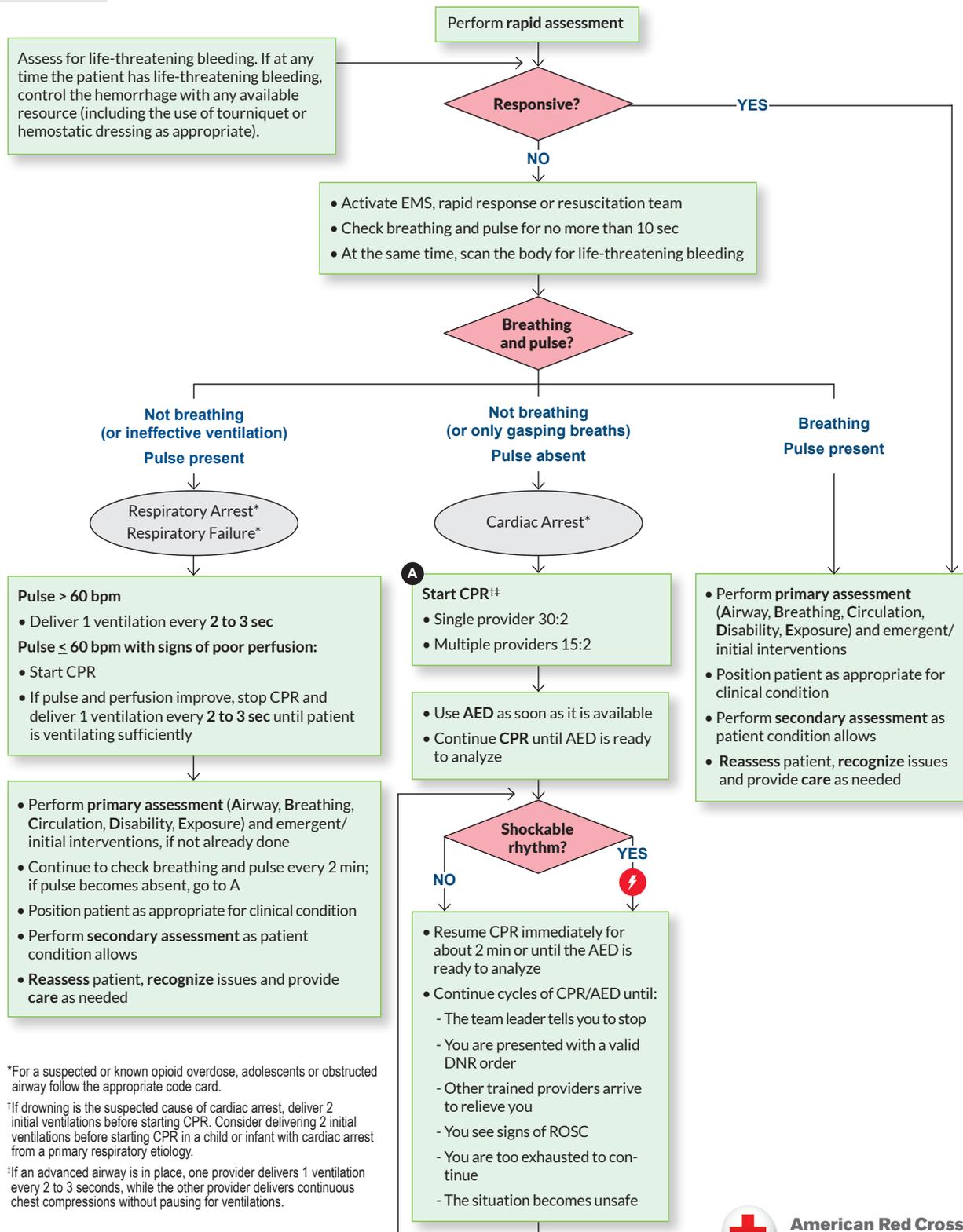
- When the fundus is at or above the umbilicus, provide continuous LUD until the infant is delivered, even if return of spontaneous circulation (ROSC) is achieved
- LUD relieves pressure placed on the inferior vena cava by the gravid uterus, increasing venous return to the heart to maximize cardiac output
- In most cases, two hands are needed to provide the necessary displacement
- From the patient's left side, reach across the patient, place both hands on the right side of the uterus, and pull the uterus to the left and up (**Fig. 1**)
- From the patient's right side, place both hands on the right side of the uterus and push the uterus to the left and up (**Fig. 2**)



BASIC LIFE SUPPORT: CHILDREN AND INFANTS

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 Shock



*For a suspected or known opioid overdose, adolescents or obstructed airway follow the appropriate code card.

**If drowning is the suspected cause of cardiac arrest, deliver 2 initial ventilations before starting CPR. Consider delivering 2 initial ventilations before starting CPR in a child or infant with cardiac arrest from a primary respiratory etiology.

†If an advanced airway is in place, one provider delivers 1 ventilation every 2 to 3 seconds, while the other provider delivers continuous chest compressions without pausing for ventilations.

BASIC LIFE SUPPORT: CHILDREN AND INFANTS

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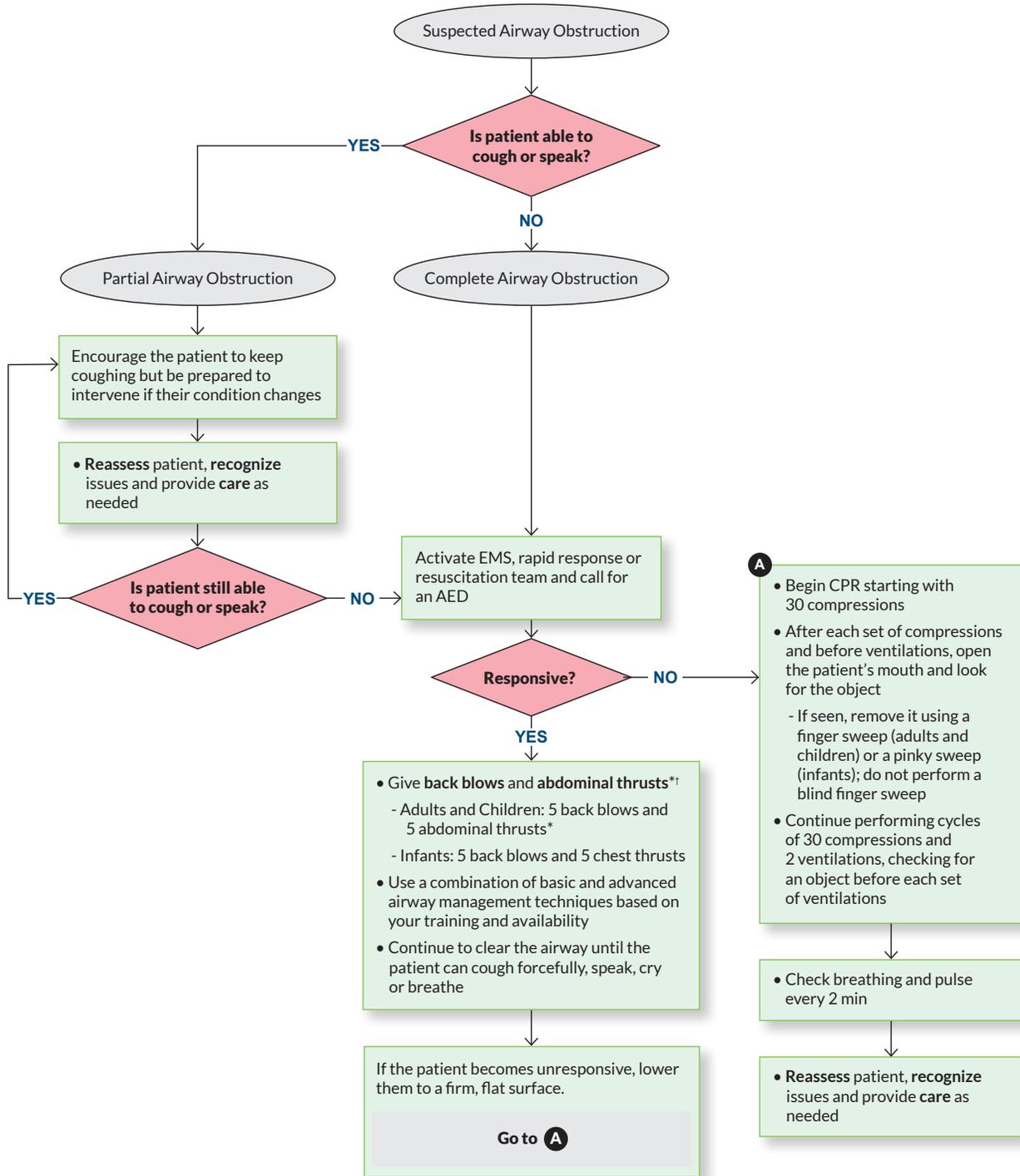
CPR Technique		Infant (< 1 Year Old)	Child (Age 1 Year to Onset of Puberty)
Compression-to-ventilation ratio: <ul style="list-style-type: none"> • Single provider 30:2 • Multiple providers 15:2 	 <p>Compressions</p>	<ul style="list-style-type: none"> • Hand position: Two thumbs placed in the center of the chest just below the nipple line (encircling thumbs technique). Alternatively two fingers may be used (i.e., two-finger technique). The one-hand technique may be considered if depth cannot be achieved with either the encircling thumbs technique or the two-finger technique. • Depth: About 1½ inches (3.8 cm) • Rate: 100 to 120 per min • Full chest recoil: Compression and recoil times should be approximately equal 	<ul style="list-style-type: none"> • Hand position: One or two hands centered on the lower half of the sternum • Depth: About 2 inches (5 cm) • Rate: 100 to 120 per min • Full chest recoil: Compression and recoil times should be approximately equal
Switch CPR compressors <ul style="list-style-type: none"> • Every 2 min • During rhythm check • If provider is fatigued 	 <p>Ventilations</p>	<ul style="list-style-type: none"> • Open airway to neutral position (avoid hyperextension). Use modified jaw-thrust maneuver instead if you suspect head, neck or spinal injury. • Each ventilation should last about 1 sec and make the chest begin to rise; allow the air to exit before delivering next ventilation. • If an advanced airway is in place, one provider delivers 1 ventilation every 2 to 3 secs, while the other provider delivers continuous chest compressions without pausing for ventilations. 	<ul style="list-style-type: none"> • Open airway to slightly past-neutral position (avoid hyperextension). Use modified jaw-thrust maneuver instead if you suspect head, neck or spinal injury. • Each ventilation should last about 1 sec and make the chest begin to rise; allow air to exit before delivering the next ventilation.

Indications of Poor Perfusion in a Child or Infant		
<ul style="list-style-type: none"> • Cool moist skin • Pallor 	<ul style="list-style-type: none"> • Mottling or cyanosis • Weak or thready pulse • Decrease in behavior or reactivity 	<ul style="list-style-type: none"> • Decreased capillary refill • Hypotension



OBSTRUCTED AIRWAY: ADULTS, CHILDREN AND INFANTS

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*For an adult or child, perform chest thrusts if you cannot reach far enough around the patient to perform abdominal thrusts, if the patient might be pregnant, if the patient is in a bed or wheelchair with features that make abdominal thrusts difficult to do or if back blows and abdominal thrusts are not effective in dislodging the object.

†If the patient is a young child or is in a wheelchair, you may need to kneel to perform back blows, abdominal thrusts or chest thrusts.

OBSTRUCTED AIRWAY: ADULTS, CHILDREN AND INFANTS

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Skill Steps: Obstructed Airway Care for Responsive Adults and Children

Give 5 back blows

- Position yourself to the side and slightly behind the patient
- Provide support by placing one arm diagonally across the patient's chest
- Bend the patient forward at the waist so the upper body is parallel to the ground or as close as it can be
- Using the heel of your other hand, give 5 firm back blows between the patient's scapulae; make each blow a separate and distinct attempt to dislodge the object

Give 5 abdominal thrusts

- Stand behind the patient, with one foot in front of the other for balance and stability; if possible, place your front foot in between the patient's feet
 - If the patient is a young child or is in a wheelchair, you may need to kneel
- Using one or two fingers to find the patient's navel, make a fist with your other hand and place the thumb side of your fist against the middle of the abdomen, just above the navel
- Grab your fist with your other hand
- Give 5 quick inward and upward thrusts
- Be sure to make each thrust a distinct attempt to dislodge the object

Give 5 Chest Thrusts *

- Position yourself behind the patient as you would for abdominal thrusts. If the patient is a young child or is in a wheelchair, you may need to kneel
- Place the thumb side of your fist against the center of the patient's chest on the lower half of the sternum
- Then cover your fist with your other hand and pull straight back, providing 5 quick inward thrusts into the patient's chest
- Be sure to make each thrust a distinct attempt to dislodge the object

Continue giving 5 back blows and 5 abdominal/chest thrusts until:

- The patient can cough forcefully, speak, cry or breathe
- The patient becomes unresponsive

Skill Steps: Obstructed Airway Care for Responsive Infants

Give 5 back blows

- Place your forearm along the infant's back, cradling the back of the infant's head with your hand
- Place your other forearm along the infant's front, supporting the infant's jaw with your thumb and fingers
- Turn the infant face down. Hold them along your forearm and use your thigh for support and keep the infant's head lower than their body
- Use the heel of your hand to give back blows between the infant's scapulae; keep your fingers up to avoid hitting the infant's head or neck
- Give 5 firm back blows, with each one separate from the others

Give 5 chest thrusts

- Position the infant between your forearms, support the head and neck, and turn the infant face-up
- Lower the infant onto your thigh with their head lower than their chest
- Place two fingers in the center of the infant's chest, just below the nipple line
- Give 5 quick chest thrusts about 1½ inches deep; let the chest return to its normal position, keeping your fingers in contact with the breastbone; each chest thrust should be separate from the others

Continue giving 5 back blows and 5 chest thrusts until:

- The patient can cough forcefully, speak, cry or breathe
- The patient becomes unresponsive

Skill Steps: Unresponsive Choking Care for Adults, Children and Infants

If the patient becomes unresponsive or if they are found unresponsive and assessed with obstructed airway:

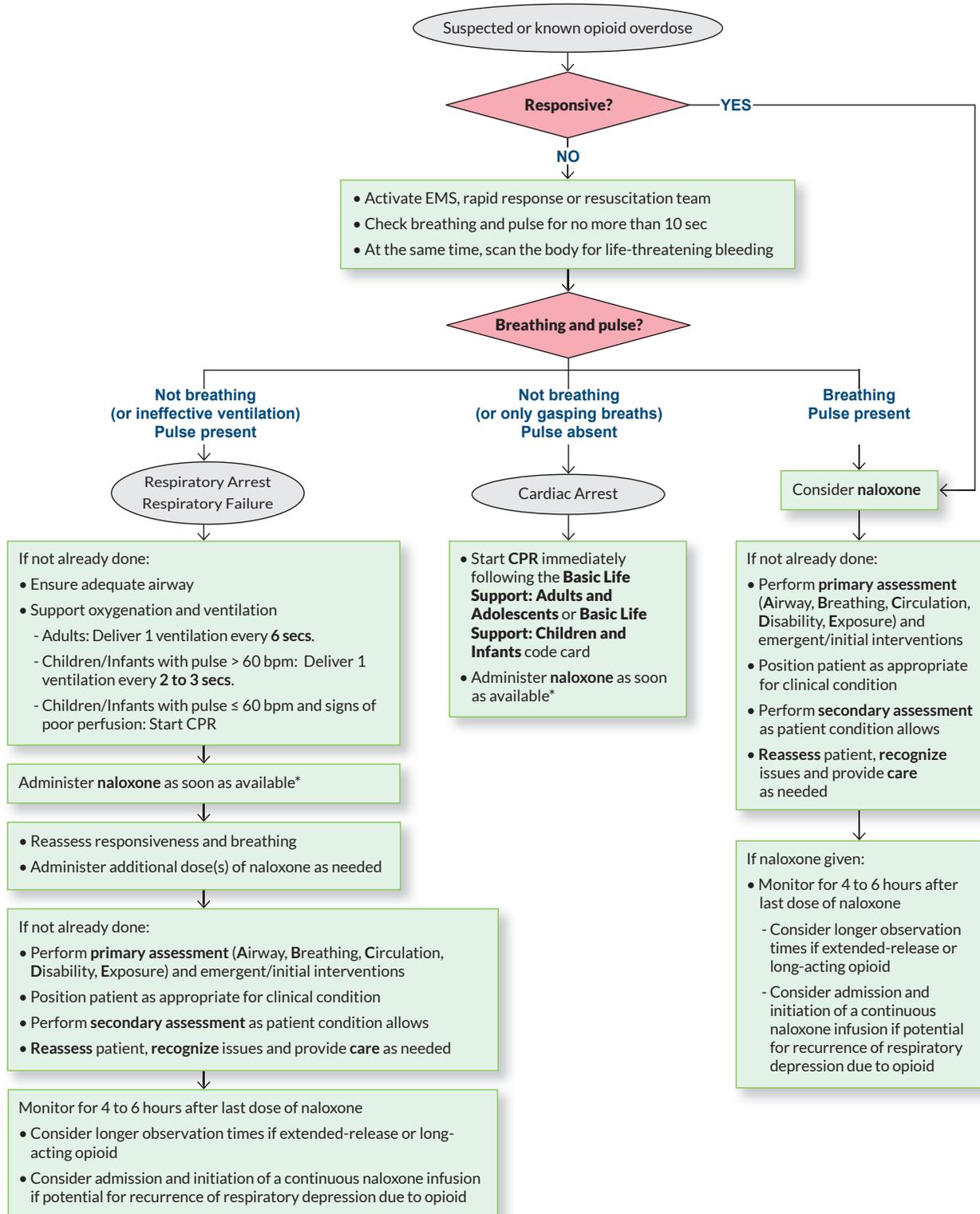
- Ensure they are on a firm, flat surface and immediately begin CPR, starting with chest compressions
- After each set of compressions and before ventilations, open the patient's mouth and look for the object
 - If seen, remove it using a finger sweep (adults and children) or a pinky sweep (infants); do not perform a blind sweep
- Attempt 2 ventilations; never try more than 2 ventilations during one cycle of CPR, even if the chest does not rise
- Continue performing cycles of compressions and ventilations, checking for an object before each set of ventilations
 - Adults: 30:2
 - Children and Infants: 30:2 (single-provider CPR) or 15:2 (multiple-provider CPR)
- Check breathing and pulse every 2 minutes

*Perform chest thrusts if you cannot reach far enough around the patient to perform abdominal thrusts, if the patient might be pregnant, if the patient is in a bed or wheelchair with features that make abdominal thrusts difficult to do or if back blows and abdominal thrusts are not effective in dislodging the object



SUSPECTED OR KNOWN OPIOID OVERDOSE: ADULTS, CHILDREN AND INFANTS

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* Prioritize care for respiratory arrest/failure or cardiac arrest over the administration of naloxone

Basic Life Support Differences Among Adults, Children and Infants

	Adult	Child (age 1 through onset of puberty)	Infant (birth to age 1)
Shout-tap-shout sequence	Shout “Are you OK?” Tap the shoulder. Then shout again.	Shout “Are you OK?” Tap the shoulder. Then shout again.	Shout “Are you OK?” Tap the bottom of the foot. Then shout again.
Calling for additional resources: If alone and no form of communication	Leave to call for additional resources. Then begin CPR.	Witnessed sudden collapse or known cardiac condition: Leave to call for additional resources. Then begin CPR. Unwitnessed sudden collapse: Perform 2 minutes of CPR. Then leave to call for additional resources.	Witnessed sudden collapse or known cardiac condition: Leave to call for additional resources. Then begin CPR. Unwitnessed sudden collapse: Perform 2 minutes of CPR. Then leave to call for additional resources.
Drowning or Other Primary Respiratory Etiologies	If drowning is suspected as the cause of cardiac arrest in an adult, deliver 2 initial ventilations before starting CPR.	If drowning is suspected as the cause of cardiac arrest, deliver 2 initial ventilations before starting CPR. You may also consider delivering 2 initial ventilations before starting CPR for a child with a primary respiratory etiology.	If drowning is suspected as the cause of cardiac arrest, deliver 2 initial ventilations before starting CPR. You may also consider delivering 2 initial ventilations before starting CPR for a child with a primary respiratory etiology.
Airway: Head-tilt/chin-lift	Past-neutral position	Slightly past-neutral position	Neutral position

	Adult	Child (age 1 through onset of puberty)	Infant (birth to age 1)
Ventilations: Respiratory arrest	1 ventilation every 6 seconds	If central pulse > 60 bpm, deliver 1 ventilation every 2 to 3 seconds. If central pulse is ≤ 60 bpm with signs of poor perfusion, start CPR.	If central pulse > 60 bpm, deliver 1 ventilation every 2 to 3 seconds. If central pulse is ≤ 60 bpm with signs of poor perfusion, start CPR.
Compression technique	Two hands interlaced on the chest centered on lower half of the sternum	Two hands interlaced on the chest centered on lower half of the sternum For smaller children, use the one-hand technique	Single-Provider CPR: Position two thumbs centered on the sternum just below the nipple line with fingers encircling chest . Alternatively, you can use the two-finger technique . If the required depth cannot be achieved with either the encircling thumbs technique or the two-finger technique in infants, you may consider using a one-hand technique . Multiple-Provider CPR: Position two thumbs centered on the sternum just below the nipple line with fingers encircling chest .
Compression rate	100 to 120 per minute	100 to 120 per minute	100 to 120 per minute
Compression depth	At least 2 inches (5 cm) but no more than 2.4 inches (6 cm)	About 2 inches (5 cm) or one-third the anterior-posterior diameter of the chest	About 1½ inches (3.8 cm) or one-third the anterior-posterior diameter of the chest
Compression-to-ventilation ratio	Single-provider CPR: 30:2 Multiple-provider CPR: 30:2	Single-provider CPR: 30:2 Multiple-provider CPR: 15:2	Single-provider CPR: 30:2 Multiple-provider CPR: 15:2
CPR with an advanced airway in place	1 ventilation every 6 seconds; compressions and ventilations are delivered continuously with no interruptions	1 ventilation every 2 to 3 seconds; compressions and ventilations are delivered continuously with no interruptions	1 ventilation every 2 to 3 seconds; compressions and ventilations are delivered continuously with no interruptions

	Adult	Child (age 1 through onset of puberty)	Infant (birth to age 1)
AED pads	Use adult pads. Do not use pediatric pads or setting ; the shock delivered will not be sufficient.	Age > 8 years, weight > 55 pounds (25 kg): Use adult pads. Do not use pediatric pads or setting ; the shock delivered will not be sufficient. Age ≤ 8 years, weight ≤ 55 pounds (25 kg): Use pediatric pads or setting . Use adult pads if pediatric pads or setting are not available.	Use pediatric pads or setting . Use adult pads if pediatric pads or setting are not available.
AED pad placement	Anterior/lateral placement <ul style="list-style-type: none"> ■ Upper right chest below right clavicle to right of sternum ■ Left side of chest several inches below left armpit on midaxillary line Anterior/posterior placement, if recommended by manufacturer	Anterior/lateral placement <ul style="list-style-type: none"> ■ Upper right chest below right clavicle to right of sternum ■ Left side of chest several inches below left armpit on midaxillary line Anterior/posterior placement, if pads risk touching each other or recommended by manufacturer	Anterior/posterior placement <ul style="list-style-type: none"> ■ Middle of chest ■ Back between scapulae

Glossary

Abandonment

Discontinuing care once it has begun.

Abdominal thrusts

Inward and upward thrusts just above the navel to force an object out of the airway when a person is choking.

Adolescent

In the context of CPR, someone from the onset of puberty (as evidenced by breast development in girls and underarm hair development in boys—usually around the age of 12) through adulthood.

Advance directive

Written instructions that describe a patient's wishes (or the wishes of the parent and/or legal guardian) regarding medical treatment or healthcare decisions.

Agonal breaths

Isolated or infrequent gasps that occur in the absence of normal breathing in an unconscious patient; can occur after the heart has stopped beating and are considered a sign of cardiac arrest.

Airway obstruction

Blockage within the airway that can prevent inhalation or ventilation.

Assess, Recognize and Care Concept

A systematic, continuous approach for quick and accurate assessment, rapid recognition and immediate care in emergency situations.

Automated external defibrillator (AED)

A portable electronic device that automatically analyzes a patient's heart rhythm and provides defibrillation, an electrical shock that may help the heart re-establish a perfusing rhythm; delivers defibrillation to patients with ventricular fibrillation and ventricular tachycardia.

Back blows

Blows between the scapulae to force an object out of the airway when a person is choking.

Bag-valve-mask (BVM) resuscitator

A handheld device used to ventilate a patient through the delivery of ambient air, thereby providing a 20% to 21% concentration of oxygen.

Battery

The unlawful, harmful or offensive touching of a patient without the patient's consent.

Capnography

A noninvasive way of measuring end-tidal carbon dioxide (CO₂) level.

Cardiac arrest

Cessation of heart function. A patient who is not breathing (or only gasping) and whose central pulse is absent is in cardiac arrest.

Chest compression

During chest compressions, you press down on the person's chest. This squeezes (compresses) the heart between the breastbone (sternum) and spine, moving blood out of the heart and to the brain and other vital organs.

Chest compression fraction (CCF)

The percentage of time spent performing chest compressions during the resuscitation effort; an indicator of CPR quality.

Chest recoil

Return of the chest to the expanded position after a compression, which allows blood to flow back into the heart.

Chest thrusts

Inward thrusts into the chest (while pulling straight back with the thumb-side of the fist against the center of the person's breastbone) to force an object out of the airway when a person is choking.

Child

A child is defined as someone from the age of 1 to the onset of puberty as evidenced by breast development in girls and underarm hair development in boys (usually around the age of 12).

Closed-loop communication

A communication technique used to prevent misunderstandings; the receiver confirms that the message has been received and understood.

Compression-to-ventilation ratio

The number of compressions and ventilations delivered during CPR; this varies for adults, children and infants.

Confidentiality

Details obtained throughout the course of providing care to a patient must not be shared with anyone except personnel directly associated with the patient's medical care.

Consent

Asking a responsive person (or the parent or guardian of a minor) for permission to help before giving care.

Coronary perfusion pressure (CPP)

The difference between the pressure in the aorta and the pressure in the right atrium during diastole; a reflection of myocardial blood flow.

CPR

Cardiopulmonary resuscitation; ventilations and compressions that circulate oxygenated blood to the patient's vital organs.

Crew resource management

A concept that helps to promote effective and efficient teamwork and reduce the likelihood of errors by encouraging problem solving and communication among team members.

Critical thinking

The process of thinking clearly and rationally to identify the connection between information and actions.

Defibrillation

Delivery of an electrical shock using an AED.

DNR order

Do Not Resuscitate order; a legal order that instructs healthcare providers to avoid CPR or advanced cardiac life support if a patient experiences cardiac or respiratory arrest.

Duty to act

The duty to respond to an emergency and provide care. Failure to fulfill this duty could result in legal action.

E-C hand position

A method to hold the mask in place; position one hand around the mask, forming an "E" with the last three fingers and a "C" with your thumb and index finger.

Feedback devices

Technology, ranging from apps to self-contained systems, that is used to gather data about CPR performance and provide real-time feedback; these devices collect objective data such as the rate at which compressions and ventilations are being delivered, the depth of compressions and the amount of chest recoil.

Finger sweep

Technique for clearing a mechanical obstruction from the upper airway of an unconscious patient in which the rescuer attempts to remove a mechanical obstruction from the patient's mouth using a finger; only used when the object is visible within the patient's mouth.

Hand hygiene

Washing hands with soap and water and keeping hands clean even when they are not visibly soiled; the most effective measure to prevent the spread of infection.

High-performance resuscitation team

A team of highly trained and skilled personnel who work together to provide resuscitative care when a patient experiences respiratory or cardiac arrest.

High-quality CPR

Method of performing CPR that helps you to provide appropriate, effective care until the advanced cardiac life support team arrives. If provided during the first few minutes of cardiac arrest, high-quality CPR can double or triple a patient's chance of survival.

Hovering

In the context of CPR, remaining in position with the hands a few inches above the patient's chest during AED analysis and shock delivery to minimize interruptions in chest compressions.

Infant

An infant is defined as someone under the age of 1.

Left uterine displacement (LUD)

A technique used in a pregnant patient to move the gravid uterus up and toward the left to relieve pressure on the inferior vena cava and maximize the return of blood to the heart and cardiac output.

Myocardial infarction (MI)

Necrosis (death) of heart tissue as a result of insufficient delivery of oxygenated blood to the heart; also called a heart attack.

Opioid overdose triad

A method for recognizing the signs and symptoms of opioid overdose; includes checking for pinpoint pupils, respiratory depression and unconsciousness or severe sleepiness.

Oropharynx

The region of the pharynx that extends from the hard palate to the level of the hyoid bone and is located posterior to the oral cavity.

Overventilation

Excessive pulmonary ventilation; increases thoracic pressure to the extent that atrial and ventricular filling is decreased and coronary perfusion pressure is reduced.

Personal protective equipment (PPE)

Specialized clothing, equipment and supplies, such as gloves, CPR breathing barriers, gowns, face shields, protective eyewear and biohazard bags, that prevent direct contact with potentially infectious materials.

Problem solving

The ability to use readily available resources to find solutions to challenging or complex situations or issues that arise.

Rapid assessment

The initial hands-on evaluation of a patient in an emergency situation; includes performing a quick visual survey, checking for responsiveness, opening the patient's airway and simultaneously checking for breathing and a pulse.

Rapid response team

A team of highly trained and skilled personnel who work together to care for a patient when signs of cardiopulmonary compromise or shock are noted.

Recovery position

A body position used to help maintain a clear airway in an unresponsive patient who is uninjured and breathing normally.

Refusal of care

A competent patient's refusal of some or all care provided by a healthcare provider. Refusal of care must be honored, even if the patient is seriously injured or ill or desperately needs assistance.

Respiratory arrest

Cessation of the breathing effort. A patient who is not breathing and has a central pulse is in respiratory arrest.

Respiratory failure

A condition in which the blood does not have enough oxygen or has too much carbon dioxide. An adult patient in respiratory failure may have some ventilation; however, this ventilation is insufficient to sustain needed gas exchange, oxygen and carbon dioxide.

Resuscitative cesarean delivery (RCD)

A surgical delivery of the fetus performed when a pregnant patient is in cardiac arrest with the goals of resuscitating the pregnant patient and increasing the likelihood of fetal survival.

Return of spontaneous circulation (ROSC)

A return of pulse during resuscitative efforts; describes the successful resuscitation of a patient in cardiac arrest.

Scope of practice

The range of duties and skills you have acquired in training that you are authorized to perform by your certification to practice.

Shout-tap-shout sequence

Technique used to check for patient responsiveness: First, shout "Are you OK?" using the patient's name if you know it, then tap the patient's shoulder (or bottom of the foot if an infant) and shout again.

Standard of care

The public's expectation that personnel summoned to an emergency will provide care with a certain level of knowledge and skill.

Standard precautions

Safety measures to prevent disease transmission based on the assumption that all body fluids may be infectious.

Stridor

High-pitched squeaking noises during attempts to breathe.

Supine

Lying on the back with the face upward.

Teamwork

The actions of a group of people with well-defined roles and responsibilities making a coordinated effort to achieve a common goal.

Universal sign of choking

Clutching the throat with one or both hands to indicate choking.

Venous return

The rate of blood flow back into the heart.

Visual survey

Initial assessment of the scene of an emergency event; includes checking your surroundings for safety, gathering an initial impression (including whether there is severe, life-threatening bleeding) and determining the need for additional resources.

Work practice controls

Methods of working that reduce the likelihood of an exposure incident by changing the way a task is carried out.

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