PURPOSE:

To provide direction for BLS and ALS responders for resuscitation of patients in cardiopulmonary arrest utilizing High Performance CPR, minimizing interruption in chest compressions using the Pit Crew approach.

INTRODUCTION:

Cardiovascular Disease is the single greatest cause of death in the United States. Each year upwards of a quarter million people receive attempted resuscitation from cardiac arrest by EMS Personnel. The prognosis for the majority of these arrests remains poor.

Scientific studies demonstrate when CPR is performed according to guidelines, the chances of successful resuscitation increase substantially. Minimal breaks in compressions, full chest recoil, adequate compression depth, and adequate compression rate are all components of CPR that can increase survival from cardiac arrest. Together, these components of CPR create High Performance CPR (HP CPR)

There are 10 main principles of HP CPR:

1. EMT’s and EMR’s own CPR
2. Minimize interruptions in CPR at all times
3. Ensure proper depth of compressions (>2 inches)
4. Ensure full chest recoil/decompression
5. Ensure proper chest compression rate (100-120/min)
6. Rotate compressors every 2 minutes
7. Hover hands over chest during shock administration and be ready to compress as soon as the shock has been delivered
8. Intubate or place advanced airway with ongoing CPR
9. Place IV/IO with ongoing CPR
10. Coordination and teamwork between ALS/BLS responders.

INDICATIONS:

Cardiopulmonary arrest due to the following;

- Asystole
- Pulseless Electrical Activity (PEA)
- Pulseless Ventricular Tachycardia
• Ventricular Fibrillation

CONTRAINDICATIONS:

• Traumatic Arrest
• Pediatric Arrest
• Respiratory Arrest due to unknown etiology (e.g. asthma).
• Drowning
• Obstructed Airway (including partial obstruction due to vomitus)
• Patients with a Left Ventricular Assist Device (LVAD)

DEFINITIONS:

1. HP CPR – High Performance Cardiopulmonary Resuscitation
2. HP CPR Algorithm - Representation of correct treatment choices in response to a patients cardiac rhythm
3. HP CPR Round – The time required to complete 200-230 compressions (approx. 2 minutes), analyze the patients rhythm, and provide a shock (if indicated)
4. Passive Oxygen Insufflation (POI) - Method of providing high flow oxygen via a Non-Rebreather Mask with an Oropharyngeal Airway in place with no ventilations during the initial phase of HP-CPR
5. Upstroke Ventilation – Positive Pressure ventilation with a Bag Valve Mask given on the upstroke of every 10th compression. 300-400cc of volume is delivered with no pause in compressions.
6. Pit Crew – The configuration of EMS responders and their defined roles to resuscitate a patient in cardiopulmonary arrest.

POLICY/PROCEDURE: Ideally providers in each EMS agency will use a “pit crew” approach when using this protocol to ensure the most effective and efficient cardiopulmonary arrest care.

A. Rescuer #1 BLS/ALS. Performs a quick assessment and determines unresponsiveness taking no longer than 10 seconds. Moves the patient to a workable area that will accommodate multiple rescuers. Opens the airway utilizing the Head Tilt Chin Lift or the Modified Jaw Thrust (if trauma is suspected) Initiates compressions only (no ventilations). Alternates with Rescuer #2.

B. Rescuer #2 BLS/ALS. Removes (cuts off) the patients shirt. Attaches the AED/Defib pads. Starts metronome (if available). Correctly sizes and inserts an Oropharyngeal Airway. Initiates POI, 15-25 LPM via a Non-rebreather Mask. Defibrillates if indicated. Alternates with Rescuer #1
C. Rescuer #3 BLS (EMR/EMT). Attaches BVM to oxygen and begins 2 person BVM ventilations at the upstroke of every 10th compression which will equal 6 bpm while maintaining a mask seal using the 2 thumbs up technique. Compression Coach assures compressions are being performed at a rate of 100-120 compressions/min and a depth of > then 2 inches. Also monitors for complete recoil of the chest after each compression, and monitors for compressor fatigue. Also checks the 2 min cycle timer and performs defibrillation with the AED if indicated.

D. Rescuer #3 ALS. Attaches BVM to oxygen and begins 2 person BVM ventilations at the upstroke of every 10th compression which will equal 6 bpm while maintaining a mask seal using the 2 thumbs up technique. Attaches ETCO2. Compression Coach assures compressions are being performed at a rate of 100-120 compressions/min and a depth of > then 2 inches. Also monitors for complete recoil of the chest after each compression, and monitors for compressor fatigue. 2 min cycle timer. Attaches the cardiac monitor, interprets rhythm and defibrillates if indicated. IV/IO access. Administers medications. Inserts advanced airway.

E. Rescuer #4 and subsequent rescuers. Takes direction from the team leader. IV/IO access (AEMT/MICP) Insert King Airway (EMT/AEMT/MICP) or ETT (MICP). Administer medications (AEMT/MICP). Logistics. Gathers patient information and medications. Responsible for assuring that the family is receiving care and is at the patient’s side if they desire.

1. CPR Quality. Push hard (> than 2 inches (5cm) and fast (> than 100/min) and allow complete chest recoil.


3. Chest Compressions. Are only interrupted during rhythm checks at the end of every HP CPR round (2 min’s). Better compressions lead to better organ perfusion which leads to better resuscitation. Compression = Organ Perfusion.

4. Decompression. Inadequate decompression compromises both coronary and cerebral blood flow. If decompression is incomplete, compression is not as effective due to inadequate blood volume in the heart and lungs, Decompression = Heart Perfusion.

5. Defibrillation. Defibrillate per ACLS guidelines when indicated. Compressions shall continue while AED/Defibrillator is charging. Hover hands over chest during shock administration and be ready to compress as soon as the shock has been delivered.

6. Metronome. Use a metronome or CPR feed back device if available to ensure that compression rate is 100-120/min.

7. Medications. Perfusion is the mechanism that circulates medications. The better the perfusion, the better the circulation of medications. Good CPR decreases two-fold the amount of time required for epinephrine to reach peak concentrations in circulating blood.

8. Ventilations. Is a vital component of resuscitation, but to much (hyperventilation) can decrease survival. Long ventilations (greater than 1 second per breath) potentially increases the pause (during 30:2) and the amount of time spent without compressions. Even when not interrupting compressions (such as the intubated patient), excessive ventilation prevents the development of negative intrathoracic pressure during the decompression phase, which impedes blood return to the heart.
9. **Pauses.** Limit your pauses, longer pauses in chest compressions = lower chances of a positive outcome. The longer the pause preceding a shock or following a shock, the lower chances of survival.


11. **Mechanical CPR Devices.** Are optional and must be approved by the Nor-Cal EMS Medical Director before being placed into service. If used it is not to be applied before the initial 800 compressions. Pausing compressions to apply the manual CPR Device must be kept to a minimum.

**Transport Decision.** The purpose of HP CPR is to maintain continuous compressions with limited interruption. We know that quality compressions are difficult to maintain while extricating patients, transferring to gurneys, transferring into ambulances, and while transporting. These instances of lower quality compressions and lengthier interruptions in compressions lower the chances of a favorable outcome considerably. If transport of a patient receiving compressions is required and it is safe to do so consider taking 3 additional riders.

1. **Asystole/PEA:** If after 20 minutes of HP CPR and ALS intervention the patient remains in asystole or a PEA < 40 confirmed in 3 leads, with no palpable pulses and no apical heart sounds BHPC shall be made to discuss termination of efforts. If the patient is found to be in Asystole/PEA with a suspected short down time, BHPC should be made as early as possible to discuss H's and T's treatment.

2. **Ventricular Fibrillation / Pulseless Ventricular Tachycardia:** If after 30 minutes of HP CPR and ALS intervention the patient remains in V-fib or pulseless V-tach that has been unresponsive to all treatment modalities BHPC shall be made to discuss termination of efforts.

3. **Hypothermia:** All patients suffering from hypothermia shall be transported to the closest receiving facility where resuscitation can be continued and a core body temperature can be measured.

4. **Pediatrics:** All children 12 years of age or less in cardiac arrest regardless of the rhythm shall be transported to the closest receiving facility.

5. **Maternal Arrest:** Treat mother per appropriate protocol with rapid transport and immediate notification to the receiving facility. Place mother supine and perform Manual Left Uterine Displacement moving the uterus to the patients left side. IV/IO access preferably above the diaphragm. Defibrillation is safe at all energy levels.

6. **Scene Safety:** If the scene is not safe or becomes un-safe at any time the patient shall be transported immediately to the closest receiving hospital assuring safety of the responders and the patient.

7. **Return of Spontaneous Circulation (ROSC):** If ROSC is achieved refer to policy 311. Air transport should be launched from the field as early as possible to minimize delays in transport to a PCI capable facility.
Training. Training shall be completed annually and documented on the annual skills verification form. It is suggested that hands on training that is simple, realistic, and scenario driven be completed monthly. Try to include all neighboring allied agencies.

Documentation. A copy of the completed cardiac arrest evaluation form shall be emailed to spoore@norcalems.org As soon as possible after the incident (preferably within 2 hours) A copy of the patient care report, rhythm strips, and a completed cardiac arrest evaluation form shall be submitted to Nor Cal EMS within 24 hours. This form shall be completed and submitted by all responding agencies.