ACLS Certification Course

Welcome to the United Medical Education Advanced Cardiac Life Support (ACLS) certification course. Here you will learn appropriate techniques to recognize and treat those in respiratory failure, potentially fatal arrhythmias, and pulseless cardiac arrest. The life saving interventions learned in the ACLS certification course are used to supplement the fundamental techniques learned in the Basic Life Support (BLS) course. In both courses teamwork among providers is emphasised.

Hemodynamics

It is important to be able to categorize your patients by their hemodynamic stability when choosing an appropriate treatment regimen.

Stable:
Arrhythmia
Vital signs retain patient asymptomatic without:
   Chest Pain, Shortness of Breath, Confusion
Conscious
Possible high risk for becoming unstable

Unstable:
Arrhythmia
Vital Signs cause patient to become symptomatic with:
   Chest Pain, Shortness of Breath, Confusion
High risk of death

Dead:
Arrhythmia
No pulse, without Vital Signs
Unconscious
Best chance for success is Electrical Therapy within 10 minutes of event!

Basic Treatment associated with stability
Stable:
   O: Oxygen
   M: Monitor
   V: vascular access
Unstable & Dead
   I: IV access
   C: CPR
CPR: for adults

**CAB-D**

(Circulation, Airway, Breathing, Defibrillate)

There is a common acronym in BLS used to guide providers in the appropriate steps to assess and treat patients in respiratory and cardiac distress. This is CAB-D (Circulation, Airway, Breathing, Defibrillate). The following scenario will help guide you in performing CAB-D.

*You find an adult lying on the ground.*

Assess to make sure the scene is safe for you to respond to the down patient.

Assess Responsiveness: Stimulate and speak to the adult asking if they are ok. Look at the chest and torso for movement and normal breathing.

If unresponsive:

(One provider) first call the emergency response team and bring an AED to the patient.

(Two providers) Have someone near call the emergency response team and bring the AED.

Place patient supine on a hard flat surface.

Circulation:
Check the patient for a *carotid pulse* for 5-10 seconds. (no more than 10 seconds)

If pulse:

Move to the airway and rescue breathing portion of the algorithm:
Provide 10-12 rescue breaths per minute (1 breath every 5-6 seconds).
Recheck pulse every 2 minutes.

If no pulse:

Begin 5 cycles of CPR (*lasts approximately 2 minutes*).
Start with compressions:
Provide 100 compressions or more per minute. This is 30 compressions or more every 18 seconds.
Place your palms midline, one over the other, on the lower 1/3 of the patient’s sternum between the nipples.
lock your arms.
Using two arms press to a depth of 2 inches or more on the patient’s chest.
Press hard and fast.
Allow for full chest recoil with each compression.
Allow for only minimal interruptions to chest compressions.
1 cycle of adult CPR is 30 chest compressions to 2 rescue breaths.
If two providers are present: switch rolls between compressor and rescue breather every 5 cycles.

Airway:
In the event of unwitnessed collapse, drowning, or trauma:
Use the Jaw Thrust maneuver (this maneuver is used when cervical spine injury cannot be ruled out):
Place your fingers on the lower rami of the jaw.
Provide anterior pressure to advance the jaw forward.

In the event of witnessed collapse and there’s no reason to assume a C-spine injury:
Use the Head Tilt-Chin Lift maneuver:
place your palm on the patient's forehead and apply pressure to tilt the head backward.
place the fingers of your other hand under the mental protuberance of the chin and pull the chin forward and cephalic.
Breathing:
Scan the patient’s chest and torso for possible movement during the “assess unresponsiveness” portion of the algorithm. Watch for abnormal breathing or gasping.

If adequate breathing:
Continue to assess and maintain a patent airway and place the patient in the recovery position. (Only use the recovery position if its unlikely to worsen patient injury)

If not breathing or inadequate breathing:
pulse: commence rescue breaths immediately.
no pulse: begin CPR (move to the Circulation portion of the algorithm)
    Use a barrier device if available.
    Pinch the patient’s nose closed.
    Make a seal using your mouth over the mouth of the patient or use a pocket mask or bag mask.
    Each rescue breath should last approximately 1 second.
    Watch for chest rise.
    Allow time for the air to expel from patient.

During normal CPR without an advanced airway:
    Provide approximately 6 rescue breaths per minute.

During normal CPR with an advanced airway:
    Provide 8-10 rescue breaths per minute (don’t pause chest compressions for breaths).

If patient has a pulse and no CPR is required:
    Provide 10-12 rescue breaths per minute (1 breath every 5-6 seconds).
    Recheck pulse every 2 minutes.

If foreign body obstruction:
    Perform abdominal thrusts
Recovery position (lateral recumbent or 3/4 prone position):
This position is used to maintain a patent airway in the unconscious person.

- place the patient close to a true lateral position with the head dependent to allow fluid to drain.
- Assure the position is stable.
- Avoid pressure of the chest that could impairs breathing.
- Position patient in such a way that it allows turning them onto their back easily.
- Take precautions to stabilize the neck in case of cervical spine injury.
- Continue to assess and maintain access of airway.
- Avoid the recovery position if it will sustain injury to the patient.

Defibrillate:
Arrival of AED (Automated External Defibrillator)
Power:

*Turn AED On NOW! (early defibrillation is the single most important therapy for survival of cardiac arrest and should be done as soon as it arrives).*
Follow verbal AED prompts.
Attachment:

*Firmly place appropriate pads (adult/pediatric) to patient’s skin to the indicated locations (pad image).*

Analyze:

*A short pause in CPR is required to allow the AED to analyze the rhythm.*
If rhythm is not shockable:

*Initiate 5 cycles of CPR.*
*Recheck the rhythm at the end of the 5 cycles of CPR.*
If shock is indicated:

*Assure no one is touching the patient or in mutual contact of a good conductor of electricity by yelling “Clear, I’m Clear, you’re Clear!” prior to delivering a shock.*
Press the shock button when the providers are clear of the patient. Resume 5 cycles of CPR.

CPR: for infants 0-1 in age
CAB-D
(Circulation, Airway, Breathing, Defibrillate)

An infant is found lying on the ground.

Assess to make sure the scene is safe for you to respond to the down patient.

Assess Unresponsiveness: Lightly shake or tap the infant’s foot and say their name. Look at the chest and torso for movement and normal breathing.

If unresponsive:

(One provider) If alone and collapse is un-witnessed: Perform 2 minutes of CPR first then call the emergency response team and bring an AED to the patient.
If alone and collapse is witnessed: call the emergency response team and bring an AED first, then start CPR.
(Two providers) Have someone near call the emergency response team and bring the AED and you start CPR.

Place patient supine on a hard flat surface.
Circulation:
Feel for either the brachial or femoral pulse (do not check for more than 10 seconds).
If pulse:
   Move to the airway and rescue breathing portion of the algorithm.
   12-20 breaths per minute
   recheck the pulse every 2 minutes.

If no pulse:
   Begin 5 cycles of CPR (lasts approximately 2 minutes).
   Start with Chest Compressions:
   Provide 100 compressions or more per minute. This is 30 compressions or more every 18 seconds.  
   One provider: Place two fingers on the sternum of the lower chest, one between the nipple line and the other 1 cm below.  
   Two providers: encircle infant’s torso with both hands, with both thumbs pointing cephalic lying 1 cm below the nipples over the sternum.  
   Chest Compressions should be at least 1.5 inches or 1/3 the depth of infant's chest.  
   Press hard and fast.  
   Allow for full chest recoil.  
   Only allow minimal interruptions to the chest compressions.  
   (One Provider: 1 cycle is 30 chest compressions to 2 rescue breaths)  
   (Two Providers: 1 cycle is 15 chest compressions to 2 rescue breaths)  
   If you have two providers: switch rolls between compressor and rescue breather every 2 minutes or 5 cycles of CPR.

Airway:
In the event of: unwitnessed collapse, drowning, or trauma:
   Use the Jaw Thrust maneuver (this maneuver is used when cervical spine injury cannot be ruled out):
   Place your fingers on the lower rami of the jaw.  
   Provide anterior pressure to advance the jaw forward.

In the event of witnessed collapse and there’s no reason to assume a C-spine injury:
   Use the Head Tilt-Chin Lift maneuver:  
   place your palm on the patient’s forehead and apply pressure to tilt the head backward.
place the fingers of your other hand under the mental protuberance of
the chin and pull the chin forward and cephalic.

Breathing:
Scan the patients chest and torso for possible movement during the “assess
unresponsiveness” portion of the algorithm. Watch for abnormal breathing or
gasping.
If adequate breathing:
Continue to assess and maintain a patent airway and place the infant
in the infant recovery position. (Only use the recovery position if its
unlikely to worsen patient injury)
If not or inadequate breathing:
has a pulse: commence rescue breaths immediately.
no pulse: begin CPR (go to Circulation portion of the algorithm).
  Use a barrier device if available.
  Make a seal using your mouth over the mouth and nose of the
  patient.
  Each rescue breath should be small and last approximately 1
  second.
  Watch for chest rise.
  Allow time for the air to expel from the patient.
During normal CPR without an advanced airway:
  One provider: Provide at least 6 rescue breaths per
  minute.
  Two provider: Provide at least 12 rescue breaths per
  minute.
During normal CPR with an advanced airway:
  Provide 12-20 rescue breaths per minute (do not stop chest
  compressions for rescue breaths).
If patient has a pulse and no CPR is required:
  Provide 12 -20 rescue breaths per minute.
  Recheck pulse every 2 minutes.
Recovery position for infants:
cradle the infant with the infant's head tilted downward and slightly to the side to avoid choking or aspiration. Continually check the infant's breathing, pulse, and temperature.

Defibrillate:
Arrival of AED (Automated External Defibrillator)
Power:
  *Turn AED On NOW!* (early defibrillation is the single most important therapy for survival of cardiac arrest. Begin use on patient as soon as it arrives).
  *Follow verbal AED prompts.*
Attachment:
  *Firmly place appropriate pads (adult/pediatric) to patient’s skin to the indicated locations (pad image).*
Analyze:
  *A short pause in CPR is required to allow the AED to analyze the rhythm.*
If rhythm is not shockable:
  *Initiate 5 cycles of CPR.*
  *Recheck the rhythm at the end of the 5 cycles of CPR.*
If shock is indicated:
  *Assure no one is touching the patient or in mutual contact of a good conductor of electricity by yelling “Clear, I’m Clear, you’re Clear!” prior to delivering a shock.*
  *Press the shock button when the providers are clear of the patient.*
  *Resume 5 cycles of CPR.*
Manual defibrillators are preferred for infant use. If the manuals defibrillator is not available the next best option is an AED with a pediatric attenuator. An AED without a pediatric attenuator can also be used.
CPR: for a child older than 1 year of age to puberty
CAB-D
(Circulation, Airway, Breathing, Defibrillate)

You find a child lying on the ground.

Assess to make sure the scene is safe for you to respond to the down patient.

Assess Unresponsiveness: Stimulate and speak to the child. Look at the chest and torso for movement and normal breathing.

If unresponsive:
(One provider) If alone and collapse is un-witnessed: Perform 2 minutes of CPR first then call the emergency response team and bring an AED to the patient.
If alone and collapse is witnessed: call the emergency response team and bring an AED first, then start CPR.
(Two providers) Have someone near call the emergency response team and bring the AED and you start CPR.
Place patient supine on a hard flat surface.

Circulation:
Check the patient for a carotid pulse for 5-10 seconds.
If pulse:
Move to the airway and rescue breathing portion of the algorithm:
Provided 12-20 rescue breaths per minute.
Recheck pulse every 2 minutes.

If no pulse:
Begin 5 cycles of CPR *(lasts approximately 2 minutes).*
Start with chest compressions:
Provide 100 compressions or more per minute. This is 30 compressions or more every 18 seconds.
Use one or two arms.
Place one or both of your palms midline, one over the other, on the lower sternum, between the nipples.
Press at least to 1/3 the depth of patient's chest or 2 inches.
Press hard and fast.
Allow for full chest recoil with each compression.
Allow for only minimal interruptions to chest compressions.
*(One Provider: 1 cycle is 30 chest compressions to 2 rescue breaths)*
*(Two Providers: 1 cycle is 15 chest compressions to 2 rescue breaths)*
If you have two providers: switch rolls between compressor and rescue breather every 2 minutes or 5 cycles of CPR.

Airway:
In the event of: unwitnessed collapse, drowning, or trauma:
Use the Jaw Thrust maneuver (this maneuver is used when cervical spine injury cannot be ruled out):
Place your fingers on the lower rami of the jaw.
Provide anterior pressure to advance the jaw forward.
In the event of: witnessed collapse and there’s no reason to assume a C-spine injury
Use the Head Tilt-Chin Lift maneuver:
place your palm on the patient's forehead and apply pressure to tilt the head backward.
place the fingers of your other hand under the mental protuberance of the chin and pull the chin forward and cephalic.
Breathing:
Scan the patients chest and torso for possible movement during the “assess unresponsiveness” portion of the algorithm. Watch for abnormal breathing or gasping that will require additional ventilatory support.

If adequate breathing:
Continue to assess and maintain a patent airway and place the child in the recovery position. (Only use the recovery position if its unlikely to worsen patient injury)

If not or inadequate breathing:
has a pulse: commence rescue breaths immediately.
no pulse: begin CPR (go to Circulation portion of the algorithm).
    Use a barrier device if available.
    Pinch the patient’s nose closed.
    Make a seal using your mouth over the mouth of the patient.
    Each rescue breath should last approximately 1 second.
    Watch for chest rise.
    Allow time for the air to expel from patient.

During normal CPR without an advanced airway:
    One provider: Provide at least 6 rescue breaths per minute.
    Two provider: Provide at least 12 rescue breaths per minute.

During normal CPR with an advanced airway:
    Provide 12-20 rescue breaths per minute (do not stop chest compressions for rescue breaths).

If patient has a pulse and no CPR is required:
    Provide 12 -20 rescue breaths per minute.
    Recheck pulse every 2 minutes.

If foreign body obstruction:
    Perform abdominal thrusts
Recovery position (lateral recumbent or 3/4 prone position):
This position is used to maintain a patent airway in the unconscious person.

- Place the patient close to a true lateral position with the head dependent to allow fluid to drain.
- Assure the position is stable.
- Avoid pressure of the chest that could impairs breathing.
- Position patient in such a way that it allows turning them onto their back easily.
- Take precautions to stabilize the neck in case of cervical spine injury.
- Continue to assess and maintain access of airway.
- Avoid the recovery position if it will sustain injury to the patient.
Defibrillate:
Arrival of AED (Automated External Defibrillator)

Power:

Turn AED On NOW! (early defibrillation is the single most important therapy for survival of cardiac arrest. Use immediately upon its arrival to the scene).

Follow verbal AED prompts.

Attachment:

Firmly place appropriate pads (adult/pediatric) to patient’s skin to the indicated locations (pad image).

Analyze:

A short pause in CPR is required to allow the AED to analyze the rhythm.

If rhythm is not shockable:

- Initiate 5 cycles of CPR.
- Recheck the rhythm at the end of the 5 cycles of CPR.

If shock is indicated:

- Assure no one is touching the patient or in mutual contact of a good conductor of electricity by yelling “Clear, I’m Clear, you’re Clear!” prior to delivering a shock.
- Press the shock button when the providers are clear of the patient.
- Resume 5 cycles of CPR.

An AED with a pediatric attenuator should be used in children under 8 years of age if available. An AED without a pediatric attenuator can also be used.
Choking: child > 1 year old or adult

Signs and symptoms of a child/adult choking:
Universal signal for choking: patient has both hands wrapped around the base of their throat.
With complete airway obstruction, the child is unable to speak, cry, or provide any sounds of respiration.
The patient may be confused, weak, obtunded, or cyanotic.

Partial airway obstruction may result in stridor or a high-pitched audible noise during respiration.
Partial airway obstruction may allow for a productive cough or allow the patient to speak.

Get the patient’s attention and ask them if they are choking.
Assess for signs and symptoms of airway obstruction.
If partial airway obstruction: do not attempt Heimlich maneuver.
If complete airway obstruction:
Send someone to call the emergency response team.
If alone: immediately call the emergency response team.
Attempt Heimlich maneuver:
Stand directly behind the child/adult.
Place both of your arms around patient’s waist.
Make a fist with one hand and grab the fist with opposite hand.
Position the thumb end of the fisted hand immediately above the patient’s naval (ample distance away from the xiphoid process).
Perform fast upward and inward diaphragmatic abdominal thrusts.
Continue abdominal thrusts until the obstruction is removed.

If patient becomes unconscious:
Initiate CPR.
Before attempting rescue breaths during normal CPR, assess the airway, removing any visually present obstruction.
Do not use a blind finger sweep in an attempt to remove an obstruction.
**Choking: Infant < 1 year old**

Signs and symptoms of an infant choking:
With complete airway obstruction, the infant is unable to speak, cry, or provide any sounds of respiration. The infant may be confused, weak, obtunded, or cyanotic.

Partial airway obstruction may result in stridor or a high-pitched audible noise during respiration. If the child has a partial airway obstruction, powerful cough, or strong audible cry, do not attempt the Heimlich maneuver.

If signs and symptoms of choking are present and infant is conscious:
Send someone to call the emergency response team.
If alone: immediately call the emergency response team.
Assess the airway for any visually present obstruction and manually remove it if possible.
Never use a blind finger sweep.

Position the patient:
- Lay infant’s face and torso down on forearm (prone) with chest being supported by your palm and their head and neck by your fingers.
- Tilt the infant’s body at a 30 degree angle, head downward (trandelenburg).
- Use your thigh or other object for support.

Interventional Back Blows:
- Provide 5 rapid forceful blows using a flat palm on the infant’s back between the two scapula.

Re-position the patient:
- Rotate the infant face up (supine), head downward (trandelenburg) by switching the infant to the opposite arm.

Interventional Chest Thrusts:
- Place your two fingers on the center of the infant’s sternum immediately below the nipple line.
- Provide 5 rapid compressions, with thrusts equaling 1/3 to 1/2 the total depth of the chest.

Continue cycling back and forth between interventional back blows and chest thrusts until the obstruction is removed or until consciousness is lost.

If becomes unconscious:
- Initiate CPR
  - Before attempting rescue breaths during normal CPR, assess the airway, removing any visually present obstruction.
  - Do not use a blind finger sweep in an attempt to remove an obstruction.
Secondary ABCD
(Airway, Breathing, Circulation, Differential Diagnosis)

Airway (two provider):

Initially provide rescue breaths using an ambu bag and a mask at full flow oxygen. Perform continued assessment of airway patency while giving breaths.

- Condensation on mask during exhalation, chest rise, Et CO2
- Have the person doing chest compressions pause during the 2 rescue breaths.

If the patient is not ventilating well or if there is a presumed risk of aspiration, insert an advanced airway device when prudent:
- Endotreacheal Intubation is the preferred method.
- (View the advanced airway section)

Breathing:
Confirm correct placement of the advanced airway device.
- Condensation during exhalation
- equal bilateral chest rise
- confirming equal bilateral breath sounds with auscultation
- auscultate stomach to assure esophageal intubation didn’t occur
- end-tidal CO2 verified with exhalation using monitor or ETD
- portable chest x-ray

If incorrect placement:
- Remove the airway device, ventilate the patient using the ambu bag for a short period of time, and then reattempt placement.

If correct placement:
- Secure placement of the airway device.

Continue to monitor:
oxygenation saturation with pulse oximeter
end-tidal CO2
Rescue breathing during CPR with an advanced airway:
  8-10 breaths per minute (1 breath every 6-8 seconds)
  Chest compressions should be given *continuously* at a rate of 100 per minute.

Circulation:
Obtain IV or IO access.
Monitors (ECG, BP cuff, pulse oximeter, et CO2 monitor)

Identify:
heart rhythm
Obtain a 12 lead ECG if possible.
Initiate therapy of ACLS algorithm corresponding with the identified heart rhythm.
  (Drug therapy, Electrical therapy, Pacing, etc.)

Differential Diagnosis:
(needed for successful treatment of some patients)
Consider reversible causes of rhythm/arrhythmia.
## Differential Diagnosis

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Airway & Breathing

There are two important principles when evaluating the airway and breathing. The first; is the airway patent or obstructed. The second; is there possible injury or trauma that would change the providers method of treating an obstructed airway or inefficient breathing.

Patent/obstructed

If the airway is patent there should be noticeable chest rise/expansion with either spontaneous respirations or with rescue breaths. The provider may also be able to hear or feel the movement of air from the patient. 

A completely obstructed airway will be silent. An awake patient will lose their ability to speak, while both a conscious or unconscious patient will not have breath sounds on evaluation. If the patient is attempting spontaneous breaths without success, there may be noticeable effort of intercostal muscles, diaphragm, or other accessory muscles without significant chest rise/expansion. The provider will also not feel or hear the movement of air. If the airway is partially obstructed snoring or stridor may be heard.

Cervical Spine Injury?

If the provider evaluates the patient to have an obstructed airway, intervention should take place. If the adverse event of the patient was witnessed and there is no reason to suspect a cervical spine injury, the provider should use the head tilt-chin lift maneuver to open the airway.

If there is a reason to suspect a cervical spine injury, if the patient’s adverse event went unwitnessed, if trauma occurred, or the patient suffered drowning the jaw-thrust maneuver should be used to open the airway. If the jaw-thrust proves unsuccessful in opening the patient’s airway attempt an oropharangeal or nasopharangeal airway. If neither technique works, attempt an advanced airway using inline stabilization.

Brain Injury?

The breathing center that controls respirations is found within the pons and medulla of the brain stem. If trauma, hypoxia, stroke, or any other form of injury affects this area, changes in respiratory function may occur. Some possible changes are apnea (cessation of breathing), irregular breathing patterns, or poor inspiratory volumes. If the breathing pattern or inspiratory volumes are inadequate to sustain life, rescue breathing will be required, and an advanced airway should be placed.

Oral Airway:

Assure the appropriate size for the patient.
Easily inserted with a tongue blade.
Avoid use in patients with an active gag reflex.

Nasal Trumpet Airway:

Best practice is to lube before insertion.
Careful not to cause trauma to nasal mucosa (results in bleeding). Reasonably tolerated by patients with an active gag reflex.

**Advanced Airways**

*Indications:*
Unable to open airway using *head tilt-chin lift* or *jaw thrust* maneuvers.
Difficulty forming a seal with the face mask.
Patient requiring continued ventilatory support.
Patient has a high risk for aspiration (provide an ETT or Combitube).

Remember, a patient should be unconscious or sedated without an active gag reflex before instrumentation of the airway occurs with an ETT, Combitube, or LMA.

**Endotracheal Tube (ETT)**
Requires additional instrument for insertion (laryngoscope, glidescope, fiberoptic).
Laryngoscope blades (average adult size): MAC 3 or 4, Miller 2 or 3
ETTs require mastery of technique for consistent appropriate placement.
Average size of ETT for orotracheal intubation:
Adult 7.5mm

The ETT is placed into the trachea, having direct visualization of the vocal cords.
Average depth of intubation:
adult male is 23cm
adult female is 21cm

Tracheal cuff of the ETT is then inflated.
Allows for positive pressure ventilation.
Reduces risk of aspiration.
Helps maintain placement of ETT.
Confirm placement of ETT.
Secure in place of ETT.
Esophageal-Tracheal Combitube
Gently advance the combitube into the mouth midline along the base of the tongue. Assure tube rotation of the combitube is following the curvature of the pharynx. Cease advancement of the tube once the heavy black rings reach the patient’s teeth. The Combitube is blindly placed into the esophagus 80% of the time and into the trachea 20% of the time. The combitube provides ventilatory access irregardless of tracheal or esophageal intubation.
Inflate the pharangeal cuff with 100ml of air.
  Prevents leak through the nose and mouth.
  Helps secure placement.
Inflate the tracheal cuff with 15ml of air.
  Prevents ventilation of stomach.
  Reduces risk of aspiration of stomach content.
First attempt confirmation of esophageal intubation by ventilating through the esophageal tube. (See “Secondary ABCD” section regarding placement confirmation)
If placement not confirmed through esophageal tube:
  Attempt confirmation of tracheal intubation by ventilating through the tracheal tube. (See “Secondary ABCD” section regarding placement confirmation)
Once placement has been confirmed:
  Mark which tube should be used for ventilation.
  Secure tube in place.
Both cuffs must be inflated to appropriately ventilate a patient in the case of esophageal intubation.

Laryngeal Mask Airway (LMA)
Visualization of the vocal cords is not required for insertion.
When inserting the LMA have the laryngeal cuff deflated.
Guide in the LMA cuff without folding back the tip, pressing it against the hard palate.
Advance the LMA till the cuff lies in the pharynx.
After placement, inflate the laryngeal cuff and check for an adequate seal by using positive pressure ventilation.
Positive pressure ventilation is generally kept under 20 CmH2O to prevent inflation of the stomach. LMA’s are contraindicated for the morbidly obese patient.
The patient is still at high risk of aspiration, even with an appropriately placed LMA. LMA’s are contraindicated in patients with GERD, full stomachs, and pregnant women.
Cardiac/Electrical Therapy

Transcutaneous Pacemaker (External Pacemaker):
Used to treat unstable bradycardias not responding to drug therapy.
Provides temporary pacing through the skin in emergency situations.
Place pads and electrodes in correct position to assure an appropriate ECG reading.
Set the pacer 10-20 beats per min above the patient’s intrinsic heart rate or 60 beats per min if there is no intrinsic heart rate.
start at 0 mA and work energy level up until you have capture (heart pulsation).
Assure the patient is sedated and comfortable during pacer delivery.

Cardioversion:
Used if drug therapy and vagal maneuvers fail.
Used when patient has a pulse.
Used to treat Atrial Fibrillation, Atrial Flutter, Atrial Tach, Symptomatic VT.
Shock performed at peak of R wave.
   Requires proper lead/pad placement to monitor ECG.
Shock energy level:
   Monophasic: 100-200J
   Biphasic: factory recommendations (generally 100J)
Assure the patient is sedated and comfortable during shock delivery.

Defibrillation:
Used to treat VF and pulseless VT.
Delivery within first 5 mins of cardiac arrest has best results.
CPR before and after each shock improves outcomes.
Shock energy level:
   Monophasic: 360J
   Biphasic: factory recommendations (generally 120-200J)
Common Cardiac Rhythms:

Normal Sinus Rhythm

Atrial Tachycardia

Supraventricular Tachycardia

Atrial Fibrillation
Atrial Flutter

Sinus Bradycardia

1° Atrioventricular Block

2° Atrioventricular Block- Type 1 (Mobitz I/Wenckebach)
2° Atrioventricular Block- Type 2 (Mobitz II/Hay)

3° Atrioventricular Block (Complete Heart Block)

Ventricular Tachycardia- Monomorphic

Ventricular Tachycardia- Polymorphic
Ventricular Tachycardia - Torsades de Pointes

Ventricular Fibrillation

Asystole

Pulseless Electrical Activity

*Without Pulse*
**Acute Myocardial Infarction**
Determine if the patient is *Stable* or *Unstable*.
Initiate CABD and Secondary ABCD.
Use appropriate ACLS algorithm.
Generally accepted treatments:
- “MONA”: Morphine, Oxygen, Nitrates, Aspirin
Consider fibrinolytic therapy.

**Tachycardias**
Determine if the patient is *Stable* or *Unstable*.
Initiate CABD and Secondary ABCD.

**Narrow QRS Complex - Stable**
*Regular:*
Attempt vagal maneuvers
- first line Rx is: Adenosine 1\textsuperscript{st} dose: 6mg IV then 2\textsuperscript{nd} and 3\textsuperscript{rd} doses: 12mg IV
- Other Rx options include: Diltiazem and Beta blockers

*Irregular:*
- Rx options include: Diltiazem and Beta blockers

**Narrow QRS Complex - Unstable**
Sedate the patient and provide cardioversion.
Tx Atrial Fibrillation: first shock 100-200j
Tx Atrial flutter and SVT: first shock 50-100j

**Wide Complex - Stable**
*Regular:*
**Ventricular Tachycardia (monomorphic)**
Sedate the patient and provide cardioversion.
Amiodarone 150mg IV over 10 min every 3-5 min, with a max of 2.2g in a 24hrs period.
Procainamide 20 to 50 mg/min IV until arrhythmia resolves, hypotension occurs, there is >50% increase in QRS duration, or the max dose of 17 mg/kg is reached
(Maintenance infusion: 1 to 4 mg/min)
Sotalol 1.5 mg/kg over 5 min
Procainamide and sotalol should be avoided in patients with prolonged QT.

**SupraVentricular Tachycardia (SVT) with Aberrancy**
Adenosine 1\textsuperscript{st} dose: 6mg IV then 2\textsuperscript{nd} and 3\textsuperscript{rd} doses: 12mg IV.

*Irregular:*
**Atrial Fibrillation with Aberrancy**
Rx options include: Cardizem, Beta Blockers
**Atrial Fibrillation with Wolff Parkinson White (delta wave)**
Avoid!!!: adenosine, verapamil, cardizem, and digoxin.
Give Amiodarone 150mg IV over 10 min

Toursades de Pointes
Give magnesium 1 to 2g IV over 2 min

Wide Complex - Unstable
Ventricular Tachycardia (VT) - monomorphic:
If still partially conscious, sedate the patient.
Attempt to cardiovert: 1st attempt with 100j, 2nd attempt with 200j, 3rd attempt with 300j, then following attempts with 360j
Ventricular Tachycardia (VT) – polymorphic:
Defibrilate the patient at 360j with a monophasic or 120-200j with a biphasic

Pulseless Ventricular Tachycardia / Ventricular Fibrillation (Refractory)
CABD, ABCD
Using defibrillator:
Verify presence of VF: Defibrillate the patient at 360j using monophasic or at Factory recommended joules for a biphasic
Drug treatment options:
Epinephrine 1mg IV every 3-5min or Vasopressin 40 U IV one time,
followed by Epinephrine 1mg IV in 3-5 min
Amiodarone 300mg IVP, repeated once in 3-5 min with following boluses at 150mg
Magnesium Sulfate: give 1-2gm in 1-2 min
Treat the cause of the arrhythmia.

Bradycardia (Rate < 60)
CABD, ABCD
Determine if the patient is stable or unstable
Stable: monitor for changes is hemodynamic status
Unstable: Epinephrine 1mg IV every 3-5min until transcutaneous pacing can be initiated
initiate transcutaneous pacing until transvenous pacing can be initiated
If TCP fails or intravenous pacing is delayed consider Epinephrine (2-10 mcg/min IV), Dopamine (5-20 mcg/kg/min), Isoproterenol (3-20 mcg/min)
Treat causes (atropine 0.5-1mg IV may be used if vagal mechanism is suspected)

Asystole
CABD, ABCD
(if lead II is asystolic, confirm rhythm in leads avL and III)
Drug therapy options:
Epinephrine 1mg IV every 3-5min or Vasopressin 40 U IV one time
followed by Epinephrine 1mg IV in 10 min
Atropine 1mg IV every 3-5 min, with a max dose of 3mg
Pulseless Electrical Activity
CABD, ABCD
Drug Therapy:
Epinephrine 1mg IV every 3-5min or Vasopressin 40 U IV one time
followed by Epinephrine 1mg IV in 10 min
Give Atropine if bradycardic arrhythmia is present: 1mg IV every 3-5 min with a max of 3mg.
Treat the cause of the arrhythmia

Acute Stroke

*Initiated treatment within 10 min of arrival to the ER.*
CABD, ABCD
Assess patient's rhythm and treat with appropriate ACLS algorithm.
Attempt to eliminate other causes of symptoms (use patient history)
Obtain neurological assessment and tests by a specialist.

*Initiated treatment within 25 min of arrival to the ER.*
establish if onset of symptoms has been less than 3 hours
Continued neurological exam (non-Contrast CT scan), monitor hemodynamics
Determine if fibrinolytic therapy is appropriate

ACLS Case Scenarios

1) You are shopping at a grocery store and an elderly lady in the produce section suddenly grimaces, grabs her chest, and falls to the floor. You and a few others hurry to her side and she quickly becomes unresponsive.

Appropriate Action:
Initiate CABD
Have one onlooker call for help.
Have another onlooker retrieve the AED.
Look, listen, and feel for breathing
   *Pt. is not breathing*
Assess for pulse
   *Pt has no pulse*
Begin 2 person CPR
   *Have student explain steps of 2 person CPR*
   *Onlooker arrives with AED*
Initiate appropriate use of AED
   *Have student explain correct use of AED*
   *AED analyzed, recommended a shock*
Assure onlookers and self are clear of pt
Initiate shock
Follow instructions of AED till arrival of Medical transport
2) You are just returning from lunch to the ER and you hear a code blue being initiated in bay 2. You run to the bay to find a patient confused, obtunded, and lethargic in the bed. Oxygen by NC, ECG, and IV access are already established. The nurse is unable to cycle a blood pressure. When assessing the ECG you see:

![ECG Image]

What should you do next?

- Initiate CABD, ABCD
  - *Patient is breathing*
  - *Faint pulse is felt approximately 35 times a minute.*
- Initiate transcutaneous pacing
  - *Central line access is established*
- Initiate transvenous pacing

3) You enter your friends house to find their elderly grandmother staring at the wall and leaning to their side.

- *Have student identify signs of stroke*
- *Have student perform prehospital stroke assessment*
  - Assess for unusual speech
  - Assess for facial drooping
  - Assess for arm drift
- Attempt to establish a history of onset and events
- Transport to hospital
- Check patient's blood glucose
- *Have student explain appropriate medical interventions for this patient.*
Congratulations on completing the Advanced Cardiac Life Support certification course here at United Medical Education. You will have continued access to these course materials even after successful exam completion. Feel free to return in the future as updates through evidence based practice and research are added. Thanks again for choosing United Medical Education.