21. HIGH PERFORMANCE CPR (HPCPR)

a) PURPOSE
To improve the overall survival rate of sudden out-of-hospital cardiac arrest patients within the State of Maryland. High Performance Cardio Pulmonary Resuscitation (HPCPR) employed with Code Resource Management (CRM) is a proven concept based on a team approach that ensures effective and efficient use of EMS resources. This systematic change in treatment and management of cardiac arrest patients is based on research and practices being used in many other high performance EMS systems across the country.

b) INDICATIONS
Patients in cardiac arrest who have reached their 8th birthday.

c) CONTRAINDICATIONS
Patients meeting the criteria for Pronouncement of Death in the Field Protocol
Patients who have not reached their 8th birthday

d) POTENTIAL ADVERSE EFFECTS/COMPLICATIONS
None

e) PRECAUTIONS
None

f) PROCEDURE FOR HIGH PERFORMANCE CPR
The first provider at the patient’s side will assess and initiate compressions.

1) **Effective Compressions** - Manual chest compressions should be initiated immediately upon identification of cardiac arrest, as long as the scene is safe. When compressions are done manually, compressors should be rotated every 2 minutes in order to maintain high-quality compressions. Ideally, one compressor is on each side of the patient’s chest; one person compressing the chest and the other person ready to start. Chest compressions will be performed at a depth of at least two inches allowing for complete recoil of the chest after each compression. Compressions should be accomplished with equal time given for the down and up motion and achieve a rate of 100–120/min.

2) **Continuous Compressions** - Chest compressions will be performed at a rate of 100–120 per minute and will NOT be interrupted during the two-minute cycle for any reason. Other treatments such as ventilations, IV access, or intubation attempts will be done while compressions are ongoing. After completion of a two-minute cycle, a phase to assess pulses and/or defibrillate will be limited to less than 10 seconds.
(3) **Defibrillation** – placement of the defibrillator pads will not interrupt chest compressions

(a) **Automatic External Defibrillation**

The AED will be powered on as soon as the cardiac arrest is confirmed. Do not interrupt chest compressions to remove clothing or place defibrillation pads. If the AED charges after analyzing, chest compressions will be performed while the device charges, then the patient will be “cleared” and defibrillated. Compressors will hover over the patient with hands ready during defibrillation so compressions can start immediately after a shock. Another two-minute cycle of compressions will be immediately performed. Pulse checks will not occur after a shock, but only after the AED prompts “no shock advised.” If no pulse is palpated, or if unsure, immediately perform another two minutes of CPR.

(b) **Cardiac Monitor/Defibrillator**

When a manual defibrillator is in use, it will be charged to the appropriate energy level as the end of the compression cycle nears (approximately 1 minute and 45 seconds into a two-minute cycle). At the end of the two-minute cycle, the patient will be cleared, the rhythm will then be interpreted rapidly, and the patient will either be defibrillated or the defibrillator energy charge will be cancelled. This sequence must be performed within 10 seconds. During this sequence, the compressors will hover over the patient with hands ready. If a shock is delivered, the compressor will immediately resume CPR. Rhythm interpretation will not occur after a shock, but only after the two-minute cycle of CPR is performed. If a shock is not indicated, check for a pulse. If patient remains pulseless, immediately resume HPCPR.

(4) **Ventilations** - Ventilations will be performed without stopping chest compressions. One ventilation will be given every 10th compression during recoil (upstroke). Once an advanced airway is in place, ventilations will be asynchronous with compressions (1 ventilation every 6 to 8 seconds). High performance, continuous compressions remain the priority. Ensure ventilations are adequate with BVM attached to 100% oxygen. Providers will not interrupt compressions to obtain an advanced airway.

(5) **Advanced Life Support** - ALS providers will address defibrillation, IV/IO access, medication administration, and advanced airway placement, as indicated within these protocols; however, the placement of an advanced airway is no longer a focus of cardiac arrest management and will not interrupt chest compressions.

Nasal capnography may be utilized to optimize CPR performance and evaluation of ROSC with use of bag-valve-mask ventilation.
(6) **Return of Spontaneous Circulation (ROSC)** - Implement the Return of Spontaneous Circulation and Neuroprotective Induced Hypothermia Protocol as indicated and transport to the closest Cardiac Interventional Center. Following stabilization, post-ROSC, obtain a 12-lead EKG.

g) **PROCEDURE: CODE RESOURCE MANAGEMENT (CRM)**

Crews should coordinate their duties keeping the call priorities in mind. Intervention priorities are (in order of highest to lowest):

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Compressions
Defibrillation
BLS Airway Adjuncts/ Ventilations
IV/IO Access
Medications
ALS Airway
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The number of personnel on a given incident and the qualifications of those personnel can vary; however, the priorities remain the same. Appropriate crew roles are outlined below:

**2 provider crew:**
Provider 1 – Chest compressions
Provider 2 – Ventilate, attach/operate AED/defibrillator, assume crew leader responsibilities (providers rotate positions every two minutes)
*Roles remain the same even if providers are ALS equipped*

**3 provider crew:**
Provider 1 – Chest compressions
Provider 2 – Ventilate
Provider 3 – Crew Leader, attach/operate AED/defibrillator
(Providers 1 and 2 rotate every two minutes)
*Roles remain the same even if providers are ALS equipped*
**4 provider crew:**
Provider 1 – Chest compressions
Provider 2 – Ventilate
Provider 3 – Attach/operate AED/defibrillator
Provider 4 – Crew leader
(Providers 1, 2, and 3 rotate every two minutes)

**Once first two roles have begun treatment, ALS providers will establish IV/IO and administer medications.**

**Greater than 4 providers** - Utilize the same initial assignments as the four provider crew. The crew leader will assign additional roles such as informing the family of patient status, gathering patient information, and documenting the medical interventions performed on the call. If resources allow, rotate additional providers to do chest compressions to achieve optimal performance.

**Crew leader** - The crew leader will keep time, record interventions performed during the arrest, give compression feedback and ensure rotation of personnel doing compressions every two minutes. Verbal announcements of time should occur at one minute, 30 seconds before reassessment, 15 seconds left, and countdown to reassessment at 10 seconds.