Cardiac Arrest

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

MCMAID – a prioritized sequence consisting of:
1. M = Metronome (100/min)
2. C = Chest compressions (focus on rate, recoil and depth)
3. M = Monitor (AED or Manuel set to max joules)
4. A = Airway (OPA, ensures patency, NON-REBREATHER MASK @ 15/LPM)
5. I = Intravenous or Intraoesous access
6. D = May or May Not 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**
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)
      - 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)

** IO is an additional skill at the AEMT level requiring additional training approved by the Medical Director and State Approval.
• Tension pneumothorax  
  o (Intermediate/Paramedic- Perform needle decompression)
• Thrombosis, cardiac i.e. myocardial infarction  
  o (No specific prehospital treatment available; cath lab)
• Thrombosis, pulmonary i.e. pulmonary embolism  
  o (No specific prehospital treatment available)
  o **May or May Not give Epinephrine**\(^1\) (1:10,000 or 1:1,000) 1 mg IV/IO every 3-5 minutes.
• VFib/Pulseless VT  
  o 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.  
  o Resume CPR immediately for 2 minutes. Do not check for pulse before 2 minutes.  
  o Defibrillate according to manufacturer’s recommendation (if recommendation unknown, defibrillate at highest power setting).  
  o Resume CPR immediately for 2 minutes  
  o **May or May Not give Epinephrine**\(^1\) 1 mg (10 ml of 1:10,000 or 1 ml of 1:1,000) IV/IO every 3-5 minutes  
  o 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).  
  o **Anti-arrhythmics**  
    - **May or May Not give Amiodarone**\(^2\) 300 mg IV bolus; may repeat 150 mg IV x1.  
      **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  
      o EMT-P: Consider 10 ml Calcium Chloride 10% IV over 2 – 5 minutes. May repeat X 1  
      o EMT-P: Consider Sodium Bicarbonate 8.4% 1 amp IV (must flush line before and after Sodium Bicarbonate use to avoid medication interaction)

---

\(^1\) 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, Compston 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 Ib, LOE B-R).

\(^2\) 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 Ib, 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.**
Contact Medical Control for the following:
• Additional orders

**Termination of Resuscitation**
If at least 20 minutes of resuscitation have occurred without return of pulses, terminate resuscitation (without Medical Control Contact) if all three of the following are present:
• Cardiac Arrest unwitnessed by EMS
• No shock by automated defibrillator or manual defibrillator
• No pulse without CPR at any time during resuscitation
If the patient does not meet all these criteria, contact Medical Control for further direction.

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.