Cardiac Arrest – General

This protocol should be followed for adult cardiac arrests. Medical cardiac arrest patients undergoing attempted resuscitation should not be transported unless return of spontaneous circulation (ROSC) is achieved, transport is ordered by Medical Control, or otherwise specified in protocol.

- If an arrest is of a known traumatic origin, refer to the **Traumatic Arrest -Treatment Protocol**.
- If it is unknown whether the arrest is traumatic or medical, and the patient does not meet dead on scene criteria per **Dead on Scene Termination of Resuscitation-Procedure Protocol**, start CPR and continue with this protocol.
- If patient is hypothermic refer to **Hypothermia/Frostbite-Treatment Protocol** for warming techniques when applicable.
- Patients displaying a Do Not Resuscitate (DNR) order, bracelet, or necklace; or valid Michigan Physician Orders for Scope of Treatment (MI POST) – follow **DNR-Procedure Protocol** or **MI-POST-Procedure Protocol** accordingly.

- Cardiac arrest patients undergoing resuscitation should only be moved if the scene is unsafe, the physical location of the patient does not permit appropriate treatment, or under a direct medical control order.

HIGH QUALITY CPR & DEFIBRILLATION

Focus should be on prompt defibrillation and effective chest compressions.

- CPR and electrical therapy should be consistent with current American Heart Association guidelines. For all patients, **anterior/posterior placement** of pads is preferred and should be used, if possible, and if defibrillation not delayed.
- For all devices defibrillate with energy levels following manufacturers' recommendations.
    - If unknown use the maximum available

Excellent CPR is a priority:

- Keep pauses in CPR to a minimum by checking rhythm when rotating rescuer doing compressions and by avoiding pauses in CPR during airway management and other interventions. CPR pauses should be kept to less than 10 seconds.
- Use End Tidal Carbon Dioxide (ETCO2) monitoring throughout resuscitation.
- CPR initial sequence is CAB (Compressions, Airway, Breathing), except in drowning or obvious respiratory cause which should use the ABC (Airway, Breathing, Compressions) sequence.
- Chest compression rate is 100 to 120/min.
- Chest compression depth for adults is 2 inches (5 cm
- Compressions and ventilations in a ratio of 30:2
- Supraglottic airways are an acceptable primary advanced airway device (i.e., considered at least as good as endotracheal intubation) for patients in cardiac arrest with exceptions noted in the **Airway Management-Procedure Protocol.**

- Transition to continuous compressions with asynchronous ventilations every 6 seconds after placement of an advanced airway.
- Allow complete chest recoil after each compression.
- Minimize interruptions in compressions. Reassess rhythm and pulses every 2 minutes or when prompted by defibrillator.
- Avoid hyperventilation.
- Minimize compression pauses during defibrillation by doing compressions while defibrillator is charging (if device allows) and restart compressions immediately after defibrillation.
- For pregnant patients, a rescuer should manually displace the uterus to the patient's left during CPR.
    - Pregnant patients may be difficult to ventilate due to increased intrabdominal pressure, monitor end tidal CO2 and SpO2
- Change rescuers doing compressions at least every 2 minutes to avoid fatigue.
- After advanced airway placement, and if personnel available, consider positioning 2 personnel (one each side) to quickly alternate in compressions (100 per person then alternate) without pauses.

OPERATIONAL CONSIDERATIONS

1. Prior to advanced airway placement, utilize ventilation periods to visualize the ECG rhythm without compression artifact, this will allow you to plan for the assessment period at the end of the two-minute CPR cycle.
2. If AED has been applied by BLS personnel, skip to appropriate place in protocol that incorporates previous care. ALS personnel should switch to manual defibrillator after initial AED defibrillation or place AED in manual mode.

PROCEDURE

1. Request additional assistance, as needed, and initiate ALS response, if available.
2. Confirm Arrest
    a. Assess breathing (cardiac arrest patients may have gasping or agonal breathing).
    b. Check a carotid/femoral pulse for not more than 10 seconds. If uncertain if pulse is present, initiate CPR.
    c. Patients with Left Ventricular Assist Device (LVAD) **refer to LVAD- Procedure Protocol**
3. Initiate CPR or continue CPR; apply and use AED/defibrillator (per **Electrical Therapy-Procedure Protocol**) as soon as available.
    a. For refractory v-fib after 3 shocks, consider double sequential defibrillation per **Double Sequential Defibrillation-Procedure Protocol** (MCA Optional Protocol)
4. Ensure high quality CPR
    a. Manual chest compressions remain the standard of care for the treatment of cardiac arrest. Mechanical chest compression devices may only be used as alternative to conventional CPR in specific settings where the delivery of high-quality manual compressions may be challenging or dangerous for the

provider (e.g., inadequate numbers of rescuers available, CPR during hypothermic cardiac arrest, CPR in a moving ambulance). See **Mechanical Chest Compression Device-Procedure Protocol** (MCA Optional Protocol)

b. An impedance threshold device may be utilized during CPR, if available. Device should be discontinued immediately upon return of spontaneous circulation. See **Impedance Threshold Device-Procedure Protocol** (MCA Optional Protocol)

c. An FDA-approved Active Compression-Decompression CPR device may be used, if available, in accordance with manufacturer's instruction for use and should be used in conjunction with an ITD (see **Active Compression-Decompression-Procedure Protocol**)

5. Establish a patent airway, maintaining C-Spine precaution if indicated, using appropriate airway adjuncts and high flow oxygen**.** See **Airway Management-Procedure Protocol.**
   a. Initiate bag-valve-mask ventilation
      i. 2-person bag-valve-mask ventilation with oral airway should be used
      ii. If only 2 rescuers, rescuer performing compressions can squeeze bag while 2nd rescuer maintains face to mask seal with both hands.
   b. Consider advanced airway (supraglottic or endotracheal) placement without interrupting chest compressions to allow for continuous compressions.
      i. Confirm placement through EtCO2 and physical examination
      ii. Ventilations delivered asynchronously at 10 breaths per minute or 1 breath every 6 seconds when using an advanced airway.
6. Reassess ABC's as indicated by rhythm or patient condition change. Pulse checks should take no more than 10 seconds. If no pulse after 10 seconds, assume pulselessness, continue CPR beginning with compressions.
7. Continuously monitor $EtCO_2$ per MCA selection in **End-Tidal Carbon Dioxide Monitoring-Procedure Protocol**.
   a. EtCO2 of 0 is indicative of failed airway.
   b. If EtCO2 is <10 mmHG, attempt to improve CPR quality. If CPR quality good, may indicate futility state.
   c. Monitor EtCO2 for trends and indications of patient status.
8. Start an IV/IO **NS** or **LR** KVO. If IV is attempted and is unsuccessful, after 2 attempts start an IO line per **Vascular Access & IV Fluid Therapy-Procedure Protocol.**
   a. Give one liter **NS** or **LR** bolus, monitor for pulmonary edema. May repeat bolus as necessary to a maximum of 2 liters.
9. Administer **epinephrine** 1 mg/10 ml administering 1 mg IV/IO every 3 to 5 minutes.
10. Administer antidysrhythmic according to rhythm check
    a. For Ventricular Fibrillation (VF, pulseless Ventricular Tachycardia (VT), or multiple AED defibrillations, per MCA selection, administer **amiodarone** 300 mg IV/IO or **lidocaine** 1 mg/kg IV/IO

Per MCA Selection

☑ **amiodarone** 300 mg IV/IO (May repeat once 150 mg IV/IO)

☐ **lidocaine** 1 mg/kg IV/IO (May repeat, every 5-10 minutes, 0.5 mg/kg, up to total dose of 3 mg/kg)

b. For suspected torsades de pointes administer **magnesium sulfate** 2 g IV/IO

11. Consider and treat reversible causes of cardiac arrest. NOTE: Sodium bicarbonate and calcium chloride are not to be routinely given in cardiac arrest UNLESS clear reason to suspect conditions below.
    a. If known or highly suspected tricyclic antidepressant overdose, administer:
        i. **sodium bicarbonate** 1 mEq/kg IV/IO
    b. If known or highly suspected hyperkalemia (e.g., dialysis patient, EKG changes) administer:
        i. **calcium chloride** (10%) 1 gm/10 mL IV/IO
        ii. FLUSH line with 20 mL **NS** between calcium chloride and sodium bicarbonate administration
        iii. **sodium bicarbonate** 1 mEq/kg IV/IO
    c. Assess for tension pneumothorax or misplaced ETT:
        i. If tension pneumothorax suspected, perform needle decompression per **Pleural Decompression-Procedure Protocol**.
    d. If known or highly suspected opioid overdose
        i. Patent airway and adequate ventilation takes precedence over pharmacological interventions.
        ii. Consider **naloxone** 2 mg IV/IO or 2-4 mg IN refer to **Opioid Overdose Treatment and Prevention-Treatment Protocol**
12. If sustained ROSC is achieved refer to **Return of Spontaneous Circulation-Treatment Protocol**
    a. Reassess for ROSC (check pulses) if $EtCO_2$ abruptly increases by more than 10 mmHg.
13. If ROSC is not achieved, continue resuscitation while contacting Medical Control
    a. BLS/LALS: If ROSC has not been achieved and ALS is not available or is delayed, contact Medical Control after **20 minutes** of high-quality CPR for further direction AND before initiating transport. Continue high quality CPR unless directed otherwise by Medical Control per **Dead on Scene & Termination of Resuscitation Protocol**.
    b. ALS: If ROSC is not present after **30 minutes of ALS time** contact Medical Control for further direction AND before initiating transport.
    c. Continue high quality CPR unless directed otherwise by Medical Control per **Dead on Scene & Termination of Resuscitation Protocol**.

Notes:

1. Chest Compression Fraction (CCF) is the proportion of time during cardiac arrest when compressions are being performed. CCF should be as high as possible, ideally greater than 80% [American Heart Association, ACLS (2020), pg.115].

2. Document tube placement confirmation by $EtCO_2$ and by auscultation as described above and/or use of other MCA approved secondary confirmation device.
3. Identify and communicate to Medical Control potentially reversible causes. Treat EMS reversible causes, using other protocols, as applicable.
    A. Hyper/hypokalemia (known renal failure), other metabolic disorders
    B. Hypothermia
    C. Hypovolemia (including vomiting/diarrhea)
    D. Hypoxia
    E. Hydrogen ion excess (acidosis)
    F. Toxins/ overdose (e.g., beta-blocker or calcium channel-blocker)
    G. Tamponade
    H. Tension pneumothorax
    I. Thrombosis (pulmonary or coronary)
4. Routine use of **sodium bicarbonate** and **calcium chloride** in cardiac arrest is not indicated.
5. If ROSC is achieved refer to **Return of Spontaneous Circulation -Treatment Protocol**
    A. Where available transport to an interventional cardiac catheterization facility, per MCA Transport Protocol

<u>Medication Protocols:</u>
Amiodarone
Calcium Chloride
Epinephrine
Lidocaine
Magnesium Sulfate
Naloxone
Sodium Bicarbonate

Protocol Source/References: Highlights of the 2020 AHA Guidelines Update for CPR and ECC