Treatment Protocol: CARDIAC ARREST **Ref. No. 1210**

Base Hospital Contact: Required prior to transport for all cardiac arrest patients who do not meet criteria for determination of death per *Ref. 814*.

1. For patients meeting *Ref. 814* Section I criteria for determination of death in the field – document Provider Impression as *DOA – Obvious Death*

2. Resuscitate cardiac arrest patients on scene ❶

3. Initiate chest compressions at a rate of 100-120 per min, depth 2 inches or 5 cm ❷
   Minimize interruptions in chest compressions

4. Assess airway and initiate basic and/or advanced airway maneuvers prn ❸❹ *(MCG 1302)*
   Supraglottic airway (SGA), e.g., i-gel is the preferred advanced airway ❺
   Monitor waveform capnography throughout resuscitation ❻

5. Administer high-flow **Oxygen** (15L/min) *(MCG 1302)*

6. Initiate cardiac monitoring *(MCG 1308)*
   Briefly assess rhythm every 2 minutes, minimizing pauses, or continuously via rhythm display technology ❼

V-FIB/PULSELESS V-TACH: ❽

7. **Defibrillate biphasic at 200J** immediately or per manufacturer's instructions
   Repeat at each 2-minute cycle as indicated
   If persistent shockable rhythm after three shocks, change the pad position when feasible ❾

8. Establish vascular access *(MCG 1375)*
   Establish IO if any delay in obtaining IV access

9. Begin **Epinephrine** after defibrillation x2:
   Epinephrine (0.1mg/mL) administer 1mg (10mL) IV/IO
   Repeat every 5 min x2 additional doses; maximum total dose 3mg ❿

   CONTACT BASE to discuss additional epinephrine doses in cases where it may be indicated due to recurrent arrest or conversion to PEA

10. After defibrillation x3 (for refractory or recurrent V-Fib/V-Tach without pulses):
    Amiodarone 300mg (6mL) IV/IO
    Repeat **Amiodarone 150mg (3mL) IV/IO** x1 prn after additional defibrillation x2, maximum total dose 450mg

ASYSTOLE/PEA:

11. **Epinephrine (0.1mg/mL) administer 1mg (10mL) IV/IO**
    Repeat every 5 min x2; administer first dose as early as possible; maximum total dose 3mg ❿

    CONTACT BASE to discuss additional epinephrine doses in cases where it may be indicated due to refractory PEA or recurrent arrest

12. Consider and treat potential causes ⓫

13. **Normal Saline 1L IV/IO rapid infusion**
    Repeat x1 for persistent cardiac arrest
    For suspected hypovolemia, administer both liters simultaneously

14. For patients with renal failure or other suspected hyperkalemia: ⓬
    Calcium Chloride 1gm (10mL) IV/IO
    Sodium Bicarbonate 50mEq (50mL) IV/IO

TERMINATION OF RESUSCITATION:

15. If resuscitative efforts are unsuccessful and the patient does not meet ALL criteria for Termination of Resuscitation in *Ref. 814, Section II.A*., **CONTACT BASE** to consult with Base Physician ❽

RETURN OF SPONTANEOUS CIRCULATION (ROSC):

16. Initiate post-resuscitation care immediately to stabilize the patient prior to transport ⓭⓮

17. For SBP < 90 mmHg:
    Normal Saline 1L IV/IO rapid infusion

    If no response after **Normal Saline 250mL,** or worsening hypotension and/or bradycardia:

    Push-dose Epinephrine – mix 9mL Normal Saline with 1mL Epinephrine 0.1mg/mL (IV formulation) in a 10mL syringe. Administer **Push-dose Epinephrine (0.01mg/mL) 1mL IV/IO** every 1-5 minutes as needed to maintain SBP > 90mmHg ⓰

18. Establish advanced airway prn ❺

19. Raise head of stretcher to 30 degrees if blood pressure allows, otherwise maintain supine

20. Continue low volume ventilations at 10 per minute ⓯

21. Immediately resume CPR if patient re-arrests

22. Perform 12-lead ECG and transmit to the SRC ⓱

23. Check blood glucose
    For blood glucose < 60mg/dL
    Dextrose 10% 125mL IV and reassess
    If glucose remains < 60mg/dL, repeat 125 mL for a total of 250 mL

24. For suspected narcotic overdose: ⑱
    Naloxone 2-4mg (2-4mL) IV/IO/IM/IN (For IN, 1mg per nostril or 4mg/0.1mL IN if formulation available)
    Maximum dose all routes 8 mg

25. Contact **Public Health 213-989-7140** for all submersion incidents involving pools or spas after transfer of patient care in the emergency department or upon termination of resuscitation in the field (this requirement is effective 10/1/21). ⑲

SPECIAL CONSIDERATIONS

❶ Maintaining perfusion with high-quality CPR throughout resuscitation is essential to ensuring good patient outcome. Transporting the patient in cardiac arrest causes interruptions in CPR and reduces CPR quality. Patients who are resuscitated until ROSC on scene have higher neurologically intact survival.

❷ Chest compressions are the most important aspect of cardiac arrest resuscitation. Maintaining continuous chest compressions should take priority over any medication administration or transport.

❸ Hyperventilation reduces venous return and worsens patient outcomes. Both continuous and interrupted (30:2) compressions/ventilations are acceptable. Regardless of ventilation method used, ventilations should be no more frequent than 10 per minute with appropriate volume, just enough to see chest rise.

❹ Bag-mask ventilation (BMV) with a viral filter is the preferred method of airway management. BMV in cardiac arrest has been associated with improved patient outcomes and advanced airway placement should be deferred until after return of spontaneous circulation (ROSC) unless BMV is inadequate. If a decision is made to transport the patient in refractory cardiac arrest, consider advanced airway prior to transport.

❺ Supraglottic airway (SGA), e.g., i-gel is the preferred advanced airway unless specifically contraindicated. Paramedics should use judgment based on patient characteristics, circumstances, and skill level when selecting the advanced airway modality.

❻ $ETCO_2$ should be > 10 with a “box-shaped” waveform during effective CPR. A flat or wavy waveform or $ETCO_2$ < 10 may indicate ineffective compressions or airway obstruction. A sudden increase in $ETCO_2$ is suggestive of ROSC. The waveform can also be used to confirm ventilation rate if an advanced airway or asynchronous ventilation with continuous compressions is used.

❼ If you are able to observe the underlying rhythm during compressions via rhythm display technology, do not pause for the rhythm check. In order to minimize pauses in chest compressions, pulse checks should only be performed during rhythm checks when there is an organized rhythm with signs of ROSC, such as normal capnography or sudden rise in capnography.

❽ Patients in persistent cardiac arrest with refractory V-Fib (persistent V-Fib after 3 unsuccessful shocks) or EMS-witnessed arrest of presumed cardiac etiology may have a good outcome despite prolonged resuscitation. For these patients, resuscitation may be continued on scene for up to 40 minutes, as long as resources allow, in order to maximize the chances for field ROSC, which is strongly associated with improved survival with good neurologic outcome. Earlier transport may be initiated for providers using a mechanical compression device who are transporting a patient to a STEMI Receiving Center (SRC) for extracorporeal membrane oxygenation (ECMO) initiation.

❾ Changing the pad position, called vector change, from anterior-lateral to anterior-posterior or vice versa in patients who do not respond to initial defibrillation attempts, increases the chances of converting to a perfusing rhythm.

❿ Epinephrine may improve outcomes if given early in non-shockable rhythms, but can worsen outcomes early in shockable rhythms, where defibrillation is the preferred initial treatment. Epinephrine is most

likely to be effective if it is given early and after chest compressions have begun. The likelihood of meaningful survival declines after three (3) doses of epinephrine. Resuscitation should continue focused on quality CPR, defibrillation, and identifying reversible causes. Additional doses of epinephrine should only be administered with Base order.

⓫ Potential causes that can be treated in the field include hypoxia, hypovolemia, hyperkalemia, hypothermia, toxins, and tension pneumothorax. Hypoglycemia is a very rare cause of cardiac arrest and should not be assessed until after ROSC. If environmental hypothermia is suspected, resuscitation efforts should not be abandoned until the patient is re-warmed, or after consultation with the Base Physician.

⓬ Treat suspected hyperkalemia with calcium and sodium bicarbonate as soon as possible. The sooner it is administered, the more likely it is to be effective. Flush the line between medication administration.

⓭ Approximately 40% of patients will re-arrest shortly after ROSC. Early indicators of impending re-arrest include falling $EtCO_2$ and progressive bradycardia. Anticipate this decline as the epinephrine administered during the resuscitation begins to lose effect. Fluid resuscitation, vasopressor support, and avoidance of hyperventilation are recommended to decrease the risk of re-arrest.. These steps take approximately 5 minutes and should be initiated immediately after ROSC to stabilize the patient prior to transport to reduce chances of re-arrest en route.

⓮ All cardiac arrest patients, with or without ROSC for whom the decision has been made to transport, shall be transported to the most accessible open SRC if ground transport is 30 minutes or less, as initiation of targeted temperature management and early coronary angiography in a specialty center have been shown to improve outcomes.

⓯ $ETCO_2$ can help guide your ventilation rate; target $ETCO_2$ 35-45 mmHg. Just after ROSC, the $ETCO_2$ may be transiently elevated. This will decrease appropriately with ventilation and does not require hyperventilation to normalize. Persistently elevated $ETCO_2$ and/or “sharkfin” waveform may indicate respiratory failure as cause of the cardiac arrest. Falsely low $ETCO_2$ measurements can occur if there is a leak with BMV or shock.

⓰ **Push-dose Epinephrine** is appropriate for non-traumatic shock including cardiogenic shock. Additional doses beyond 10mL may need to be prepared for prolonged transports.

⓱ An ECG with STEMI after ROSC requires notification of ECG findings to the SRC.

⓲ Narcotic overdose should be suspected in cases where there is drug paraphernalia on scene or there is a witness report. Pinpoint pupils may be present, but hypoxia during cardiac arrest can cause mydriasis (dilated pupils) instead.

⓳ EMS is assisting the Department of Public Health (DPH) in promptly investigating fatal or nonfatal drownings at public pools or spas in order to ensure safety can be verified before reopening. Contacting the on-call DPH officer will allow timely investigation of these incidents and prevent future incidents.