AMERICAN HEART ASSOCIATION 2010 ACLS GUIDELINES:
WHAT EVERY CLINICIAN NEEDS TO KNOW

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Advanced Cardiac Life Support

- 400 residents & fellows
- 100 medical students
- 900 physicians
- 2800 nurses

Scott & White Memorial Hospital

American Heart Association
AUTHORIZED
TRAINING
CENTER
AHA 2010 BLS Guidelines

C-A-B

- ABC is not longer the CPR mnemonic of choice!
- This change has been long in coming
- CAB does not apply to all situations
- Healthcare professional CPR differs from lay public CPR
Compression only CPR

• What about chest compression only CPR?
• AHA coined the phrase “Hands-only CPR”
• Why does this work?
• What data supports this?
  – Arizona Data
  – SOS Kanto
• When is it appropriate to use this?
  – Technically, not in the hospital
  – Technically, not for health care professionals
Compression-Only CPR

- CPP (Coronary Perfusion Pressure) is how blood is circulated through the heart
- Happens during diastole
- CPP builds with uninterrupted compressions
- CPP drops with interruptions in compressions
Compression-Only CPR

“Coronary Perfusion Pressure” During CPR
Compression-Only CPR

• Blood in the body is completely oxygenated at the time of cardiac arrest
• Enough O2 for several minutes of CPR
• Early in CPR ventilations add very little, they detract from compressions and CPP substantially!
Compression-Only CPR

- Bag-Mask Ventilation (BMV) is a difficult skill
- Mouth-to-mouth is even more challenging
- Most breaths are ineffective
- People are afraid to go “mouth to mouth”
- This often deters would-be rescuers
AHA 2010 ACLS Guideline

CPR Quality
- Push hard (≥2 inches [5 cm]) and fast (≥100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 30:2 compression-ventilation ratio
- Quantitative waveform capnography
  - If PETCO₂ <10 mm Hg, attempt to improve CPR quality
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality

Return of Spontaneous Circulation (ROSC)
- Pulse and blood pressure
- Abrupt sustained increase in PETCO₂ (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Shock Energy
- Biphasic: Manufacturer recommendation (120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- Monophasic: 360 J

Drug Therapy
- Epinephrine IV/IO Dose: 1 mg every 3-5 minutes
- Vasopressin IV/IO Dose: 40 units can replace first or second dose of epinephrine
- Amiodarone IV/IO Dose: First dose: 300 mg bolus. Second dose: 150 mg.

Advanced Airway
- Supraglottic advanced airway or endotracheal intubation
- Waveform capnography to confirm and monitor ET tube placement
- 8-10 breaths per minute with continuous chest compressions

Reversible Causes
- Hypovolemia
- Hypoxia
- Hyperglycemia
- Hypo/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary
Compression Depth

• Aside from early defibrillation, quality compressions improve survival from cardiac arrest more than anything else

• In 2010 depth increased from 1.5-2 inches to greater than 2 inches

• Every 5 mm of increased compression depth results in statistically significant improvement in survival!
Compression Rate

• This was changed from ~100 compressions per min to **at least 100 compressions per min**

• Studies have shown that the more compressions the better

• “Another one Bites the Dust” vs “Staying Alive” – sound bites?
Complete Recoil

• To maximize the effect of each compression, the heart must be allowed to completely refill
• Molding of the chest accentuates incomplete recoil!
AHA 2010 ACLS Guideline

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  - Quantitative waveform capnography
- Treat Reversible Causes

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Minimizing Interruptions

• The overall number of compressions given has been linked to survival in animal and human studies

• As little as 5 seconds without compressions prior to defib reduces shock efficacy

• Many of the changes in BLS and ACLS in 2005 and 2010 reflect this theme!

• Remember compressions are the MOST IMPORTANT part of ACLS
Minimizing Interruptions

• Once a code is called or CPR initiated, only 3 things justify interrupting compressions
  – Rhythm check
  – Shock
  – Ventilations (if synchronous)

• Interruptions usually NOT warranted in:
  – Starting IVs or Central Lines
  – Intubating the patient (weigh the need for this)
  – Checking the rhythm AFTER a shock
AHA 2010 ACLS Guideline

Adult Cardiac Arrest

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AVOID EXCESSIVE VENTILATION!

• Excessive ventilations are harmful for many reasons:
  – Impair venous return
  – Decreases CPP
  – Barotrauma
  – Gastric insufflation
  – Limited cardiac output means there is less capacity for gas exchange. Added ventilations are fruitless
AVOID EXCESSIVE VENTILATION!

• The proper rate is **8-10 breaths/minute** if dead, **10-12 breaths/minutes** if respiratory arrest only.

• This is **6-8 seconds/breath** if dead or **5-6 seconds/breath** if respirator arrest only.

• If you don’t count this out, YOU WILL HYPERVENTILATE!
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Adult Cardiac Arrest

Shout for Help/Activate Emergency Response

Start CPR
- Give oxygen
- Attach monitor/defibrillator

2 minutes

Check Rhythm
- If VF/VT Shock

Drug Therapy
- IV/IO access
- Epinephrine every 3-5 minutes
- Amiodarone for refractory VF/VT

Consider Advanced Airway
- Quantitative waveform capnography

Continuous CPR

Return of Spontaneous Circulation (ROSC)
- Post-Cardiac Arrest Care
- If VF/VT Shock

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Waveform Capnography

• Continuous quantitative waveform capnography (End-Tidal CO2 or ETCO2) is now recommended throughout the periarrest period.
• Think of this as exhaust from a car
• Capnography helps determine quality of compressions, ET tube placement, and appropriate ventilation rates post-resuscitation
• Many devices commercially available both as nasal prongs and as a vent circuit interface.
Waveform Capnography

*notice difference in readings as compressions improve, then when ROSC spikes capnography readings well above normal from sudden expulsion of CO$_2$ build-up after ROSC
AHA 2010 ACLS Guideline

Adult Cardiac Arrest

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2 minutes

Check Rhythm
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Return of Spontaneous Circulation (ROSC)

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Quantitative waveform capnography

Treat Reversible Causes

Continuous CPR

Monitor CPR Quality

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- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary
Correct Shock Energy

• Monophasic vs Biphasic?
• Rectilinear vs Truncated Exponential?!?!
• Some rhythms more sensitive to electricity
• FIND THE ENERGY SETTING and TURN IT ALL THE WAY UP!
• FIND THE SYNC BUTTON and TURN IT ON!
• Remember: Stacked shocks are long gone
AHA 2010 ACLS Guideline

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- Hypercapnia, hypercapnea
- Hyperoxic acidosis
- Hyper- to hypokalemia
- Hypothermia
- Tension pneumothorax
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- Thrombosis, pulmonary
- Thrombosis, coronary
Drugs in ACLS 2010 Guidelines

- Remember that NO DRUG has been shown to improve outcomes in cardiac arrest.
- Epinephrine/Vasopressin doses unchanged.
- Recent study on Epinephrine in cardiac arrest shows more survival to hospitalization but worse functional outcomes. (ALERT: this is not yet reflected in ACLS guidelines)
Drugs in ACLS 2010 Guidelines

• Adenosine for WIDE complex tachycardia
  – This is controversial
  – Dose same as before (6mg, then 12mg if needed)

• Epinephrine/Dopamine for bradycardia
  – Works VERY well!
  – Start at 2-10 mcg/min. Titrate to effect

• Atropine for PEA/Asystole
  – Downgraded again
Advanced Airway

• ALCS courses now teach and test on nasopharyngeal airway (NPA) and oropharyngeal airway (OPA) placement but NOT direct laryngoscopy for endotracheal tube (ETT) placement.
• OPA is measured mouth to jaw
• NPA is measured nose to ear
• ALWAYS weigh the need for an advanced airway.
AHA 2010 ACLS Guideline

Adult Cardiac Arrest

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Check Rhythm

Post-Cardiac Arrest Care

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Intraosseous Line

• AHA, European Resuscitation Council, and ILCOR all endorse the IO approach
• “if intravenous access is difficult or impossible the provider should consider the intraosseous route”
• Several commercially available products:
  – Standard needle
  – BIG gun
  – EZ-IO
Steps for IO insertion

- Steps for proximal tibia insertion are illustrated on the inside of each driver case.
- Proximal humerus and distal tibia may also be used.
- Pressure infusion on conscious patients will require 20-40mg. 2% Lidocaine infused after starting IO (1-2cc’s)
Adult Immediate Post-Cardiac Arrest Care

1. Return of Spontaneous Circulation (ROSC)

2. Optimize ventilation and oxygenation
   - Maintain oxygen saturation ≥94%
   - Consider advanced airway and waveform capnography
   - Do not hyperventilate

3. Treat hypotension (SBP <90 mm Hg)
   - IV/IO bolus
   - Vasopressor infusion
   - Consider treatable causes
   - 12-Lead ECG

5. Consider induced hypothermia

4. Follow commands?
   - Yes
   - STEMI OR high suspicion of AMI
   - Coronary reperfusion

8. Advanced critical care

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Doses/Details

Ventilation/Oxygenation
Avoid excessive ventilation. Start at 10-12 breaths/min and titrate to target PETCO₂ of 35-40 mm Hg. When feasible, titrate FiO₂ to minimum necessary to achieve SpO₂ ≥94%.

IV Bolus
1-2 L normal saline or lactated Ringer's. If inducing hypothermia, may use 4°C fluid.

Epinephrine IV Infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

Dopamine IV Infusion:
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Norepinephrine
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Oxygenation

- Excessive Oxygen in unnecessary and may be harmful
- Can act to vasoconstrict coronary arteries
- After ROSC, O2 sats should be monitored and titrated to \( \geq 94\% \)
- Supplementary O2 is NOT needed if no respiratory distress or when O2 sat is \( \geq 94\% \) in periarrest or ROSC patients.
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Therapeutic Hypothermia

• 2 landmark multi-center RCT’s showed a HUGE benefit to therapeutic hypothermia, many other smaller studies have followed
• Clear benefit for *comatose* survivors of *witnessed, v-fib* arrest
• Other types of arrest are less clear
• Use your judgment, consult with the experts
Therapeutic Hypothermia

• Goal temperature is 33 degrees celcius
• Cool ASAP for 24 hrs
• Your hospital/ICU should have a protocol, if not you can easily find one online.
Strongly Consider STEMI

• As many as ½ of cardiac arrest patient are due to coronary ischemia.
• The post resuscitation EKG may not show a STEMI
• Consult cards on every one
THE END

Questions?