

# Chapter 14, BLS

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## 1. Introduction to Basic Life Support (BLS)

- Basic Life Support (BLS) is non-invasive emergency life-saving care used to treat medical conditions like airway obstructions, respiratory arrest, and cardiac arrest [6].
- The principles of BLS were introduced in 1960, and techniques have been regularly reviewed and revised [4].
- BLS focuses on the ABCs: Airway, Breathing, and Circulation [8].
  - For patients in cardiac arrest, the CAB sequence (Compressions, Airway, Breathing) is used because chest compressions are essential and must start quickly [9].
  - Only seconds should pass between recognizing the need for treatment and starting bls [9].
- Time is critical for patients who are not breathing; permanent brain damage is possible if the brain is without oxygen for more than four to six minutes [10].
- BLS differs from Advanced Life Support (ALS), which includes advanced procedures like cardiac monitoring and administering medications [19].
  - When done correctly, BLS can maintain life temporarily until ALS measures can begin [20].
- The American Heart Association Chain of Survival includes six links that must all be followed [21].
  - These links are recognition and activation of the emergency response system, immediate high-quality CPR, rapid defibrillation, basic and advanced emergency services, advanced life support, post-arrest care, and recovery [23].
  - If any link is missing, the patient is more likely to die [25].

Feature	Basic Life Support (BLS)	Advanced Life Support (ALS)
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Nature	Non-invasive emergency life-saving care	Advanced procedures
Procedures	CPR, defibrillation, airway management	Cardiac monitoring, IV fluids/medications, advanced airway adjuncts
Goal	Treat conditions like arrest/obstruction	Maintain life until ALS measures can be started
Time Maintained	Short time	Initiated after BLS

## 2. Core Components of BLS: CPR and Defibrillation

- Cardiopulmonary resuscitation (CPR) re-establishes circulation and artificial ventilation in a patient who is not breathing and has no pulse [14].
- The steps of CPR involve restoring circulation through high-quality chest compressions and restoring breathing by opening the airway and providing rescue breathing [15].
  - Administer two breaths over one second, visualizing for chest rise and fall [17].
- Chest compressions involve applying rhythmic pressure and relaxation to the lower half of the sternum [49].
  - Compression squeezes the heart to circulate blood [49].
  - Avoid leaning on the chest between compressions to allow for complete recoil [49].
  - Injuries can be minimized with proper technique and hand placement [50].
  - Compression and relaxation should be rhythmic and of equal duration, a one-to-one ratio [53].
  - The sternum must return to its normal resting position between compressions [54].
- An automated external defibrillator (AED) is a vital link in the chain of survival and should be applied to a cardiac arrest patient as soon as possible [34].
  - If cardiac arrest is witnessed, begin CPR and then apply the AED immediately [36].
- aed use in children differs: apply after the first five cycles of CPR (about two minutes) [37].
  - Use pediatric-sized pads and a dose attenuating system [38].
  - If pediatric pads or attenuator are unavailable, use adult-sized pads with an anterior-posterior placement [39].

- For patients with pacemakers or implanted defibrillators, place AED electrodes at least one inch away from the device [40].
- If the patient is wet or in water, pull them out and dry the skin before attaching AED pads [41].
  - If in a small puddle or snow, the aed can be used, but the chest should be dried [42].
- Remove transdermal medication patches and wipe the skin before attaching AED pads [42].
- For CPR to be effective, the patient must be supine on a firm, flat surface [43].
  - Ensure enough space for two rescuers [44].
  - If possible, log roll the patient onto a long backboard [45].
- Quickly check for breathing and a pulse simultaneously, taking no longer than 10 seconds [46].
  - Visualize the chest for signs of breathing and palpate for a carotid pulse [48].
- One-rescuer adult CPR involves a continuous cycle of 30 compressions followed by two ventilations [67].
- Two-rescuer adult CPR is preferred [69].
  - Rescuers can switch positions every two minutes to facilitate effective compressions [70].
- Basic principles of bls are the same for infants, children, and adults, but the causes of arrest differ [30].
  - Cardiac arrest in adults usually follows respiratory arrest, while in infants and children, respiratory arrest typically causes cardiac arrest [31].
  - Airway and breathing are the focus of pediatric BLS [80].
- For effective chest compressions, the infant or child must be on a hard, flat surface [86].
  - Use two fingers to compress an infant's chest [86].
  - If two rescuers are present for an infant, use the two-thumb encircling technique [86].
  - In children older than eight years old, the heel of one or both hands can be used [87].
- If a child is not breathing but has a pulse, open the airway and deliver one breath every two to three seconds (about 12 to 20 breaths a minute) [91].
- If a child is not breathing and has no pulse, provide rescue breathing after every 30 compressions, or 15 compressions if two rescuers are present [92].
- Maintain a chest compression fraction greater than 80%, meaning compressions should be performed for at least 80% of the total resuscitation time [100].

Age Group	Compression to Ventilation Ratio (1 Rescuer)	Compression to Ventilation Ratio (2 Rescuers)	Hand Placement	Compression Technique	Depth
Adult	30:2 [68]	30:2 [68]	Lower half of sternum [49]	Heel of one or both hands	At least 2 inches
Child (1 yr+)	30:2 [92]	15:2 [92]	Heel of one or both hands (older children) [87]	Heel of one or both hands	About 2 inches
Infant	30:2 [92]	15:2 [92]	Lower half of sternum [86]	Two fingers [86]	About 1.5 inches
Infant			Lower half of sternum (two-rescuer) [86]	Two thumbs encircling [86]	About 1.5 inches

### 3. Airway Management in BLS

- Opening the airway is the next step in BLS after starting cpr and applying an AED.
- In non-traumatic adult patients, open the airway using a head tilt-chin lift maneuver [57].
- If trauma is suspected, use the jaw thrust maneuver [57].
- Remove any foreign materials found in the mouth [57].
- If the patient is breathing adequately and has no signs of head, spine, hip, or pelvis injury, place them in the recovery position [58].
  - The recovery position maintains an open airway in an adequately breathing patient with a decreased level of consciousness who has no spinal injury [58].
- Lack of oxygen (hypoxia) combined with too much carbon dioxide (hypercarbia) is lethal [59].
- If the patient is not breathing, provide deliberate ventilations lasting for one second [59].
- Ventilations can be given by one or two EMS providers [60].

- Use a barrier device such as a pocket mask with a one-way valve or a bag-valve mask [61].
  - These devices are used to supply supplemental oxygen when possible [61].
- Artificial ventilations may cause gastric distension (stomach filling with air), which can lead to vomiting [64].
  - Be ready with a suction unit in case the patient vomits [64].
- For patients with a stoma (a surgical opening connecting the trachea to the skin), place the bag mask or pocket mask device directly over the stoma to ventilate [63].
  - A face mask with a one-way valve or barrier device over the tracheostomy site can also be used [94].
  - In a child with a trach tube, remove the mask from the bag and connect it directly to the tube [93].

#### 4. Managing Foreign Body Airway Obstruction

- Recognize foreign body airway obstructions, remembering the most common cause in unresponsive patients is the relaxation of throat muscles, particularly the tongue [109].
- Other causes include vomited contents, blood, damaged tissue, dentures, food, or small objects [110].
- In adults, airway obstruction usually occurs during a meal, while in children, it can happen during a meal or at play [111].
- With a mild airway obstruction, the patient can exchange an adequate amount of air but shows signs of respiratory distress [112].
  - Leave patients with mild obstruction alone and observe for signs of severe obstruction, continuing to reassess [113].
- A sudden severe obstruction is usually easy to recognize in responsive patients [115].
  - The patient suddenly cannot speak or cough, may grasp their throat, turn cyanotic, and make exaggerated breathing efforts; stridor might also be present [116].
- In unresponsive patients, suspect airway obstruction if maneuvers to open the airway and ventilate are ineffective [117].
- To remove a foreign airway obstruction in adults and children older than one year, use the abdominal thrust maneuver (Heimlich maneuver) [118].
  - This maneuver creates an artificial cough [119].
- If a patient with a severe airway obstruction becomes unresponsive, perform chest compressions [120].
- Instead of abdominal thrusts, use chest thrusts for women in advanced stages of pregnancy and obese patients [123].

- If a responsive patient becomes unresponsive due to airway obstruction, lower them to the ground, call for help, and start 30 chest compressions [127].
  - Do not check for a pulse before starting compressions [128].
  - Open the airway and look in the mouth; if a visible object can be easily removed, remove it with a finger [129].
  - If no object is seen, continue chest compressions [130].
  - Repeat the sequence until the obstruction is relieved or ALS takes over [131].
- In unresponsive patients, after checking for breathing and a pulse, if a pulse is present but breathing is absent, open the airway and attempt to ventilate [132].
  - If the first ventilation doesn't cause chest rise, reposition the airway and attempt again [134].
  - If both attempts fail, perform 30 compressions, open the airway, look for and carefully remove any visible object, then attempt to ventilate again [135].
- In children with signs of airway obstruction, do not waste time trying to dislodge the object if they can still breathe, cough, or talk; administer supplemental oxygen if needed and transport immediately [136].
  - If they can breathe, cough, or talk, do not interfere [138].
- For a responsive, standing, or sitting child, perform the heimlich maneuver with less force than on an adult [140].
- An unresponsive child older than one year with airway obstruction is managed like an adult [141].
- For responsive infants, perform back slaps and chest thrusts (compressions) [143].
  - Hold the infant face down on your forearm with the head lower than the body [144].
  - Give five back blows between the shoulder blades with the heel of your hand [146].
  - Roll the infant over and give five quick chest thrusts with two fingers on the lower half of the sternum [146].
- In unresponsive infants, begin chest compressions immediately; do not check for a pulse [148].
  - Open the airway and look in the mouth; if a visible object can be easily removed, remove it [150].
  - If no object is seen, resume chest compressions [152].
  - Continue the sequence of compressions, opening the airway, and looking in the mouth until the obstruction is relieved or ALS takes over [153].

Age/Situation	Responsive Patient	Unresponsive Patient
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Adult/Child (>1 yr)	Heimlich maneuver (abdominal thrusts) [118]	Chest compressions [120]
Pregnant/Obese Adult	Chest thrusts [123]	Chest compressions (after becoming unresponsive) [127]
Child (signs of obstruction)	Observe, transport if needed, supplement oxygen if tolerated [136]	Chest compressions (managed like adult if >1 yr) [141], open airway, look, remove [150]
Infant	Back slaps and chest thrusts [143]	Chest compressions [148], open airway, look, remove [150]

## 5. Special Considerations and When to Stop BLS

- There are special circumstances to consider during bls [154].
  - For opiate overdoses, EMTs may administer narcan to reverse the arrest [155].
  - In cardiac arrest during pregnancy, the priority is high-quality cpr [155].
    - If the uterus is felt at or above the umbilicus, perform manual displacement of the uterus to the patient's left to relieve compression on the great vessels while doing cpr [155].
    - If not in cardiac arrest, position the pregnant patient on her left side [155].
- There are three general rules for when **not** to start cpr [102].
  - If the scene is unsafe [102].
  - If the patient has obvious signs of death along with absence of pulse and breathing [102].
    - Obvious signs of death include rigor mortis (stiffening), dependent lividity/liver mortis (purple discoloration), putrefaction (decomposition), or evidence of a non-survivable injury [103].
  - If the patient and physician have previously agreed on Do Not Resuscitate (DNR) orders [106].
- Once cpr begins, continue until one of the following events occurs, using the STOP mnemonic [106].

Mnemonic	Meaning	Explanation
S	Patient starts breathing and has a pulse [106]	Indicates a return of spontaneous circulation.

T	Patient is transferred to another provider of equal or higher training [107]	Handing over care to qualified personnel.
O	You are out of strength [107]	Physically unable to continue CPR, not just tired.
P	Physician directs you to discontinue [107]	Medical command provides an order to stop resuscitation efforts.

## 6. Importance of Training and Support

- Ongoing education and training are crucial for EMTs [164].
  - cpr skills can deteriorate over time [164].
  - Practice often using mannequin-based training [164].
  - cpr self-instruction through video or computer-based modules with hands-on practice can be an alternative to instructor-led courses [165].
- Education and training for the public are also very important [166].
  - EMTs are patient advocates responsible for facilitating training of lay people in cpr and aed operation [166].
  - If asked to train community members in hands-only cpr, consider it a professional responsibility [167].
- Grief support for family members and loved ones is a significant aspect of care [156].
  - Family members may experience a psychological crisis [156].
  - They will remember the event in detail for the rest of their lives [157].
  - Appropriate and supportive care at the onset of grief can positively affect their grieving process [157].
- Keep the family informed throughout the resuscitation process [158].
  - Designate one provider to communicate the patient's status clearly and concisely [158].
- After resuscitation has stopped, helpful measures include taking the family to a quiet, private place, introducing yourself, using clear language, and speaking in a warm, sensitive, and caring manner [159].
  - Exhibit calm, reassuring authority, use the patient's name, and use eye contact and appropriate touch [160].
  - Accept that family members will show emotion; be supportive but do not hover [161].
  - Ask if a friend or family member can be called for support [162].



- When leaving, turn the family member over to someone and ensure children are not ignored [\[163\]](#).