



ACLS Course Objectives

AHA ACLS book pg. 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

AHA ACLS book pg. 13

- 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
- Coronary perfusion pressure > 15 and Chest Compression Fraction > 80%
- 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 early treatment
 - Threatened airway
 - Resp rate <6 or > 30 per min
 - Heart rate < 40 or > 140 per min
 - Systolic pressure < 90
 - Symptomatic Hypertension
 - Unexpected ↓ LOC
 - Unexplained agitation
 - Seizure
 - Significant decrease in urine output
 - Subjective concern about pt.



Systematic Approach

AHA ACLS book pg. 33-42

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 adv. Airway 1 breath q 6 sec.
 - If has a pulse – 1 breath q 6 sec rescue breathing
 - If breathing – administer O₂ as needed
 - C – Support circulation, BP > 90 systolic or MAP 65
 - Access – either IV or IO
 - Drugs and fluids if indicated
 - Temp and glucose levels
 - D – Disability
 - LOC – AVPU
 - Alert
 - Voice
 - Painful
 - 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 and T's
 - Hypovolemia
 - Hypoxia
 - Hydrogen ion (acidosis)
 - Hyperkalemia
 - Hypokalemia
 - Hypothermia
 - Tension Pneumothorax
 - Tamponade (Cardiac)
 - Toxins
 - Thrombosis
 - Pulmonary
 - Cardiac



HIGH Performance Teams

AHA ACLS book pg. 25-32 Handbook pg. 8

- 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
- CPR Coach
 - New role to promote delivery of high-quality CPR.
 - CPR Coaches stand across from compressor next to feedback-device.
 - Verbalizes feedback, mid-range target for HR
 - Coordinate CPR
 - Initiating CPR, Placing CPR board, analyzing rhythm, switching compressors (goal to keep pauses <5 sec), defibrillating, intubating (must be <10 seconds)

Preventing Arrest: Brady and Tachycardia Algorithms

Stable vs unstable

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



BRADYCARDIA & Heart Blocks

AHA ACLS book pg.120-128, Handbook pg. 12

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 mg IVP q 3-5 min (max 3 mg)
Try Atropine for ALL unstable bradycardias
- Transcutaneous Pacing and/or
- Dopamine drip 5-20 mcg/kg/min or
- Epinephrine drip 2-10 mcg/min or

Prepare for Transvenous Pacing or Permanent Pacer

TACHYCARDIA with a pulse

AHA ACLS book pg. 129-144 Handbook pg. 13-16

- 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 IVP SLAMMED, Flush with 20mL NS, RAPID SLAM
- 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 -- Joules as directed by manufacturer or physician



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 120-200 joules; As directed by manufacturer or physician

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

Option of Adenosine IVP

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

UNSTABLE

- Synchronized cardioversion as directed by manufacturer or physician

Wide Irregular (Polymorphic VT)

Example – Torsades de Points

- Defibrillate (unsynchronized) Biphasic 120-200j (or 360 equivalent monophasic)
 - Variations in rhythm may make cardioversion impossible
- Magnesium
 - 1-2 Gm in 50-100 mL D5W over 5-20 min

Cardiac Arrest

AHA ACLS book pg. 92-109 Handbook pg. 9-10

- ***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
- Defibrillate 120—200 joules;
- CPR for 2 min cycles – rhythm check every 2 minutes 30:2
- Defibrillate 120—200 (**Two defibs BEFORE** first medication - Prior to next possible defib – it is reasonable to pre-charge defibrillator in anticipation of another defibrillation to minimize time off chest.
- Get IV/IO Access
 - **First drug:** (Give meds during compressions early in the cycle)
 - Epinephrine 1 mg IV PUSH every 3-5 min – vasoconstrictor
 - **Second drug - antiarrhythmic:**
 - ***Choice or either not both***
 - Amiodarone 300 mg IVP (given between 1st and 2nd Epi) 2nd dose 150 mg in 3-5 min
 - Lidocaine



Cardiac Arrest (Cont)

- Lido Dose for either pulseless or with a pulse
 - 1-1.5 mg/kg IV PUSH Repeat with ½ dose every 5-10 min Max 3 mg/kg
 - ET 2-2.5 times IV dose
 - 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 Q2 minutes, repeat pulse check only if rhythm changes.

Non-shockable Rhythms:

- **PEA or Asystole**

Pulseless Electrical Activity (PEA)

AHA ACLS book pg. 110-113

Organized rhythm on monitor with NO detectable pulse

- High Quality CPR and Epinephrine
 - Epinephrine 1 mg IV PUSH every 3-5 min
- Confirm oxygenation, give fluids.
- **Search for and treat identifiable causes (H's and T's)**

Asystole Confirm in 2 leads

AHA ACLS book pg. 114-118

- 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

AHA ACLS book pg. 145-152 Handbook pg. 11

Following ROSC (Return of Spontaneous Circulation)

1. 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 sats ≥ 92-98%
 - Prolonged use of high FIO2 (O2%) can cause O2 Toxicity
 - Use waveform capnography – target 35 to 45 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 = 90 systolic MAP 65
 - Fluids (1-2 liters NS or LR) then Vasopressors
 - Epi drip 2-10mcg/min or
 - Norepinephrine drip 0.1-0.5 mcg/kg/min or
 - Dopamine drip 5-10 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 36 degrees C, cool and maintain for at least 24 hours



High Quality BLS

Handbook pg. 1-4

- **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 continue during charging
 - Never interrupt compression for more than 10 seconds.
 - **High Quality Compressions**
 - 100-120/Min, at least 2", Allow for complete recoil
 - Switch compressors every 2 minutes/5 cycles or when fatigue
 - 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
 - 2 - 2.4 inches
 - Allow for complete Recoil
 - When a BVM arrives begin 30:2
- **AED**
 - **Goal: To Eliminate ABNORMAL rhythm**
 - Use as soon as available
 - Turn it on and follow prompts
- **Child BLS**
 - Ages 1-puberty
 - Depth - 1/3rd of AP chest
 - 2nd Rescuer → Change to 15:2 ratio
 -
- **Infant BLS**
 - 1 rescuer 30:2 / 2 fingers/2 thumbs or 1 hand
 - 2 Rescuer 15:2 / thumb encircling
 - Depth – 1/3 AP chest
- **Choking**
 - Adult and Child
 - 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



Airway Management

ACLS book pg. 44-58

Handbook pg. 69-72

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 (12 per min)**
- **Child: 1 breath every 2-3 seconds (20-30 per min)**
- Just enough air to see chest rise, each over 1 second

Airway – ET TUBE

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)

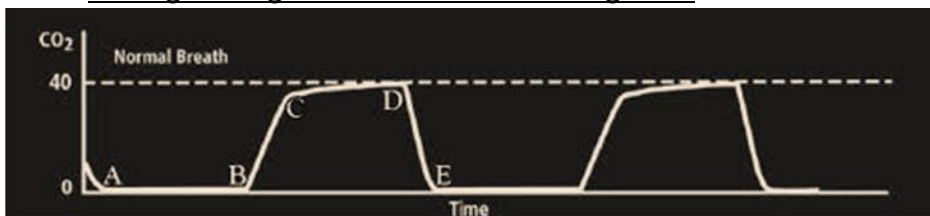
- Less than 10 sec
- During catheter withdrawal

CPR Cycle after intubation

- **1 breath q 6 sec without pauses in compressions**

PETCO2

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





Maternal Cardiac Arrests

AHA Handbook page 5-6

- Follow ACLS treatments
 - Same Meds, Defibrillation, Early Intubation
 - CPR done with manual uterine displacement (Pulled to the left side)
- Perform perimortem cesarean delivery in 5 min, depending on provider resources and skill set

ABCDEFGH - Differential Diagnosis for Maternity Arrests

- Anesthesia Complications
- Bleeding / DIC
- Cardiac Disease/Cardiovascular
- Drugs
- Embolism: coronary / pulmonary / amniotic fluid
- Fever
- General: PATCH 5MD or H's and T's
- Hypertension / preeclampsia / eclampsia

Acute Coronary Syndrome (ACS)

AHA ACLS book pg. 59-72

Chest Pain suggestive of Myocardial Ischemia

Handbook pg. 25-39

- Immediate Assessment (<10 minutes) including 12 lead ECG, VS, O2 Sat, IV Access, Targeted History and Physical, lytes, coagulation studies, enzymes, chest x-ray
- 12 Lead to determine STEMI from Non-STEMI MI

O2 @ 4L/min for O2 sats 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 STEMI: REPERFUSION!!

- Window of Opportunity for STEMI: Symptoms Present \leq 12 hrs

Select reperfusion strategy based on resources:

- Angiography with angioplasty or stent placement
 - **GOAL – Door to PCI reperfusion <90 min. Ideally take patient DIRECTLY to PCI if possible.**
 - **Transport to PCI capable facility**
- Thrombolytic therapy
 - If not a candidate for Cardiac Catheterization
 - GOAL– Door to Thrombolytic Drug <30 min



Stroke (CVA)

AHA ACLS book pg.73-91

handbook pg. 19-24

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 ruptures
 - Subarachnoid – bleeding onto the surface of the brain
 - Intracerebral – bleeding in the brain
 - Can be fatal at onset, hypertension most common precipitating factor

8 D's

- **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 hr 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, Lytes, Coags, Blood Sugar. 12-lead EKG
- **Data/Decision/Drug:**
 - If CT shows NO hemorrhage:
 - Thrombolytic criteria? Clot Retrieval?
 - 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.



Rhythm Strips for practice

