ACLS Electrical Therapies

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Emergency Medicine
Objectives

- ACLS = Perfusion
- Approach to patients
- Rhythms to Defibrillate
- AEDs
- Cardioversion
- Pacing
- Questions
ACLS = Perfusion !!!

- Adequate blood flow and oxygen delivery to vital organs
- Measures of perfusion:
  - Blood pressure
  - Pulse
  - End organ complaints:
    - Mental status
    - Chest pain
    - Shortness of Breath
    - Renal Output
Patient condition

- **STABLE**
  - + PERFUSION
  - + pulse
  - + BP

- **UNSTABLE**
  - POOR/ NO PERFUSION
  - Weak / no pulse
  - Weak /absent BP
  - Poor mental status
  - CP
  - SOB
Rhythms

- Perfusing rhythms: have pulse = stable (another lecture)
- Poorly perfusing rhythms = end organ complaints:
  - Low BP, CP, SOB
- NON – perfusing rhythms:
  - NO PULSE !!!!, NO BP, NO MS
1. No movement or response

2. PHONE 911 or emergency number
   Get AED
   or send second rescuer (if available) to do this

3. Open AIRWAY, check BREATHING

4. If not breathing, give 2 BREATHS that make chest rise

5. If no response, check pulse:
   Do you DEFINITELY feel pulse within 10 seconds?

5A. Definite Pulse
   - Give 1 breath every 5 to 6 seconds
   - Recheck pulse every 2 minutes

6. No Pulse
   - Give cycles of 30 COMPRESSIONS and 2 BREATHS
   until AED/defibrillator arrives, ALS providers take over, or victim starts to move
   - Push hard and fast (100/min) and release completely
   - Minimize interruptions in compressions

7. AED/defibrillator ARRIVES

8. ...
Ventricular Fibrillation

- Ventricles not contracting
- No Cardiac Output
- NO pulse or perfusion
Ventricular Tachycardia

- NO pulse = V FIB
- NO perfusion
- SAME problem
ACLs
Pulseless
Arrest
Algorithm

1. PULSELESS ARREST
   - BLS Algorithm: Call for help, give CPR
   - Give oxygen when available
   - Attach monitor/defibrillator when available

2. Check rhythm
   - Shockable rhythm?

3. Shockable
   - Give 1 shock
     - Manual biphasic: device specific (typically 120 to 200 J)
     - Note: If unknown, use 200 J
     - AED: device specific
     - Monophasic: 360 J
     - Resume CPR immediately
   - Check rhythm
     - Shockable rhythm?

4. Shockable
   - Give 5 cycles of CPR
   - Check rhythm
     - Shockable rhythm?

5. Shockable
   - Give 5 cycles of CPR
   - Check rhythm
     - Shockable rhythm?

6. Shockable
   - Continue CPR while defibrillator is charging
     - Give 1 shock
       - Manual biphasic: device specific (same as first shock or higher dose)
       - Note: If unknown, use 200 J
       - AED: device specific
       - Monophasic: 360 J
     - Resume CPR immediately after the shock
     - Consider antaryrhythmics: give during CPR
       - Before or after the shock
     - adenosine (30 mg IV/IO once, then consider additional 150 mg IV/IO once or 50 mg IV/IO every 2 min)
     - lidocaine (1 to 1.5 mg/kg IV/IO first dose, then 0.5 to 0.75 mg/kg IV/IO, maximum 3 doses or 3 mg/kg)
     - Consider magnesium, loading dose 1 to 2 g IV/IO for torsades de points
     - After 5 cycles of CPR, go to Box 5 above

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     - After 5 cycles of CPR, go to Box 5 above

9. Not Shockable
   - Asystole/PEA

10. Resume CPR immediately for 5 cycles
    - When IV/IO available, give vasopressor
      - Epinephrine 1 mg IV/IO
      - Repeat every 3 to 5 min
      - May give 1 dose of vasopressin 40 U IV/IO to replace first or second dose of epinephrine
    - Consider atropine 1 mg IV/IO for asystole or slow PEA rate
      - Repeat every 3 to 5 min (up to 3 doses)

11. Check rhythm
    - Shockable rhythm?

12. Shockable
    - If asystole, go to Box 10
    - If electrical activity, check pulse. If no pulse, go to Box 10
    - If pulse present, begin postresuscitation care

13. Not Shockable
    - Go to Box 4

During CPR
- Push hard and fast (100/min)
- Ensure full chest recoil
- Minimize interruptions in chest compressions
- One cycle of CPR: 30 compressions then 2 breaths; 5 cycles ~2 min
- Avoid hyperventilation
- Secure airway and confirm placement
- After an advanced airway is placed, rescuer no longer deliver "cycles" of CPR. Give continuous chest compressions without pauses for breaths. Give 8 to 10 breaths/minute. Check rhythm every 2 minutes
- Rotate compressors every 2 minutes with rhythm checks
- Search for and treat possible contributing factors:
  - Hypovolemia
  - Hypoxia
  - Hypothermia
  - Hypotension
  - Hypocalcemia
  - Tension pneumothorax
  - Tension pneumothorax
  - Thrombosis (coronary or pulmonary)
  - Trauma
V FIB/ pulseless VT treatment

• Defibrillate
  – Biphasic: 120-200 joules
  – Monophasic: 360 joules

  – No stacked shocks
  – CPR for 2 minutes
  – Minimize interrupting compressions!
What’s New in Defibrillation?


Biphasic waveform defibrillators: Different waveforms: acceptable
- Monophasic (DpSn) (A) OLDER
- Seldom used: monophasic (TrEx)
- Multiple new brands: biphasic (B and C)
- Biphasic shocks achieve a higher level of defibrillation on first shock (95%)
- Biphasic uses less energy

All are currently acceptable

A= monophasic (damped sinusoidal [Edmark])
B= biphasic (quasisinusoidal [Gurvich])
C= biphasic (truncated exponential)
Background: Defibrillation and Time

• Approximately 50% survival after 5 mins
• Survival reduced by 7% -10% per minute if no CPR; but only 3 - 4 % with CPR.
• Rapid defibrillation is key
• CPR prolongs VF
• slows deterioration
Probability of Survival Is Related to 2 Intervals:
(1) Collapse to Defibrillation and
(2) Collapse to CPR

Probability of survival to hospital discharge

Pulseless Arrest Sequence

- Assess, activate 911, breaths, CPR...
- 1 shock: 120-200 biphasic/360 monophasic
- CPR 5 cycles = 2 mins
- Check rhythm
- CPR
- 1 shock (same or higher)
- CPR 2 mins
- Drugs = Pressors (Epi or Vasopress)
Continued

- CPR 2 mins
- Rhythm check
- Shock same or higher
- CPR
- Antiarrhythmics (Amio, Lido, Procainamide)
- CPR
Operation of AEDs:
4 Universal Control Steps

1. POWER ON the AED
2. ATTACH pads
   ( stop CPR)
3. ANALYZE rhythm
4. SHOCK (if advised)
Know your AED
Monomorphic V Tach With pulse but UNSTABLE (BP= 70)

• Synchronized CARDIOVERSION
  – Monophasic 100, 200 joules
  – Biphasic 120 joules (machine does not go higher than 200)
    – Flip switch to allow synch (this is a “soft button” on the Zoll)
Supraventricular Tachycardia
Atrial Flutter
# Synchronized cardioversion

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<th>Mono</th>
<th>Biphasic</th>
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Synchronized Cardioversion

- Premedicate with both sedative and analgesic if appropriate

- **Sedatives**
  - Diazepam
  - Midazolam
  - Barbiturates
  - Etomidate
  - Ketamine

- **Analgesics**
  - Fentanyl
  - Morphine
  - Meperidine
Bradycardia Algorithm

1. BRADYCARDIA
   Heart rate <60 bpm and inadequate for clinical condition

2. • Maintain patent airway; assist breathing as needed
   • Give oxygen
   • Monitor ECG (identify rhythm), blood pressure, oximetry
   • Establish IV access

3. Signs or symptoms of poor perfusion caused by the bradycardia?
   (eg, acute altered mental status, ongoing chest pain, hypotension or other signs of shock)

4A. Observe/Monitor

4. Adequate Perfusion

4. Poor Perfusion
   • Prepare for transcutaneous pacing; use without delay for high-degree block
     (type II second-degree block or third-degree AV block)
   • Consider atropine 0.5 mg IV while awaiting pacer. May repeat to a total dose of 3 mg. If ineffective, begin pacing
   • Consider epinephrine (2 to 10 μg/min) or dopamine (2 to 10 μg/kg per minute)
     infusion while awaiting pacer or if pacing ineffective

5. Reminders
   • If pulseless arrest develops, go to Pulseless Arrest Algorithm
   • Search for and treat possible contributing factors:
     - Hypovolemia
     - Hypoxia
     - Hydrogen ion (acidosis)
     - Hypo-/hyperkalemia
     - Hypoglycemia
     - Hypothermia
     - Toxins
     - Tamponade, cardiac
     - Tension pneumothorax
     - Thrombosis (coronary or pulmonary)
     - Trauma (hypovolemia, increased ICP)

6. • Prepare for transvenous pacing
   • Treat contributing causes
   • Consider expert consultation
Pacing

- Symptomatic Bradycardia with pulse
- High degree AV block
  - 2\textsuperscript{nd} degree type II
  - 3\textsuperscript{rd} degree
Asystole / PEA

- Shock does not help
- Pacing does not help
- Electricity does not help

- Need to look for the reversible cause
Thanks