Chapter 11
BLS Resuscitation

Unit Summary

After students complete this chapter and the related course work, they will have reviewed the basic life support (BLS) procedures for adults, infants, and children. Please note that BLS knowledge is a prerequisite for the course and that this chapter should serve as a review.

National EMS Education Standard Competencies

Shock and Resuscitation

Applies a fundamental knowledge of the causes, pathophysiology, and management of shock, respiratory failure or arrest, cardiac failure or arrest, and post-resuscitation management.

Knowledge Objectives

1. Explain the elements of BLS, how it differs from advanced life support (ALS), and the urgency surrounding its rapid application. (pp 413–414, 416–417)
2. Explain the goals of cardiopulmonary resuscitation (CPR) and when it should be performed on a patient. (p 414)
3. Explain the system components of CPR, the links in the American Heart Association chain of survival, and how each one relates to maximizing the survival of a patient. (pp 414–415)
4. Discuss guidelines for circumstances that require the use of an automated external defibrillator (AED) on both adult and pediatric patients experiencing cardiac arrest. (p 415)
5. Explain three special situations related to the use of automated external defibrillation. (p 416)
6. Describe the proper way to position an adult patient to receive BLS. (pp 417–418)
7. Describe the two techniques an EMT may use to open an adult patient’s airway and the circumstances that would determine when each technique would be used. (pp 417–419)
8. Describe the recovery position and circumstances that would warrant its use as well as situations in which it would be contraindicated. (p 420)
9. Describe the process of providing artificial ventilations to an adult patient using a barrier device, ways to avoid gastric distention, and modifications required for a patient with a stoma. (pp 420–422)
10. Describe the purpose of external chest compressions. (pp 423–424)
11. Explain the steps in providing one-rescuer adult CPR. (pp 424–427)
12. Explain the steps in providing two-rescuer adult CPR, including the method for switching positions during the process. (pp 425–429)
13. Describe the different mechanical devices that are available to assist emergency responders in delivering improved circulatory efforts during CPR. (pp 427–430)
14. Describe the different possible causes of cardiopulmonary arrest in children. (pp 430–431)
15. Explain the four steps of pediatric BLS procedures and how they differ from procedures used in an adult patient. (pp 431–436)

16. Describe the ethical issues related to patient resuscitation, providing examples of when not to start CPR on a patient. (pp 436–437)

17. Explain the various factors involved in the decision to stop CPR once it has been started on a patient. (p 437)

18. Explain common causes of foreign body airway obstruction in both children and adults and how to distinguish mild or partial airway obstruction from complete airway obstruction. (pp 437–441)

19. Describe the different methods for removing a foreign body airway obstruction in an infant, child, and adult, including the procedure for a patient with an obstruction who becomes unconscious. (pp 439–444)

Skills Objectives

1. Demonstrate how to reposition an unconscious adult for airway management. (pp 417–418, Skill Drill 11-1)

2. Demonstrate how to check for a pulse at the carotid artery in an unresponsive patient. (pp 417)

3. Demonstrate how to perform external chest compressions in an adult. (pp 419–420, Skill Drill 11-2)

4. Demonstrate how to perform a head tilt–chin lift maneuver on an adult patient. (pp 419–421)

5. Demonstrate how to perform a jaw-thrust maneuver on an adult patient. (p 420–421)

6. Demonstrate how to place a patient in the recovery position. (p 421–422)

7. Demonstrate how to perform rescue breathing in an adult with a simple barrier device. (pp 422–423)

8. Demonstrate how to perform one-rescuer adult CPR. (pp 424–426, Skill Drill 11-3)

9. Demonstrate how to perform two-rescuer adult CPR. (pp 424–428, Skill Drill 11-4)

10. Demonstrate how to perform a head tilt–chin lift maneuver on a pediatric patient. (p 434)

11. Demonstrate how to perform a jaw-thrust maneuver on a pediatric patient. (p 434)

12. Demonstrate the use of mechanical devices that assist emergency responders in delivering improved circulatory efforts during CPR. (pp 428–429)

13. Demonstrate how to perform rescue breathing on a child. (pp 434–435)

14. Demonstrate how to perform rescue breathing on an infant. (pp 432–433)

15. Demonstrate how to perform external chest compressions on an infant. (pp 431–433, Skill Drill 11-5)

16. Demonstrate how to perform CPR in a child who is between 1 year of age and the onset of puberty. (pp 432–433, Skill Drill 11-6)

17. Demonstrate how to remove a foreign body airway obstruction in a conscious adult patient using abdominal thrusts (Heimlich maneuver). (p 439)

18. Demonstrate how to remove a foreign body airway obstruction in a conscious pregnant or obese patient using chest thrusts. (pp 439–440)

19. Demonstrate how to remove a foreign body airway obstruction in a conscious child older than 1 year using abdominal thrusts (Heimlich maneuver). (pp 440–441)
20. Demonstrate how to remove a foreign body airway obstruction in an unconscious child. (pp 441–443, Skill Drill 11-7)

21. Demonstrate how to remove a foreign body airway obstruction in an infant. (pp 441–442)

Lecture

I. Introduction

A. The principles of basic life support (BLS) were introduced in 1960.
B. Since then, the specific techniques have been reviewed and revised every 5 to 6 years.
C. The information here follows the 2010 guidelines, which represent the most recent revision.

II. Elements of BLS

A. BLS is noninvasive emergency lifesaving care that is used to treat medical conditions, including:
   1. Airway obstruction
   2. Respiratory arrest
   3. Cardiac arrest

B. Focus is on what has traditionally been called the ABCs:
   1. Airway (obstruction)
   2. Breathing (respiratory arrest)
   3. Circulation (cardiac arrest or severe bleeding)

C. BLS follows a specific sequence for adults, infants, and children.

D. Only seconds should pass between the time you recognize that a patient needs BLS and the start of treatment.
   1. Brain damage is possible if brain is without oxygen for 4 to 6 minutes.
   2. Brain damage is likely if brain is without oxygen for more than 6 minutes.

E. Cardiopulmonary resuscitation (CPR)
   1. Establishes artificial ventilation and circulation in a patient who is not breathing and has no pulse
   2. CPR steps:
      a. Determine that the patient is unresponsive, not breathing, and does not a pulse.
      b. Perform chest compressions to circulate the blood.
      c. Provide artificial respirations by rescue breathing.
         i. Mouth-to-mouth
         ii. Mouth-to-nose
         iii. Use of mechanical devices

F. BLS differs from advanced life support (ALS), which involves advanced procedures, such as:
1. Cardiac monitoring
2. Administration of intravenous (IV) fluids and medications
3. Use of advanced airway adjuncts

G. When done correctly, BLS can maintain life for a short time until ALS measures can be started.

III. The System Components of CPR

A. Chain of survival
   1. The American Heart Association’s (AHA) chain of survival:
      a. Early access
         i. Requires public education and awareness
            (a) Early warning signs of cardiac arrest
            (b) Immediate activation of EMS
      b. Early CPR
         i. Early CPR will keep blood and oxygen flowing.
      c. Early defibrillation
         i. AEDs are readily available.
      d. Early advanced care
         i. Advanced airway management
         ii. Manual defibrillation
         iii. IV access
         iv. Administration of medications
      e. Integrated post-arrest care
         i. Controlling temperature to optimize neurologic recovery in the field
         ii. Maintaining glucose levels in the patient who is hypoglycemic
         iii. Other interventions when indicated

B. If any one of the links in the chain is absent, the patient is more likely to die.
   1. Few patients survive cardiac arrest if CPR is not done in the first few minutes.

IV. Automated External Defibrillation

A. AED use is a vital link in the chain of survival.
B. AED should be applied to a cardiac arrest patient as soon as available.
C. If you witness cardiac arrest, begin CPR and apply the AED as soon as available.
D. AED use in children
   1. Safe for infants and children older than 1 month of age
   2. Apply after the first five cycles of CPR.
   3. For children 1 month to 1 year of age, a manual defibrillator is preferred; if this is not available, use pediatric-sized pads and dose-attenuating system. If neither is available, an AED without a dose-attenuating system may be used.

E. Special situations
1. Pacemaker
   a. Easily recognizable by a hard lump in the chest, near the heart
   b. If AED electrical pads are placed over the device, may block shock.
      i. Place electrodes at least 1″ to the side of the device.

2. Wet patients
   a. Do not use the AED unit in water.
   b. If the patient is in water, pull them out and dry the skin before attaching the electrodes.
   c. If the patient is in a small puddle of water or in the snow, the AED can be used, but the patient’s chest should be dry.

3. Transdermal medication patches
   a. Medication delivered through a transdermal patch
   b. The patch could block the electrical current and cause a burn to the skin.
   c. Remove the patch and wipe the skin to remove the medication residue prior to attaching the AED pads.

V. Assessing the Need for BLS

A. Always begin by surveying the scene:
   1. Is the scene safe?
   2. How many patients are there?
   3. What is your initial impression of the patients?
   4. Are there bystanders who may have additional information?
   5. What is the mechanism of injury or nature of illness?
   6. Do you suspect trauma?
   7. Does the dispatch information match what you are seeing?

B. Complete the primary assessment as soon as possible in order to evaluate the patient’s ABCs.

   1. First step is determining unresponsiveness:
      a. A conscious patient does not need CPR.
      b. An unresponsive patient may or may not need CPR.
   2. Protect spinal cord from further injury if cervical spine injury is present.

C. The basic principles of BLS are the same for infants, children, and adults.

   1. An infant is younger than 1 year.
   2. A child is between 1 year and the onset of puberty.
   3. Adulthood is from the onset of puberty and older.

D. Although cardiac arrest in adults usually occurs before respiratory arrest, the reverse is true in infants and children.

VI. Positioning the Patient

A. Position the patient so the airway is open.
1. For CPR to be effective, the patient must be lying supine on a firm surface.
2. Must be enough space around the patient for two rescuers to perform CPR (See Skill Drill 11-1).
3. If possible, log roll the patient onto a backboard for easier airway access, breathing, and circulation.

VII. Assessing Pulse, Airway, and Breathing

A. Check for a pulse.
1. After determining that an unresponsive patient is not breathing:
   a. Check for a pulse at the carotid artery.
      i. If a pulse cannot be felt, begin chest compressions.
   b. If patient has a pulse but is not breathing, provide rescue breaths.

B. Administer chest compressions (See Skill Drill 11-2).
1. Apply rhythmic pressure and relaxation to the lower half of the sternum.
2. The heart is located slightly to the left of the middle of the chest between the sternum and spine.
3. Compressions squeeze the heart, acting as a pump to circulate blood.
   a. Circulates only one third of normal heart-pumped blood
4. Place the patient on a firm, flat surface in the supine position.
5. Proper hand positioning is crucial.
6. Proper compression technique
   a. Complications are rare, but include:
      i. Fractured ribs
      ii. Lacerated liver
      iii. Fractured sternum
   b. Injuries can be minimized by proper technique and hand placement.
      i. Lock your elbows with arms straight.
      ii. Position the shoulder directly over your hands.
      iii. Depress the sternum at least 2\(\text{in}\)
      iv. Compression must be followed by an equal period of relaxation.
         (a) Ratio should be 1:1.

C. There are two techniques for opening the airway in adults.
1. Head tilt–chin lift maneuver
   a. Make sure the patient is supine. Kneel close behind the patient.
   b. Place one hand on the patient\(\text{s}\) forehead and apply firm backward pressure with your palm to tilt the head back.
   c. Next, place the tips of the index and middle fingers of your other hand under the lower jaw near the bony part of the chin.
   d. Lift the chin upward, bringing the entire lower jaw with it and helping to tilt the head back.
2. Jaw-thrust maneuver
   a. Maintain the head in neutral alignment, place your fingers behind the angles of the lower jaw, and move the jaw upward.
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b. Use your thumbs to open the mouth to allow breathing.
   c. The nose can be sealed with your cheek when providing rescue breathing with this maneuver.

D. Check for breathing in a patient after opening the airway.
   1. If chest rises and falls, and you feel or hear air, the patient is breathing.

E. If the patient is breathing on his or her own and has no signs of trauma, you should place him or her in the recovery position.
   1. Maintains a clear airway
   2. Allows vomitus to drain from the mouth
   3. Never place a patient with a potential head or spinal injury in the recovery position.

F. If patient is not breathing, ventilations can be given by one or two EMTs, by EMRs, or by trained bystanders.
   1. Use a barrier device, such as a pocket mask or bag-mask device.

H. For a patient with a stoma, place a bag-mask device or pocket mask directly over the stoma.

G. Artificial ventilation may result in gastric distention.
   1. The stomach becomes filled with air when:
      a. Ventilations occur too fast
      b. Too much air is received
      c. The patient's airway is not opened adequately

VIII. One-Rescuer Adult CPR

A. When providing CPR alone, you must give both chest compressions and artificial ventilations (see Skill Drill 11-3).
   1. The ratio of compressions to ventilations is 30:2.

IX. Two-Rescuer Adult CPR

A. Always preferable to one-rescuer CPR (see Skill Drill 11-4)
   1. The rescuer who is doing the compressions can be switched.
      a. Less tiring
      b. Facilitates effective chest compressions

B. Switching rescuers during CPR is beneficial to the equality of CPR administered.
   1. It is recommended to switch positions every 2 minutes.
      a. No more than a 10-second break between the compression cycle

C. Several devices are available to assist EMTs.
   1. Impedance threshold device (ITD)
      a. Valve device placed between the ET tube and bag-mask device
      b. Limits the air entering lungs during the recoil phase between chest compressions
   2. Mechanical piston device
a. Depresses the sternum via a compressed gas-powered plunger
   i. Results in uniform delivery of compressions

3. Load-distributing band CPR or vest CPR
   a. Composed of a constricting band and backboard
   b. Electrically or pneumatically driven to compress the heart by putting inward pressure on the thorax

X. Infant and Child CPR

A. Unlike in many adults, the heart is healthy in most children.
   1. Sudden cardiac arrest is rare.
   2. More commonly, cardiac arrest in children comes from respiratory or circulatory failure from illness or injury.
      a. Airway and breathing are the focus of pediatric BLS.

B. Causes of respiratory problems leading to cardiopulmonary arrest in children:
   1. Injury, both blunt and penetrating
   2. Infections of the respiratory tract or another organ system
   3. A foreign body in the airway
   4. Near drowning
   5. Electrocution
   6. Poisoning or drug overdose
   7. Sudden infant death syndrome

C. Pediatric BLS can be divided into four steps:
   1. Determine responsiveness.
      a. Never shake a child to determine responsiveness.
         i. Gently tap child on shoulder and speak loudly.
      b. If you find an unresponsive, apneic, pulseless child, perform CPR for 2 minutes and then call the EMS system.
         i. Cardiopulmonary arrest in children is often the result of respiratory failure.
            (a) They require immediate restoration of oxygenation, ventilation, and circulation.
   2. Assess airway.
      a. Foreign body obstruction in children is common.
      b. Place an unconscious, breathing child in the recovery position.
         i. Do not use this position if a spinal injury is possible.
      c. Two common techniques for manually opening a child’s airway:
         i. Head tilt–chin lift maneuver
         ii. Jaw-thrust maneuver
      d. Place a wedge of padding under a child’s upper chest and shoulders to avoid partially obstructing the airway.
   3. Assess breathing.
a. Once the airway is open, determine if the child is breathing spontaneously.

b. If a child is breathing, transport immediately.

c. If a child is not breathing, provide rescue breathing while keeping the airway open, and transport immediately.
   i. If using mouth-to-mouth on an infant, place your mouth over the infant’s mouth and nose to create a seal.

   a. If you determine that an infant or child is not responsive and not breathing, check for a pulse.
      i. Check pulses in carotid or femoral arteries in children.
      ii. Check pulses in the brachial artery in infants.
   b. For chest compressions in an infant, place the infant on a firm, flat surface (see Skill Drill 11-5).
   c. For children between 1 year of age and the onset of puberty, perform CPR (see Skill Drill 11-6).
   d. For children past the onset of puberty, use the adult CPR sequence, including the use of the AED.

XI. Interrupting CPR

A. CPR is an important holding action that provides minimal circulation and ventilation until the patient can receive definitive care in the form of defibrillation or further care at the hospital.

B. No matter how well performed, CPR is rarely enough to save a patient’s life.

C. If ALS is not available at the scene:
   1. Provide transport based on your local protocols, continuing CPR on the way.
   2. Request rendezvous en route to hospital.

D. Try not to interrupt CPR for more than a few seconds, except when necessary.
   1. For example, you may have to move the patient up and down stairs.

XII. When Not to Start BLS

A. Two general rules regarding when not to start CPR:
   1. If the patient has obvious signs of death, which include an absence of pulse and breathing, along with any one of the following findings:
      a. Rigor mortis - stiffening of the body after death
      b. Dependent lividity (livor mortis) - discoloration of the skin caused by pooling of blood
      c. Putrefaction - decomposition of the body
      d. Evidence of nonsurvivable injury - eg, decapitation, dismemberment, or burned beyond recognition
   2. If the patient and physician have previously agreed on do not resuscitate (DNR) orders
      a. Usually only applies when patient is in the terminal stage of an incurable disease
      b. Can be a complicated issue
      c. Advanced directives expressing patient’s wishes may be hard to find.
      d. When in doubt, begin CPR.
      e. Very important to know local protocol.
XIII. When to Stop BLS

A. Once you begin CPR, continue until one of the following occur (using the mnemonic STOP):
   1. **S** - Patient Starts breathing and has a pulse
   2. **T** - Patient is Transferred to another trained responder
   3. **O** - You are Out of strength
   4. **P** - Physician directs you to discontinue

B. “Out of strength” does not just mean tired, but physically unable to continue.

XIV. Foreign Body Airway Obstruction in Adults

A. An airway obstruction may be caused by various things:
   1. Relaxation of the throat muscles in an unconscious patient
   2. Vomited or regurgitated stomach contents
   3. Blood
   4. Damaged tissue after an injury
   5. Dentures
   6. Foreign bodies such as food or small objects

B. In adults, foreign body airway obstruction usually occurs during a meal.

C. In children, airway obstruction usually occurs during a meal or at play.

D. Mild airway obstruction
   1. Patient is able to exchange adequate amounts of air but still has signs of respiratory distress
      a. Observe for signs of a severe airway obstruction:
         i. Weak or absent cough
         ii. Decreasing level of consciousness
         iii. Cyanosis

E. A sudden, severe obstruction is usually easy to recognize in conscious patients.
   1. Hands at the throat is the universal choking sign.
   2. A stridor may be present.
      a. High-pitched sound that occurs when the object is not fully blocking the airway

F. In unconscious patients, suspect obstruction if maneuvers to open airway and ventilate are ineffective.

G. Abdominal-thrust maneuver (Heimlich maneuver) is recommended in conscious adults and children older than 1 year.
   1. Creates an artificial cough
   2. Forces residual air to flow upwards and expel the object
   3. Each thrust should be deliberate, with the intent of removing the object.
H. Instead of the abdominal-thrust maneuver, use chest thrusts for the following conscious patients:
   1. Women in advanced stages of pregnancy
   2. Very obese patients

I. In conscious patients who become unconscious, perform CPR, starting with chest compressions.

J. When the victim is found unconscious:
   1. Determine unresponsiveness.
   2. Perform 30 compressions, open the airway, and look in the mouth.
      a. Attempt to carefully remove any visible object.
   3. Attempt ventilation.

XV. Foreign Body Airway Obstruction in Infants and Children

A. Airway obstruction is a common problem in infants and children.

B. On a conscious standing or sitting child, perform the Heimlich maneuver but with less force than what would be used on an adult.

C. An unconscious child older than 1 year who has an airway obstruction is managed in the same manner as an adult (see Skill Drill 11-7).

D. Infants
   1. Abdominal thrusts are not recommended for conscious infants.
   2. Instead, perform back slaps and chest thrusts (compressions).

E. In unconscious infants, begin CPR.
   1. Look inside the infant's airway each time before ventilating.
   2. Remove the object if seen.

XVI. Summary

A. BLS is noninvasive emergency lifesaving care that is used to treat medical conditions, including airway obstruction, respiratory arrest, and cardiac arrest.

B. BLS care focuses on what has often been termed the ABCs: airway (obstruction), breathing (respiratory arrest), and circulation (cardiac arrest or severe bleeding).

C. CPR is used to establish circulation and artificial ventilation in a patient who is not breathing and has no pulse.

D. The goal of CPR is to restore spontaneous breathing and circulation; however, advanced procedures such as medications and defibrillation are often necessary for this to occur.

E. ALS involves advanced lifesaving procedures, such as cardiac monitoring, administration of IV fluids and medications, and use of advanced airway adjuncts.

F. The links in the chain of survival are early access, early CPR, early defibrillation, early advanced care, and integrated post-arrest care.
G. The AED should be applied to any nontrauma cardiac arrest patient older than 1 month of age as soon as it is available.

H. For infants aged 1 month to 1 year, a manual defibrillator or an AED with pediatric-sized pads and a dose-attenuating system (energy reducer) is preferred; if neither is available, an AED without a dose-attenuating system should be used. When using an AED on a child between 1 and 8 years of age, you should use pediatric-sized pads and a dose-attenuating system. If these are not available, an adult AED should be used.

I. Start CPR in virtually all patients in cardiac arrest. Two exceptions are if the patient has obvious signs of death or if the patient and physician previously agreed on DNR or no-CPR orders.

J. Once you begin CPR in the field, you must continue until one of the following events occurs: the patient starts breathing and has a pulse, the patient is transferred to another trained responder, you are out of strength, or a physician gives direction to discontinue CPR.

K. An airway obstruction may be caused by various things, including relaxation of the throat muscles in an unconscious patient, vomited or regurgitated stomach contents, blood, damaged tissue after an injury, dentures, or foreign bodies such as food or small objects.

L. The manual maneuver recommended for removing severe airway obstructions in the conscious adult and child is the abdominal-thrust maneuver (the Heimlich maneuver).
Unit Assessment

1. What are the five links in the chain of survival?

2. The automated external defibrillator (AED) is not indicated for use in infants younger than ____ month(s) of age.

3. If a patient is breathing on his or her own and has no signs of trauma, you should place him or her in the _____________ position.

4. When is the best time to switch positions when performing two-person CPR?

5. A(n) ________________ is a valve device placed between the endotracheal tube and a bag-mask device; it is designed to limit the air entering the lungs during the recoil phase between chest compressions.

6. What are the four steps in pediatric basic life support?

7. Under what situations would you not begin CPR?

8. Patients with ________________ are able to exchange adequate amounts of air but still have signs of respiratory distress.

9. The ________________ is the preferred way to dislodge a severe airway obstruction in conscious adults and children older than 1 year of age.

10. ________________ are the preferred method of removing a foreign body airway obstruction in women in advanced stages of pregnancy and in very obese patients.
Knowledge Objectives