Cardiac Arrest

Code Commander – One rescuer responsible to oversee that quality compressions and proper ventilations are being performed.

MCMAID – a prioritized sequence consisting of:

- **M** = Metronome (100/min)
- **C** = Chest compressions (focus on rate, recoil and depth)
- **M** = Monitor (AED or Manual set to max joules)
- **A** = Airway (OPA, ensures patency, NON-REBREATHER MASK @ 15/LPM)
- **I** = Intravenous or Intraosseous access
- **D** = **M**ay or **M**ay **N**ot give drugs (Epi, Amiodarone). If you are going to give drugs, be ready to administer and monitor timing for repeat doses.

### EMERGENCY MEDICAL RESPONDER (EMR) / EMERGENCY MEDICAL TECHNICIAN (EMT)/ADVANCED EMT (AEMT)/INTERMEDIATE / PARAMEDIC

- **Establish** that the patient is unresponsive, and not breathing normally
- **Check** for DNR bracelet, dependent lividity, rigor mortis
- **Perform Effective Chest compressions**
  - Push hard and fast 100-120 compressions per minute
  - Compress the chest 5-6 cm
  - Allow for complete chest recoil
  - Transport of a patient in cardiac arrest is not indicated except in unusual circumstances. Medical Control must be involved in this decision. Manual chest compression is ineffective in a moving vehicle.
- **Defibrillate**:
  - Apply and activate the AED as soon as possible after starting chest compressions.
- **Manage the airway**
  - Head tilt/chin lift (jaw thrust if c-spine injury suspected) and oral/nasal airway with non-rebreather mask at 15 L/minute.
  - Consider withholding ventilation for the first 6 minutes of the resuscitation if AED indicates shock (or patient is receiving shocks).
  - Non-visualized advanced airway, if approved, if no shock is indicated or 6 minutes of CPR have been performed. (*Endotracheal intubation may only be placed after pulses have returned and are sustained.*)
  - Do not interrupt compressions to place an airway, unless absolutely necessary.
  - Consider ventilation at 30 compressions: 2 ventilations.
  - If there is ROSC (Return of Spontaneous Circulation, i.e. pulse achieved), provide the following supportive interventions:
    - Support ventilation at 10-12 breaths/minute. If ETCO2 available, titrate ventilations to ETCO2 of 35-45 mmHg unless patient factors prompt more individualized treatment.
    - Titrate oxygen therapy to the lowest level required to maintain an oxygen saturation greater than 93%
    - May consider Endotracheal intubation if airway not controlled and ROSC achieved and maintained.
• If trained and approved, get 12 lead EKG**. If unable to interpret 12 lead EKG, transmit EKG to hospital.

** 12 lead EKG is an additional skill at the EMT & AEMT level requiring additional training approved by the Medical Director and State Approval

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** ADVANCED EMT (AEMT)/ INTERMEDIATE / PARAMEDIC **

- Basic CPR and appropriate AED use is the most important
- Initiate IV/IO** NS, if approved, without interrupting CPR and run wide open if no signs of CHF.

** Contact Medical Control for the following:**
- Additional orders

** INTERMEDIATE / PARAMEDIC **

- Basic CPR and appropriate defibrillation are most important.
- Initiate cardiac rhythm monitoring and analysis.
- Proceed to the respective protocols for:
  - Asystole/Pulseless Electrical Activity
  - Ventricular Fibrillation/Pulseless Ventricular Tachycardia (VF/PVT)
- Asystole/PEA
  - If Asystole appears on the monitor, confirm true asystole
    - Check on/off switches
    - Check leads
    - Check gain and sensitivity settings
    - Confirm asystole in 2 or 3 leads
  - Identify and correct reversible causes: The H’s and T’s
    - This applies mostly to PEA, but to a lesser extent, asystole, as well.
    - The Hs (treatment orders are in parentheses)
    - Hypovolemia
      - (Infuse Normal Saline wide open)
    - Hypoxia
      - (Administer high-flow oxygen and perform ventilation: do not hyperventilate)
    - Hydrogen Ion, i.e. acidosis
      - (Perform ventilation, EMT-P: Consider Sodium Bicarbonate 1 amp IV)
    - Hyperkalemia
      - (EMT-P: Consider 10 ml Calcium Chloride 10% IV over 2 – 5 minutes. May repeat X 1)
      - (EMT-P: Consider Sodium Bicarbonate 1 amp IV)
      - (EMT-A/I/P: Albuterol nebulizer treatment with 1 – 2 Unit Doses)

** IO is an additional skill at the AEMT level requiring additional training approved by the Medical Director and State Approval.**
- Hypokalemia
  - (Even if hypokalemia is suspected, it is not treated in the field.)
- Hypothermia
  - (See Hypothermia & Frostbite Guidelines)
- Hypoglycemia
  - (Administer Dextrose IV- see hypoglycemia protocol)

The Five Ts (treatment orders are in parentheses)

- Tablets
  - (See Toxic Exposure & Overdose Guidelines)
- Tamponade
  - (EMT-P: Pericardiocentesis if trained and approved)
- Tension pneumothorax
  - (Intermediate/Paramedic- Perform needle decompression)
- Thrombosis, cardiac i.e. myocardial infarction
  - (No specific prehospital treatment available; cath lab)
- Thrombosis, pulmonary i.e. pulmonary embolism
  - (No specific prehospital treatment available)
  - May or May Not give Epinephrine\(^\text{18}\) (1:10,000 or 1:1,000) 1 mg IV/IO every 3-5 minutes.

- VFib/Pulseless VT
  - Defibrillate according to manufacturer’s recommendation (if recommendation unknown, defibrillate at highest power setting). Have defibrillator charged prior to checking rhythm to reduce time of CPR interruption.
  - Resume CPR immediately for 2 minutes. Do not check for pulse before 2 minutes.
  - Defibrillate according to manufacturer’s recommendation (if recommendation unknown, defibrillate at highest power setting).
  - Resume CPR immediately for 2 minutes
  - May or May Not give Epinephrine\(^\text{1}\) 1 mg (10 ml of 1:10,000 or 1 ml of 1:1,000) IV/IO every 3-5 minutes
  - If VT/VF persists, defibrillate according to manufacturer’s recommendation every 2 minutes with continuous CPR between defibrillation. After the third defibrillation attempt, may consider Double Sequential External Defibrillation (if two defibrillators are available, see protocol).

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\(^{18}\) Epinephrine IV during cardiac arrest has been shown to improve the chance of getting a pulse back and getting admitted to the hospital, but survival to hospital discharge is unchanged compared to no epinephrine. A study looking at data from 2004-2007 (Swor R, Lucia V, McQueen K, Compton S. “Hospital costs and revenue are similar for resuscitated out-of-hospital cardiac arrest and ST-segment acute myocardial infarction patients.” Acad Emerg Med. 2010 Jun;17(6):612-6.), showed the median hospital revenue from cardiac arrest patients admitted to the hospital was $17,334. Although epinephrine may seem inexpensive, the $20,000 plus dollars (inflation) that the hospitalization costs the family and their insurance, without improved survival, may not be the best use of resources. AHA 2015 Recommendation—Updated Standard—dose epinephrine (1 mg every 3 to 5 minutes) may be reasonable for patients in cardiac arrest (Class IIb, LOE B-R).
- Anti-arrhythmic
  - May or May Not give Amiodarone\(^{19}\) 300 mg IV bolus; may repeat 150 mg IV x 1.
  
  Or
  - May or May Not give Lidocaine 100 mg IV bolus (1.5 mg/kg); may give 50 mg (0.75 mg/kg) every 5-10 minutes times two doses (max total 3 mg/kg).
  - Magnesium Sulfate (Paramedic only) 2 g IV bolus only for Torsades de Pointe, may repeat in 5-15 minutes x 1 if not resolved.
  - If chronic dialysis patient and suspected hyperkalemia
    - EMT-P: Consider 10 ml Calcium Chloride 10% IV over 2-5 minutes. May repeat X 1
    - EMT-P: Consider Sodium Bicarbonate 8.4% 1 amp IV (must flush line before and after Sodium Bicarbonate use to avoid medication interaction)

Contact Medical Control for the following:
- Additional orders

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Contact Medical Control for the following:
Medical Control may terminate resuscitation by other criteria, may advise other efforts or may order transport. DO NOT INITIATE TRANSPORT OF A PATIENT IN CARDIAC ARREST WITHOUT MEDICAL CONTROL APPROVAL.

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\(^{19}\) Amiodarone IV during VFib cardiac arrest has been shown to improve the chance of getting a pulse back and getting admitted to the hospital, but survival to hospital discharge is unchanged compared to no amiodarone. **AHA 2015 Recommendations—Updated** Amiodarone may be considered for VF/pVT that is unresponsive to CPR, defibrillation, and a vasopressor therapy (Class IIb, LOE B-R).

“Amiodarone, Lidocaine or Placebo in Out-of-Hospital Cardiac Arrest” by ROC, NEJM April 2016 (online ahead of publish) showed no survival advantage of Amiodarone or Lidocaine over Placebo.