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.
Introduction

• The principles of basic life support (BLS) were introduced in 1960.

• Specific techniques have been revised every 5 to 6 years.

• The most recent review was conducted by the International Liaison Committee on Resuscitation (ILCOR).
Elements of BLS (1 of 8)

• Noninvasive emergency lifesaving care
• Used to treat medical conditions including:
  – Airway obstruction
  – Respiratory arrest
  – Cardiac arrest
Elements of BLS (2 of 8)

• Focus is on the ABCs
  – Airway (obstruction)
  – Breathing (respiratory arrest)
  – Circulation (cardiac arrest or severe bleeding)
Elements of BLS  (3 of 8)

• Ideally, only seconds should pass between the time you recognize a patient needs BLS and the start of treatment.
  – Permanent brain damage is possible if brain is without oxygen for 4 to 6 minutes.
Elements of BLS (4 of 8)

TIME IS CRITICAL!

- 0–1 min: cardiac irritability
- 0–4 min: brain damage not likely
- 4–6 min: brain damage possible
- 6–10 min: brain damage very likely
- More than 10 minutes: irreversible brain damage

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Elements of BLS (5 of 8)

• Cardiopulmonary resuscitation (CPR)
  – Used to establish circulation and artificial ventilation in a patient who is not breathing and has no pulse
Elements of BLS (6 of 8)

• CPR steps
  1. Restore circulation (perform chest compressions).
  2. Open the airway.
  3. Restore breathing (provide rescue breathing).
Elements of BLS (7 of 8)
Elements of BLS (8 of 8)

• BLS differs from advanced life support (ALS)

• ALS involves:
  – Cardiac monitoring
  – Intravenous fluids and medications
  – Advanced airway adjuncts
The System Components of CPR (1 of 2)

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The System Components of CPR (2 of 2)

• AHA’s chain of survival
  – Recognition and activation of the emergency response system
  – Immediate, high-quality CPR
  – Rapid defibrillation
  – Basic and advanced emergency medical services
  – Advanced life support and post-arrest care

• If any one of the links in the chain is absent, the patient is more likely to die.
Assessing the Need for BLS

(1 of 3)

• Always begin by surveying the scene.

• Complete primary assessment as soon as possible.
  – Evaluate ABCs.

• Determine unresponsiveness.
  – Responsive patient does not need CPR.
Assessing the Need for BLS
(2 of 3)

- Basic principles of BLS are same for infants, children, and adults.
- Although cardiac arrest in adults usually occurs before respiratory arrest, the reverse is true for infants and children.
Assessing the Need for BLS
(3 of 3)
Automated External Defibrillation (1 of 3)

• Vital link in the chain of survival
• Automated external defibrillator (AED) should be applied to cardiac arrest patients as soon as available.
• If you witness cardiac arrest, begin CPR and apply the AED as soon as it is available.
• Children
  – Apply after first five cycles of CPR.
  – Manual defibrillator preferred for infants 1 month to 1 year
    • If unavailable, use pediatric-sized pads and dose-attenuating system.
    • If neither is available, then use an AED with adult-sized pads with anterior-posterior placement.
Automated External Defibrillation (3 of 3)

• Special situations
  – Pacemakers and implanted defibrillators
  – Wet patients
  – Transdermal medication patches
Positioning the Patient

- For CPR to be effective, patient must be supine on firm, flat surface.
- Must be enough space for two rescuers to perform CPR
- Log roll patient onto long backboard.
Check for Breathing and a Pulse (1 of 5)

• Quickly check for breathing and a pulse.
  – Visualize the chest for signs of breathing.
  – Palpate for a carotid pulse.
Check for Breathing and a Pulse (2 of 5)

• Provide external chest compressions.
  – Apply rhythmic pressure and relaxation to lower half of sternum.
  – Heart is located slightly to left of middle of the chest between sternum and spine.
  – Compressions squeeze heart, acting as a pump to circulate blood.
Check for Breathing and a Pulse (3 of 5)

• Administer chest compressions (cont’d)
  – Allow the chest to completely recoil between compressions.
  – Proper hand positioning is crucial.
  – Injuries can be minimized by proper technique and hand placement.
Check for Breathing and a Pulse (4 of 5)
Check for Breathing and a Pulse (5 of 5)

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Opening the Airway and Providing Artificial Ventilation (1 of 7)

Head tilt–chin lift maneuver

Jaw-thrust maneuver

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Opening the Airway and Providing Artificial Ventilation (2 of 7)

- If you determine that the patient is adequately breathing, and there are no signs injury to the head, spine, hip, or pelvis, place the patient in the recovery position.
  - Maintains clear airway
  - Allows vomitus to drain from mouth
  - Roll the patient as a unit.
Recovery position
The combination of lack of oxygen and too much carbon dioxide in the blood is lethal.
- Provide slow, deliberate ventilations that last 1 second.

If patient is not breathing, ventilations can be given by one or two EMS providers.

Use a barrier device.
Opening the Airway and Providing Artificial Ventilation (5 of 7)

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For a patient with a stoma, place a BVM or pocket mask device directly over the stoma.

Artificial ventilation may result in gastric distention.
  - Stomach becomes filled with air

Have a suction unit available in case patient vomits.
Opening the Airway and Providing Artificial Ventilation (7 of 7)
One-Rescuer Adult CPR

- Single rescuer gives both chest compressions and artificial ventilations.
- Ratio of compressions to ventilations is 30:2.
Two-Rescuer Adult CPR

- Always preferable to one-rescuer CPR
  - Less tiring: Rescuer doing compressions can be switched
  - Facilitates effective chest compressions
- Switching rescuers during CPR is critical to maintain high-quality compressions.
  - Recommended to switch positions every 2 minutes.
Devices and Techniques to Assist Circulation (1 of 4)

• Active compression-decompression CPR
  – Involves compressing the chest and then actively pulling it back up to its neutral position.

• Impedance threshold device (ITD)
  – Valve device placed between endotracheal tube and BVM
  – Limits air entering lungs during recoil phase between chest compressions
Devices and Techniques to Assist Circulation (2 of 4)

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Courtesy of Advanced Circulatory Systems, Inc.
Devices and Techniques to Assist Circulation

- Mechanical piston device
  • Depresses sternum via compressed gas–powered or electric-powered plunger
- Load-distributing band CPR or vest CPR
  • A circumferential chest compression device composed of constricting band and backboard
- Manual chest compressions remain the standard of care.
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Cardiac arrest in infants and children follows respiratory arrest.

- Airway and breathing are the focus of pediatric BLS.
• Causes of child respiratory problems:
  – Injury
  – Infections
  – Foreign body
  – Submersion
  – Electrocution
  – Poisoning/overdose
  – SIDS
Infant and Child CPR (3 of 5)

• Determine unresponsiveness.
  – Gently tap on the shoulder and speak loudly.

• Check for breathing and a pulse.
  – Assessment can occur simultaneously
  – Should take no longer than 10 seconds
Infant and Child CPR (4 of 5)

- Foreign body obstruction in children is common.
  - Place an unresponsive, breathing child in the recovery position.

- The techniques for opening the airway are modified for pediatric patients.

- Place a wedge under the upper chest and shoulders when supine.
Infant and Child CPR (5 of 5)

- Provide rescue breathing.
- Not breathing and has a pulse:
  - 1 breath every 3 to 5 seconds
- Not breathing and no pulse:
  - 2 breaths after every 30 compressions
Interrupting CPR (1 of 2)

- CPR is a crucial, lifesaving procedure.
  - Provides minimal circulation and ventilation until the patient can receive defibrillation, ALS treatment, and definitive care at the ED.

- If no ALS available at scene:
  - Provide transport per local protocols.
  - Consider requesting ALS rendezvous en route to hospital.
Interrupting CPR (2 of 2)

• Try not to interrupt CPR for more than a few seconds.

• Chest compression fraction
  – The total percentage of time during a resuscitation attempt in which chest compressions are being performed
  – Should be at least 60%
When Not to Start CPR

• If the scene is not safe
• If the patient has obvious signs of death
  – Rigor mortis (stiffening of body)
  – Dependent lividity (livor mortis)
  – Putrefaction or decomposition of body
  – Evidence of nonsurvivable injury
Dependent lividity
When Not to Start CPR (3 of 3)

- If the patient and physician have previously agreed on do not resuscitate (DNR) orders:
  - Can be complicated issue
  - Advanced directives expressing patient’s wishes may be hard to find.
  - When in doubt, begin CPR.
When to Stop CPR

• Once you begin CPR, continue until (STOP acronym):
  – S Patient Starts breathing and has a pulse
  – T Patient is Transferred to another provider of equal or higher-level training
  – O You are Out of strength
  – P Physician directs to discontinue

• “Out of strength” does not just mean tired, but physically unable to continue.
Foreign Body Airway Obstruction in Adults (1 of 7)

• Airway obstruction may be caused by:
  – Relaxation of throat muscles
  – Vomited or regurgitated stomach contents
  – Blood
  – Damaged tissue
  – Dentures
  – Foreign bodies
Foreign Body Airway Obstruction in Adults (2 of 7)

• In adults, usually occurs during a meal
• In children, usually occurs during a meal or at play
• Patient with mild airway obstruction is able to exchange air but with signs of respiratory distress.
  – Leave these patients alone.
Foreign Body Airway Obstruction in Adults (3 of 7)

- Sudden, severe obstruction is usually easy to recognize in responsive patients.
- In unresponsive patients, suspect obstruction if maneuvers to open airway and ventilate are ineffective.
- Abdominal-thrust maneuver (Heimlich) is recommended in responsive adults and children older than 1 year.
Foreign Body Airway Obstruction in Adults (4 of 7)
Foreign Body Airway Obstruction in Adults (5 of 7)

• Instead of abdominal-thrust maneuver, use chest thrusts for the following responsive patients
  – Women in advanced stages of pregnancy
  – Obese patients
Foreign Body Airway Obstruction in Adults (6 of 7)
Foreign Body Airway Obstruction in Adults (7 of 7)

• Unresponsive patients:
  – Determine unresponsiveness.
  – Check for breathing and a pulse.
  – If pulse is present and breathing is absent, attempt ventilation.
  – If two attempts do not produce visible chest rise, perform 30 compressions, open airway, and look in mouth.
  
  • Attempt to carefully remove any visible object.
Foreign Body Airway Obstruction in Infants and Children (1 of 5)

• Common problem
• If there are signs and symptoms of airway infection, do not waste time trying to dislodge a foreign body.
• On responsive, standing or sitting child, perform Heimlich maneuver.
• On unresponsive child older than 1 year, manage in the same manner as an adult.
Foreign Body Airway Obstruction in Infants and Children (2 of 5)

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Foreign Body Airway Obstruction in Infants and Children (3 of 5)

• Infants
  – Do not use abdominal thrusts.
  – Instead, perform back slaps and chest thrusts (compressions).
In unresponsive infants, begin CPR, beginning with chest compressions.

Do not check for a pulse before starting compressions.

Open the airway and look in the mouth.
  - Remove the object if seen.
  - Resume chest compressions if no object is seen.
Special Resuscitation Circumstances

• Opioid overdose
  – Standard resuscitation measures take priority over naloxone administration.

• Cardiac arrest in pregnancy
  – Priorities are to provide high-quality CPR and relieve pressure off the aorta and vena cava.
Grief Support for Family Members and Loved Ones (1 of 3)

• Family members may experience a psychologic crisis that turns into a medical crisis.

• Family members and loved ones will remember this event in detail for the rest of their lives.

• Keep the family informed throughout the resuscitation process.
Grief Support for Family Members and Loved Ones (2 of 3)

• After resuscitation has stopped, helpful measures include:
  – Take the family to a quiet, private place.
  – Use clear language and speak in a warm, sensitive, and caring manner.
  – Exhibit calm, reassuring authority.
  – Use the patient’s name.
  – Use eye contact and appropriate touch.
Grief Support for Family Members and Loved Ones (3 of 3)

• After resuscitation has stopped, helpful measures include (cont.):
  – Expect emotion.
  – Be supportive but do not hover.
  – Ask if a friend or family member can be called.

• Ensure that children are not ignored.
Education and Training for the EMT

• CPR skills can deteriorate over time.
  – Practice often using manikin-based training.
  – CPR self-instruction through a video and/or computer-based modules with hands-on practice may be a reasonable alternative to instructor-led courses.
Education and Training for the Public

• You are a patient advocate.

• You must do your part to facilitate the training of laypeople in the critical skills of CPR and AED operation.
1. Brain damage is very likely in a brain that does not receive oxygen for:
   A. 0–1 minutes.
   B. 0–4 minutes.
   C. 4–6 minutes.
   D. 6–10 minutes.
Answer: D

Rationale: Permanent brain damage is very likely if the brain is without oxygen for 6 minutes or longer. After 10 minutes without oxygen, irreversible brain damage is likely.
1. Brain damage is very likely in a brain that does not receive oxygen for:

A. 0–1 minutes.
   **Rationale:** Cardiac irritability ensues at this stage.

B. 0–4 minutes.
   **Rationale:** Brain damage is not likely at this stage.

C. 4–6 minutes.
   **Rationale:** Brain damage is *possible* at this stage, but not *likely*.

D. 6–10 minutes.
   **Rationale:** Correct answer
2. Which of the following sequences of events describes the AHA’s chain of survival?

A. Early access, integrated post-arrest care, early advanced care, early CPR, early defibrillation

B. Early advanced care, early defibrillation, integrated post-arrest care, early CPR, early access

C. Early access, early CPR, early defibrillation, early advanced care, integrated post-arrest care

D. Early access, early riser, early CPR, early advanced care
Answer: C

Rationale: The AHA has determined an ideal sequence of events that, if taken, can improve the chance of successful resuscitation of a patient who has an occurrence of sudden cardiac arrest: early access, early CPR, early defibrillation, early advanced care, and integrated post-arrest care. If any one of the links in the chain is absent, the patient is more likely to die.
2. Which of the following sequences of events describes the AHA’s chain of survival?

A. Early access, integrated post-arrest care, early advanced care, early CPR, early defibrillation
   **Rationale:** Early CPR and defibrillation come before advanced care.

B. Early advanced care, early defibrillation, integrated post-arrest care, early CPR, early access
   **Rationale:** Chain is backwards.
2. Which of the following sequences of events describes the AHA’s chain of survival?
   
   C. Early access, early CPR, early defibrillation, early advanced care, integrated post-arrest care  
   **Rationale:** Correct answer
   
   D. Early access, early riser, early CPR, early advanced care  
   **Rationale:** Early riser is not in the chain of events.
3. For CPR to be effective, the patient must be on a firm surface, lying in the _____________ position.
   A. Fowler
   B. prone
   C. supine
   D. recovery
Answer: C

Rationale: For CPR to be effective, the patient must be lying supine on a firm surface, with enough clear space around the patient for two rescuers to perform CPR. If the patient is crumpled up or lying face down, you will need to reposition him or her. The few seconds that you spend repositioning the patient properly will greatly improve the delivery and effectiveness of CPR.
3. For CPR to be effective, the patient must be on a firm surface, lying in the ______________ position.

   A. Fowler
      **Rationale:** The patient is sitting up with knees bent in this position, making it nearly impossible to make effective chest compressions.

   B. prone
      **Rationale:** The patient is lying face down in this position.
3. For CPR to be effective, the patient must be on a firm surface, lying in the ______________ position.

   C. supine  
   **Rationale:** Correct answer

   D. recovery  
   **Rationale:** The patient is lying face down with one knee bent and the head slightly tilted.
4. The pulse check should take:
   A. 1 second.
   B. at least 1 second but no more than 5 seconds.
   C. at least 10 seconds.
   D. at least 5 seconds but no more than 10 seconds.
Answer: D

Rationale: The pulse check should take at least 5 seconds but no more than 10 seconds.
4. The pulse check should take:
   A. 1 second.
      **Rationale:** One second is not long enough to detect a pulse.
   B. at least 1 second but no more than 5 seconds.
      **Rationale:** Five seconds may not be long enough to detect a pulse.
4. The pulse check should take:
   
   C. at least 10 seconds.  
   **Rationale:** Ten seconds is a long time in this situation. The brain should not be deprived of oxygen for longer than 6 minutes. Every second counts.
   
   D. at least 5 seconds but no more than 10 seconds.  
   **Rationale:** Correct answer
Review Question

5. Artificial ventilation may result in the stomach becoming filled with air, a condition called:

A. gastric distention.
B. vomitus.
C. abdominal-thrust maneuver.
D. acute abdomen.
Answer: A

Rationale: Artificial ventilation may result in the stomach becoming filled with air, a condition called gastric distention. Gastric distention is likely to occur if you ventilate too fast, if you give too much air, or if the airway is not opened adequately. Therefore, it is important for you to give slow, gentle breaths.
5. Artificial ventilation may result in the stomach becoming filled with air, a condition called:

   A. gastric distention.
   **Rationale:** Correct answer

   B. vomitus.
   **Rationale:** Gastric distention may lead to vomitus.
5. Artificial ventilation may result in the stomach becoming filled with air, a condition called:

C. abdominal-thrust maneuver.
Rationale: The abdominal-thrust maneuver is a method of removing a foreign obstruction from an airway.

D. acute abdomen.
Rationale: Acute abdomen is a medical term referring to the sudden onset of abdominal pain, generally associated with severe, progressive problems that require medical attention.
6. The ______________ is a circumferential chest compression device composed of a constricting band and backboard.
   A. mechanical piston device
   B. load-distributing band
   C. impedance threshold device
   D. cardiopulmonary resuscitation
Answer: B

Rationale: The load-distributing band is a circumferential chest compression device composed of a constricting band and backboard. The device is either electronically or pneumatically driven to compress the heart by putting inward pressure on the thorax. As with the mechanical piston device, use of the device frees the rescuer to complete other tasks. It is lighter and easier to apply than the mechanical piston device.
6. The _______________ is a circumferential chest compression device composed of a constricting band and backboard.

A. mechanical piston device  
   **Rationale:** This device depresses the sternum via a compressed gas-powered plunger mounted on a backboard.

B. load-distributing band  
   **Rationale:** Correct answer
6. The _______________ is a circumferential chest compression device composed of a constricting band and backboard.

C. impedance threshold device
   **Rationale:** This valve device is placed between the endotracheal tube and a bag-valve mask. It is designed to limit the air entering the lungs during the recoil phase.

D. cardiopulmonary resuscitation
   **Rationale:** This procedure is used to establish artificial ventilation and circulation in a patient who is not breathing and has no pulse.
7. Which of the following scenarios would warrant an interruption in CPR procedures?

A. An hysterical family member trying to gain access to the unconscious patient
B. A vehicle honking its horn anxious to pass by the scene on a blocked road
C. A small set of steps leading to the exit of the building, on the way to the ambulance
D. Being tired from trying to resuscitate a patient
**Answer:** C

**Rationale:** Try not to interrupt CPR for more than a few seconds, except when it is absolutely necessary. For example, if you have to move a patient up or down stairs, you should continue CPR until you arrive at the head or foot of the stairs, interrupt CPR at an agreed-on signal, and move quickly to the next level where you can resume CPR.
7. Which of the following scenarios would warrant an interruption in CPR procedures?

A. An hysterical family member trying to gain access to the unconscious patient

Rationale: Family members should be calmed down and reassured that the patient is in good hands. A hysterical family member does not warrant a break in CPR.
7. Which of the following scenarios would warrant an interruption in CPR procedures?

B. A vehicle honking its horn anxious to pass by the scene on a blocked road

**Rationale:** Your primary focus should be on the patient. Let the on-scene police and/or traffic control deal with upset motorists and blocked roadways.
7. Which of the following scenarios would warrant an interruption in CPR procedures?

C. A small set of steps leading to the exit of the building, on the way to the ambulance
   **Rationale:** Correct answer.

D. Being out of breath while trying to resuscitate a patient
   **Rationale:** CPR should always be continued until the patient’s care is transferred to a physician in a hospital setting. Being “out of breath” does not mean being physically incapable of performing more CPR.
8. Once you begin CPR in the field, you must continue until one of the following events occurs:

A. The patient stops breathing and has no pulse.
B. The patient is transferred to another person who is trained in BLS, to ALS-trained personnel, or to another emergency medical responder.
C. You are out of gas in the ambulance.
D. A police officer assumes responsibility for the patient and gives direction to discontinue CPR.
Answer: B

Rationale: The “T” in the “STOP” mnemonic stands for patient *transfer* to another person who is trained in BLS, to ALS-trained personnel, or to another emergency medical responder.
8. Once you begin CPR in the field, you must continue until one of the following events occurs:

A. The patient stops breathing and has no pulse
   **Rationale:** These are reasons to *begin* CPR.

B. The patient is transferred to another person who is trained in BLS, to ALS-trained personnel, or to another emergency medical responder
   **Rationale:** Correct answer
8. Once you begin CPR in the field, you must continue until one of the following events occurs:

C. You are out of gas in the ambulance
   **Rationale:** This is not a valid reason to stop CPR. You are *out of strength* or too tired to continue may be a valid reason.

D. A police officer assumes responsibility for the patient and gives direction to discontinue CPR
   **Rationale:** A *physician* who is present or providing online medical direction should assume responsibility for the patient and give direction to discontinue CPR.
9. Instead of the abdominal-thrust maneuver, use __________ for women in advanced stages of pregnancy and patients who are obese.
   A. chest thrusts
   B. Sellick maneuver
   C. basic life support
   D. DNR orders
**Answer: A**

**Rationale:** You can perform the abdominal-thrust maneuver safely on all adults and children. However, for women in advanced stages of pregnancy and patients who are obese, you should use chest thrusts.
9. Instead of the abdominal-thrust maneuver, use ___________ for women in advanced stages of pregnancy and patients who are obese.

A. chest thrusts
   **Rationale:** Correct answer

B. Sellick maneuver
   **Rationale:** This technique is used to prevent gastric distention in which pressure is applied to the cricoid cartilage; also referred to as cricoid pressure.
9. Instead of the abdominal-thrust maneuver, use ___________ for women in advanced stages of pregnancy and patients who are obese.

C. basic life support
   **Rationale:** BLS is noninvasive emergency lifesaving care that is used to treat medical conditions. Chest thrusts are a BLS tactic.

D. DNR orders
   **Rationale:** Do not resuscitate orders are specific instructions not to perform lifesaving techniques on certain patients who may be suffering from terminal illnesses. DNR orders have to be on hand and can be a complicated issue.
10. In infants who have signs and symptoms of an airway infection, you should not waste time trying to dislodge a foreign body. You should intervene only if signs of ____________ develop, such as a weak, ineffective cough; cyanosis; stridor; absent air movement; or a decreasing level of consciousness.
   A. sudden infant death syndrome
   B. child abuse
   C. bronchitis
   D. severe airway obstruction
Answer: D

Rationale: With a mild airway obstruction, the patient can cough forcefully, although there may be wheezing between coughs. As long as the patient can breathe, cough, or talk, you should not interfere with his or her attempts to expel the foreign body. As with an adult, encourage the child to continue coughing. Administer 100% oxygen with a nonrebreathing mask and provide transport to the emergency department.
10. In infants who have signs and symptoms of an airway infection, you should not waste time trying to dislodge a foreign body. You should intervene only if signs of ____________ develop, such as a weak, ineffective cough, cyanosis, stridor, absent air movement, or a decreasing level of consciousness.

A. sudden infant death syndrome  
   **Rationale:** Death of an infant or young child that remains unexplained after a complete autopsy.

B. child abuse  
   **Rationale:** The obstruction may be the result of child abuse, but these signs are those of a severe airway obstruction.
10. In infants who have signs and symptoms of an airway infection, you should not waste time trying to dislodge a foreign body. You should intervene only if signs of ______________ develop, such as a weak, ineffective cough, cyanosis, stridor, absent air movement, or a decreasing level of consciousness.

C. bronchitis  
**Rationale:** This is an inflammation of the lung. It is not the direct result of a foreign body lodged in the airway.

D. severe airway obstruction  
**Rationale:** Correct answer