

ACLS Course Objectives

AHA ACLS Book Page 1

- Apply the BLS, Primary and Secondary Assessment sequences for a systematic evaluation of adult patients.
- Perform prompt, high quality BLS, including prioritizing early chest compressions and integrating early AED use.
- Recognize respiratory arrest and perform early management of respiratory arrest.
- Discuss early recognition and management of acute coronary syndromes (ACS), including appropriate disposition.
- Discuss early recognition and management of stroke, including appropriate disposition.
- Recognize bradyarrhythmias and tachyarrhythmias that may result in cardiac arrest or complicate resuscitation outcome. Perform early management of bradyarrhythmias and tachyarrhythmias that may result in cardiac arrest or complicate resuscitation outcome.
- Recognize cardiac arrest and perform early management of cardiac arrest until termination of resuscitation or transfer of care, including immediate post-cardiac arrest care.
- Evaluate resuscitative efforts during a cardiac arrest through continuous assessment of CPR quality, monitoring the patient's physiological response, delivering real-time feedback to the team.
- Model effective communication as a member or leader of a high-performance team & recognize the impact of team dynamics on overall team performance.

Science of Resuscitation

- Immediate High-Quality CPR starting with compressions at least 2 inches deep, 100-120/min.
- AED or Manual Defib ASAP 1 shock q 2 minutes for VF/pVT
- Minimizing interruptions in compressions
- Avoid excessive ventilations (decreases cardiac output and cerebral perfusion). 500-600 ML Tidal Volume. Enough for visible chest rise
- Coronary perfusion pressure >15 and Chest Compression Fraction > 60%
- ETCO₂ < 10 indicates compressions ineffective
- Max 10 sec off chest at any time
- Feedback devices recommended
- Integrated post Cardiac Arrest Care
- RRT/MET (Rapid Response Team and Medical Emergency Teams) improving outcomes by early detection and initial treatment
 - Threatened airway
 - Resp rate <6 or > 30 per min
 - Heart rate < 40 or > 140 per min
 - $\geq$ Map 65
 - Symptomatic Hypertension

- Unexpected Decreased LOC
- Unexplained agitation
- Seizure
- Significant decrease in urine output
- Subjective concern about pt.

Systematic Approach

AHA ACLS Book Page 13-24

Initial Impression - CBC (Consciousness - Breathing - Color)

- Unconscious - BLS survey - ✓ breathing and pulse, activate emergency response (call code) High quality CPR, rapid defib
- Primary assessment ABCDE
 - A - Airway patent, consider advanced device
 - B - Breathing 2 breaths after 30 compressions
 - If advanced airway: 1 breath q 6 seconds
 - If has pulse- 1 breath every 5-6 seconds rescue breathing
 - If breathing – administer O2 as needed
 - C - Support circulation, BP> 90 systolic ≥Map 65
 - Access - either IV or IO
 - Drugs and fluids if indicated
 - Temp and glucose levels
 - D – Disability
 - LOC-AVPU
 - Alert – Voice – Pain – Unresponsive
 - E – Exposure
 - Remove clothing- examine
- Secondary Assessment - SAMPLE
 - S - Signs and symptoms
 - A – Allergies
 - M- Medications
 - P - Past Medical history
 - L- Last meal
 - E – Events
- H's and T's
 - Hypovolemia
 - Hypoxia
 - Hydrogen ion (acidosis)
 - Hyperkalemia

- Hypokalemia
- Hypothermia
- Tension Pneumothorax
- Tamponade (Cardiac)
- Toxins
- Thrombosis
 - Pulmonary
 - Cardiac
- Hypoglycemia Not AHA But something to consider

High Performance Teams

AHA ACLS Book Page 95-97

- Elements of Team Dynamics and communication
 - Roles
 - Clear roles and responsibilities - clearly delegate tasks
 - Designated Team leader
 - Know limitations - ask for new role if not assigned an appropriate task
 - Constructive intervention
 - Be tactful but address team member to prevent error
 - What to communicate
 - Knowledge sharing
 - Summarizing and reevaluation
 - How to communicate
 - Closed Loop Communication
 - Clear messages
 - Mutual respect
- Debriefing
 - Work together as a team
 - Debriefing during and after code
 - Improves team performance
 - Improve patient outcome after arrest

Algorithms

Stable vs Unstable

- Hypotension?
- Altered mental status?
- Signs of shock?
- Ischemic Chest pain?
- Acute Heart Failure?

BRADYCARDIA & Heart Blocks

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Stable patient (Asymptomatic slow heart rate):

- Call for expert consultation
- Obtain focused history and physical exam; monitor and observe

Unstable patient (Symptomatic Slow Rate)

- Identify and treat underlying cause
- Maintain patent airway; ventilate and give O2 if needed
- Cardiac monitoring, BP, and SPO2 monitoring
- IV access
- 12 lead ECG if available
- Administer Atropine 1.0 mg IVP q 3-5 min (max 3mg)
- Try Atropine on all unstable bradycardias
- Transcutaneous Pacing and / or
- Dopamine 5 -20 mcg/kg/min
- Epinephrine drip 2-10 mcg/min or

Prepare for Transvenous Pacing or Permanent Pacer

TACHYCARDIA with a Pulse

AHA ACLS Book Page 78-92

- Identify and treat underlying cause
- Maintain patent airway; ventilate and give O2 if needed
- Cardiac monitoring, BP and SPO2 monitoring
- IV Access
- 12 lead ECG if available

All unstable Tachycardias require Synchronized Cardioversion

For stable

- Determine if wide or narrow QRS
- Regular or irregular?

Narrow Regular (Supraventricular Tachycardia)

STABLE *EXPERT CONSULTATION*

- O2, IV, Monitor, 12 lead ECG Do Vagal Maneuvers (Cough, Deep Breath, etc.)
- Adenosine 6mg RIVP, Flush with 20mL NS, RIVP
- May repeat with Adenosine 12 mg in 1-2 min, Flush with 20mL NS, RAPID SLAM

- ANTICIPATE SIDE EFFECTS
- IDENTIFY UNDERLYING RHYTHM

UNSTABLE

- Synchronized Cardioversion 50 - 100 Joules

Narrow Irregular QRS Tachycardia (Atrial Fibrillation/Flutter)

STABLE

- CONTROL RATE
 - Ca Channel Blockers Verapamil, Diltiazem (Cardizem), Beta Blockers, Digoxin, etc.

UNSTABLE

- SYNCHRONIZED CARDIOVERSION
 - Atrial Fib 200 joules; Atrial Flutter 200 joules

Wide Regular QRS Tachycardia with a Pulse VT with Pulse

STABLE - Antiarrhythmic Infusions IVPB

- **Amiodarone:**
 - Loading Dose: 150 mg in 100 ml of D5W over 10 min; can repeat if needed
- **Amiodarone drip**
 - 1 mg/min for 6 hrs. then decrease to 0.5mg/min for 18 hrs.
- **Procainamide:**
 - 20-50 mg/min until arrhythmia suppressed, max dose or side effects
 - Infusion 1-4 mg/min
- **Sotalol**
 - 100 mg (1.5 mg/kg) over 5 min

Option of Adenosine IVP

- May be used ONLY if monomorphic, stable, regular tachy's
- 1st Dose 6mg, then 12mg IV / 10 RIVP with 20 cc NS flush RIVP.

UNSTABLE

- Synchronized cardioversion @ 100 Joules

Wide Irregular (Polymorphic VT)

Example - Torsades de pointes

- Defibrillate (unsynchronized) Biphasic 120-200j (or a 360-equivalent monophasic)
 - Variations in rhythm may make cardioversion impossible
- **Magnesium**
 - 1-2 Gm in 50-100 ml D5q over 5-20 min

Cardiac Arrest

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Priority is effective High-Quality CPR

Shockable Rhythms:

- VF and pVT
 - **Early Defib** and defib every 2 minutes

Continue compressions while defib is charging

- Compressions immediately prior to defib and immediately after

SAFE defibrillation includes:

- "ALL Clear... Shocking in 3,2,1 shock"
- Visual sweep – Make sure O2 is clear! Eyes on patient – then defibrillate
- Remove from water, dry patient the best you can (It's okay to use AED in snow)
- CPR for 2 min cycles - rhythm check every 2 minutes 30:2 (5x = 2min)
- Get IV/IO Access
 - **First Drug:** (Give meds during compressions early in cycle)
 - Epinephrine 1 mg IV PUSH every – vasoconstrictor
 - **Second Drug:** Antiarrhythmic
 - Amiodarone 300 mg IVP (given between 1st and 2nd Epi) 2nd dose 150 mg in 3-5 min or
 - Lidocaine 1-1.5 mg/kg IV PUSH Repeat with ½ dose every 5-10 min Max 3 mg/kg
 - Maintenance infusion 1-4 mg/min start at 1 mg higher than total of boluses
- Consider advanced airway and waveform capnography
 - PETCO2 less than 10 during compressions indicate ineffective compressions

- Rhythm check and Defibrillate 02 minutes, repeat pulse check only if rhythm changes.

Non – Shockable Rhythms:

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PEA or Asystole

Pulseless Electrical Activity (PEA)

Organized rhythm on monitor with NO detectable pulse

- High Quality CPR and Epinephrine 1mg IVP
- Epinephrine 1mg IVP q 3-5 minutes (recommend 4min)
- Confirm oxygenation, give fluids

Search for and Treat identifiable causes (H's and T's)

Asystole (Confirm In 2 leads)

- High Quality CPR and Epinephrine
 - Epinephrine 1 mg IV PUSH every 3-5 min
- Search for and Treat identifiable causes (H's and T's)

Post Cardiac Arrest Care

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1. Following ROSC (Return of Spontaneous Circulation)
 - Maintain Ventilation/Oxygenation "Is the patient breathing effectively?"
 - If nonresponsive and ineffective respirations Intubation (ventilator support if needed) use lowest O2 concentration to keep O2 saturation >94 %
 - Prolonged use of high FIO2 (O2%) can cause O2 Toxicity
 - Use waveform capnography target 35 to 40 during ROSC
 - Excessive ventilation (hyperventilation) can decrease cerebral perfusion and decrease cardiac output
 - Rescue breathing (1 ventilation every 6 seconds)
2. Monitor & Treat Hypotension
 - Target BP = Map $\geq$ 65
 - Fluids (1-2 liters NS or LR) then Vasopressors
 - Epi drip 2-10 mcg/min
 - Norepinephrine drip 0.1-0.5 mcg/kg/min or
 - Dopamine drip 5-20 mcg/kg/min
 - Treat causes
3. 12 Lead ECG
 - R/O possible STEMI
 - Coronary Reperfusion transport to PCI facility

4. Non-responsive pts.
 - Targeted Temperature Management Protocols
 - For non-responsive adult pts. ROSC after Cardiac Arrest
 - Pick a temp between 32 and 37.5 C'degrees, cool and maintain for at least 36 hours

High Quality BLS

- **C-A-B**
 - After determining the patient is unresponsive and has no OBVIOUS pulse START COMPRESSIONS
- **The most Common Mistake in CPR?**
 - Prolonged Interruptions in Compressions
 - Start compression within 10 seconds of recognition
 - Compression continues during charging
 - Never interrupt compression for more than 10 seconds.
- **High Quality Compressions**
 - 100-120/Min, at least 2", Allow for complete recoil
 - 5 cycles and 2 minutes
 - Is the Scene Safe?
 - Check Responsiveness
 - Get Help Coming
 - Check Breathing and Pulse
 - Agonal Gasps are indication of cardiac arrest
 - Unsure if they have a pulse
 - Send for an AED and start compressions
 - 100 120 per minute
 - At least 2 inch. About 5cm
 - Allow for complete Recoil
 - When a BVM arrives begin 30:2
- **AED**
 - Use as soon as available
 - Turn it on and follow prompt
- **Child BLS**
 - Ages 1-puberty
 - Depth - 1 /3rd of AP chest or about 2inch.
 - 2nd Rescuer? Change to 15:2 ratio
- **Infant BLS**
 - 1 rescuer 30:2 / 2 fingers

- 2 Rescuer 15:2 / thumb encircling
- Depth - 1 / 3 AP chest or about 1.5 inch.
- **Choking**
 - Adult and Child
 - Back slaps and or Abdominal Thrusts if responding
 - CPR if non-responsive
 - Check mouth before breaths
 - Infant
 - 5 back slaps and 5 chest thrusts repeated if responding
 - CPR if non-responsive
 - Check mouth before breaths

RESPIRATORY ARREST WITH A PULSE

AHA ACLS Book Pg104-117

Open airway

- Jaw thrust/chin lift
- Using OPA/NPA. (OPA- measure corner of mouth to angle of mandible)

Rescue Breathing is ventilations without compressions (with or without advanced airway)

- **ADULT: 1 breath every 6 seconds (10 per min)**
- **CHILD/INFANT: 1 breath every 2 seconds (25-30 per min)**
- Just enough air to see chest rise (trying to achieve tidal volume; measured by 8-10 mg/kg)
 - Squeeze about 1/3 - 1/2 the Bag Valve Mask (BVM), each breath over 1 second

Airway- ET TUBE

Cricoid Pressure: Not routinely recommended (Consider only if elevated risk aspiration)

Confirmation of ETT Placement

- Auscultation and Chest Rise & Fall
- Colorimetric Capnography (color change CO2 Detector)
- **Continuous waveform capnography- best way to monitor ET placement**
- Chest X-Ray and ABG

ET Suctioning (Hyper-oxygenate prior to suctioning)

- Less than 10 sec
- During catheter withdrawal

CPR Cycle after intubation

- 1 breath q 6 sec (10/min) without pauses in compressions

PETC02

- Best indicator of CPR efficiency & coronary perfusion
- Best indicator of ET placement and ET monitoring
- During CPR goal is waveform reading >10

Acute Coronary Syndrome (ACS)

AHA ACLS Book Page 26-41

Chest Pain suggestive of Myocardial Ischemia

- Immediate Assessment (<10 minutes) including 12 lead ECG, VS, O2 Sat, IV Access, Targeted History and Physical, electrolytes, coagulation studies, enzymes, chest x-ray

O2 @ 2-4 U/min for O2 Saturation below 90% or S/S of hypoxia

ASA 162-325 mg PO

NTG 0.4 mg SL or Spray

- Vasodilator , decreases preload , watch BP!
- Hold Nitro if hypotensive, tachycardia, bradycardia , Rt. sided MI or recent erectile enhancement drugs

Morphine 2-4 MG IV every 5 min for pain not relieved with NTG (Use morphine cautiously)

Treatment of Choice for STEM/: REPERFUSION!

- Window of Opportunity for STEMI: Symptoms Present <12 hrs

Select reperfusion strategy based on resources:

- Angiography with angioplasty or stent placement
 - GOAL- Door to PCI reperfusion <90 min
 - Transport to PCI capable facility
- Thrombolytic therapy
 - If not a candidate for Cardiac Catheterization
 - GOAL Door to Thrombolytic Drug <30 min

Stroke (CVA)

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A neurological impairment caused by disruption of blood supply to a region of the brain

- Third leading cause of death in the US and leading cause of adult disability

Ischemic Stroke

- Occurs when a blood vessel supplying the brain is occluded
- 87% of strokes are ischemic

Hemorrhagic Stroke

- Occurs because a cerebral artery has ruptured
 - Subarachnoid - bleeding onto the surface of the brain
 - Intracerebral - bleeding in the brain
- Can be fatal at onset, hypertension most common precipitating factor

8D's of Stroke

- **Detection:** Recognize signs and symptoms
- **Dispatch:** Early activation of EMS
- **Delivery:** Pre-hospital EMS Assessment using Cincinnati Pre-Hospital Stroke Score, if positive: Identify time symptoms began Divert to Stroke Center with Head CT capabilities
- **Door:** 3 Hour window of opportunity for thrombolytics
 - Select pts may have up to 4.5 hr. window
 - Optional treatments may have slightly longer window
 - Immediate Assessment - Neurological Screening ASAP, H&P, Glasgow, NIH Stroke Scale, VS, IV, CBC, Electrolytes, Coagulation, Blood Sugar, 12-lead EKG, CT within 25 min of arrival, CT read within 45 minutes
- **Data/Decision/Drug:**
 - If CT shows NO hemorrhage: Thrombolytic criteria / Clot Removal
 - If CT shows hemorrhage:
 - Consult Neurosurgery, reverse anticoagulation, and/or bleeding disorder, monitor neurological condition, control hypertension
- **Disposition:** Admission to Stroke Unit or ICU within 3 hrs.

NOTES:

Rhythm Strips to Know

