



PRINCE GEORGE'S COUNTY, MARYLAND
FIRE/EMERGENCY MEDICAL SERVICES DEPARTMENT GENERAL ORDER

General Order Number: 05-26	Effective Date: July 1, 2016
Division: Emergency Medical	
Chapter: Code Resource Management	
By Order of the Fire Chief: Marc S. Bashoor	Issue Date: May 1, 2016

POLICY

This General Order standardizes the EMS management of adult cardiac arrest patients by using a "team approach" concept known as Code Resource Management (CRM). This concept is based on peer-reviewed research and best practices throughout the country. The process of CRM is believed to increase the survival rate of patients with sudden out-of-hospital cardiac arrest and has been approved by both the State EMS Medical Director and the Jurisdictional Medical Director.

This General Order contains every aspect of cardiac arrest management from the pre-incident preparation through the post-incident analysis. Upon arrival, EMS providers (a minimum of 6 providers, including 2 ALS providers for the ALS2 response pattern) are assigned specific tasks based upon order of arrival at the patient's side. Each task plays an important role in the overall CRM process with an emphasis being placed on high quality chest compressions with minimal interruptions.

This General Order applies to all Fire/EMS Department personnel involved in any aspect of providing pre-hospital emergency medical care. It is expected that all providers will adhere to the General Order and the outlined performance measures.

DEFINITIONS

Advanced Life Support Provider – EMS providers that are licensed as either a Cardiac Rescue Technician or a Paramedic. If they are the initial providers on scene, they will assume the primary roles in the CRM process (compressor, airway provider, back-up compressor). Rotations within these assignments will continue until additional resources are available. ALS providers will have overall authority of patient care until field termination or transfer of care is completed with emergency department staff. To ensure effective CRM processes are maintained, ALS providers will coordinate overall care and management of the patient with the code coordinator.

Airway Provider – This provider will assume the position at the patient's head and is responsible for interposed ventilations via bag-valve mask with oxygen attached at a rate of 1 breath every 10th compression. If an AED/manual defibrillator has not been applied, the airway provider is responsible for applying and operating it. At the end of a two-minute cycle, this provider is responsible for performing a pulse check on the carotid artery for no more than 10 seconds, and reporting the findings to the team. The airway provider will remain in the airway position until an ALS provider assumes it.

Automatic External Defibrillator (AED) – A device used by first responders/EMS providers to provide emergency defibrillation of a cardiac arrest patient.



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Back-up Compressor – Will apply AED/manual defibrillator (if not already done), and become the time keeper until the arrival of a dedicated code coordinator. They will take over as the compressor after the two-minute cycle of CPR is completed and continue to rotate every two-minutes thereafter. This provider will coordinate with the current compressor and position themselves ready to perform chest compressions without delay; this will typically be on the opposite side of the patient.

Cardiac Arrest Registry to Enhance Survival (CARES) – Database that helps to measure performance and identify how to improve cardiac arrest survival rates in the County.

Code Coordinator – This provider is responsible to keep time, record interventions performed, give compression feedback and coordinate rotation of personnel every two minutes. Verbal announcements of time should occur at 1:00, 1:30, 1:45 and countdown to reassessment at 10 seconds. This provider is responsible for ensuring that the three provider positions of Compressor, Airway Provider and Back-up compressor are always filled. This EMS provider is responsible for coordination of the resuscitation.

Code of Maryland Annotated Regulations (COMAR) Title 30 – A sub-section of Maryland regulations that regulate Emergency Medical Services Operational Programs.

Code Resource Management (CRM) – Team based approach for cardiac arrest, which ensures effective and efficient use of EMS resources.

Compression Fraction – Percentage of time the crew performs chest compressions, compared to the total time of the resuscitation. The compression fraction is typically reported as a percentage of compressions in a given minute.

Compressor – Responsible for completing the initial patient assessment (when first on-scene) and performing chest compressions at a rate of 100-120 a minute at a depth of at least 2 inches. When a metronome is available it should be utilized and the compressor should be in sequence with the metronome at the given rate. At the end of the two-minute cycle of CPR, the compressor will become the back-up compressor unless otherwise directed.

Data – In quality assurance terms, refers to readily available sets of information about a process, treatment, and includes, but is not limited to, such things as run sheets, patient care reports, surveys, and demographics.

Electronic Patient Care Report (ePCR) – A standardized electronic report that has been adopted by the Prince George's County Fire/EMS Department for the intended use of documenting patient assessments and treatment modalities. This report provides data used by the Quality Assurance Program.

Emergency Medical Dispatch (EMD) – A nationally recognized protocol to prioritize medical emergencies for the dispatch of appropriate resources and providing protocol based instructions to the caller before first responders arrive.



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LUCAS2 – Mechanical compression device used to deliver chest compressions to a cardiac arrest patient.

Maryland Medical Protocols for EMS Providers – Protocols that standardize the emergency patient care that EMS providers, through medical consultation, deliver at the scene of illness or injury and while transporting the patient to the closest appropriate hospital. These protocols will help EMS providers anticipate and be better prepared to give the emergency patient care ordered during the medical consultation.

Timekeeper - Provider responsible for monitoring the timing of the two-minute cycles. This will be a responsibility of the Back-up Compressor until the duty is taken over by the Code Coordinator.

Transition Period – The interval between the two-minute cycle of compressions, which should not last more than 10 seconds.

PROCEDURES / RESPONSIBILITIES

I. General Provisions

The goal of CRM is to optimize the available resources through the prioritization of skills. These skills are reflected in order of priority from top to bottom in the inverse triangle below.





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II. Roles and Responsibilities

A. Pre-Arrival Phase

1. Goal is to minimize the time it takes to get the "hands-on chest" by assigning specific interchangeable responsibilities to the first arriving units.
 - a) Assign primary CRM job functions based on "riding positions."
 - b) All personnel are accountable for knowing the duties for all assignment positions.
2. Reduction of "turn-out" time for all responding units.

B. Arrival Phase

1. Providers are to assume CRM roles and responsibilities based on their arrival at the patient's side. The 3 primary CRM positions (Compressor, Airway/AED, Back-up Compressor) will be maintained throughout the duration of the resuscitation.
2. Assignments as providers arrive at the patient's side:
 - a) 1st EMS provider (regardless of certification level) to arrive at patient's right side:
 - (1) Duties: Compressor (primary CRM position)
 - (a) Initial assessment based on simultaneous checking of the patient's Airway, Breathing and Circulation.
 - (b) Move patient to gain 360° access.
 - (c) When in doubt, assume that the patient is in cardiac arrest and immediately begin chest compressions.
 - (d) Begin effective and continuous chest compressions.
 - (i) Rate of 100-120 compressions per minute at a depth of at least 2 inches.
 - (ii) Do NOT interrupt chest compressions during two-minute cycle.
 - (2) Transition period (between two-minute cycle): Will remain in same location and become the back-up compressor (until relieved by additional resources).
 - b) 2nd EMS provider (regardless of certification level) to arrive will go to patient's head.
 - (1) Duties: Airway/AED Provider (primary CRM position)
 - (a) Attach AED/Manual defibrillator (if available). This is the priority when only two EMS providers are on-scene;
 - (i) If using an AED:
 - (a) Powered on as soon as the cardiac arrest is confirmed. Do not interrupt chest compressions to remove clothing or place defibrillation pads.



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- (b) Once AED is in place, stop CPR only while AED analyzes patient.
 - (c) If the AED charges after analyzing, chest compressions will be performed while the device charges, then the patient is to be "cleared" and defibrillated.
 - (d) The compressor is to "hover" hands 6-8" over the patient when the AED is analyzing or shocking the patient and will resume compressions immediately after a shock.
 - (e) Do NOT check for pulse after shock; resume CPR for two-minute cycle.
- (ii) If using a manual defibrillator:
 - (a) Monitor placed in "paddles" mode throughout duration of incident.
 - (b) Charge monitor to the appropriate energy level at 1 minute and 45 seconds of CPR cycle.
 - (c) At two-minutes of CPR cycle, pulse is checked by airway provider, and rhythm is rapidly interpreted.
 - (d) The patient is either defibrillated or the charge is cancelled by pushing the selector knob.
 - (e) This sequence must be performed within 10 seconds.
 - (i) During this sequence, the compressor is to "hover" hands over the patient and will resume CPR after a shock is delivered or if indicated after the charge is cancelled.
 - (f) Rhythm interpretation is not to occur after a shock, but only after the two-minute cycle of CPR is performed. After the two-minute cycle, if a shock is not indicated, check for a pulse. If patient remains pulseless, immediately resume CPR.
- (b) Ventilate
 - (i) Initiate ventilations via Bag Value Mask ventilations with 100% oxygen.
 - (ii) Ventilations will occur without stopping chest compressions. One (1) ventilation is interposed every 10th compression during recoil (upstroke).
 - (iii) Ventilate just enough to allow for chest rise.
 - (iv) Place basic airway (oropharyngeal airway or nasopharyngeal airway) and assess ventilation adequacy, if effective, placement of advanced airway is not a priority.
- (c) Pulse Check at the end of the two-minute cycle
 - (i) Carotid Artery, no more than 10 seconds.
 - (ii) If an AED is used, and advises, "no shock advised," a pulse check is to be done immediately.



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- (2) Transition period: Will remain at airway position unless resources are limited.
 - (a) If limited resources, will rotate to compressor position after pulse checks are completed.
- c) 3rd EMS provider (regardless of certification level) to arrive will assume position on the left side of the patient.
 - (1) Duties: Back-up Compressor (primary CRM position).
 - (a) Timekeeper until arrival of Code Coordinator.
 - (b) Stand-by.
 - (2) Transition period: Alternates with Initial Compressor after a two-minute CPR cycle ends.
 - (a) "Hovers" hands over chest at the end of cycle.
 - (b) After pulse checks and rhythm analysis is completed resumes chest compression.
 - (c) Expectation is to resume chest compressions within 10 seconds.
- d) Code Coordinator – 4th EMS provider to arrive at patient. Typically assumed or designated by the ranking officer (unless ALS provider).
 - (1) Will be timekeeper, record interventions performed during the arrest, give compression feedback and ensure rotation of personnel doing compressions every two minutes.
 - (a) Verbal announcements of time should occur at one minute, 30 seconds before reassessment, 15 seconds left, and countdown to reassessment at 10 seconds.
 - (2) Ensure Compressor, and Back-up Compressor rotates every two minutes, monitoring provider for fatigue.
 - (3) Coordinate application of Lucas2 device (see procedures).
 - (4) Once additional resources arrive on scene, the code coordinator can assign personnel based on the CRM priorities (i.e., Back-up compressor, family liaison).
 - (a) Assign a provider to family members to gather information and provide feedback on the patient's status (if available).
 - (5) Transition period: Will remain as coordinator throughout.



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- e) ALS Providers – Perform ALS assessment and treatment in accordance with established MD protocols, manage patient care with Code Coordinator.

(1) Duties:

- (a) Ensure primary CRM positions are filled.
- (b) ALS treatment priorities:
 - (i) Rhythm determination/defibrillation (if indicated) between cycle intervals.
 - (ii) Initiate IV/IO access.
 - (iii) Administration of medication (as indicated).
 - (iv) Assessment of ventilations/compressions.
 - (a) Achieved through the application of capnography.
 - (v) Advanced Airway placement.
 - (a) Placement of advanced airway is not a priority unless adequate ventilations cannot be maintained by a BVM with simple airway adjuncts. If indicated, the preferred advanced airway is the King airway since it is placed without interrupting compressions.

C. Transition Phase

1. Rotation of providers will occur during transition only.
2. Code Coordinator will assign provider responsibilities prior to the transition period.
 - a) Announce specific time periods:
 - (1) Start Time
 - (2) 1:30 minute – Ensure Back-up provider is in place
 - (3) 1:45 minute – Providers prepare to rotate and notify the ALS provider to charge the defibrillator (if available).
 - (4) 2:00 minute – Transition
 - (a) Compressor stops and will become back-up compressor (if relieved, replacement will become back-up compressor).
 - (b) Back-up compressor becomes primary Compressor and “hovers” hands over the patient’s chest.
 - (c) Airway/AED Provider checks for a carotid pulse (less than 10 seconds), announces findings to team.
 - (i) If a manual defibrillator is used, ALS provider makes determination to “shock” or “no shock.”
 - (a) If shock indicated, patient cleared, shock delivered and resumes CPR.
 - (b) If no shock indicated, CPR resumes.
 - (ii) If AED only, press to analyze and follow prompts from AED instruction.
 - (d) Goal of CPR transition period is to minimize interruption of CPR to less than 10 seconds.



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D. Transportation/Termination of Resuscitation Decision Phase

1. Considerations for transport
 - a) If patient has Return of Spontaneous Circulation (ROSC):
 - (1) Prepare to move patient to transport unit.
 - (2) Ensure LUCAS2 remains in place but OFF.
 - (3) Consult with base station hospital.
 - (a) Transport to Cardiac Intervention Center.
 - (b) If ALS equipped
 - (i) Obtain and transmit 12 Lead ECG.
 - (ii) Start therapeutic hypothermia protocol.
 - (4) Review ROSC check sheet.
 - b) Family members/citizens become unruly.
 - c) Provider's safety is in question.
2. Termination of Resuscitation as indicated in Maryland Protocol for Pre-hospital Providers.

E. Post Incident Phase

1. An informal post incident analysis should be completed after every cardiac arrest call.
 - a) Review of performance measures.
 - b) Effectiveness of CPR/transitions between CPR providers.
 - c) Team communication and decision making.
2. Complete ePCR
 - a) ALS provider upload ECG and monitor data to ePCR via blue tooth.
 - b) Ensure completion of Cardiac Tab on ePCR.
 - c) Upload AED/Cardiac Monitor via DT Express system within one hour of incident.
3. EMS Quality Management Office:
 - a) Review every cardiac arrest and provide feedback to the providers within two weeks of incident.
 - (1) Provider feedback to include the compression rate and the "Compression Fraction."
 - (2) The feedback is provided constructively to allow crews the ability to evaluate their performance and improve.
 - (3) Our goal is to provide CPR 95% of each two-minute cycle and to perform chest compressions at a rate of at least 100 compressions/minutes.
 - b) Evaluate established performance measures.
 - (1) Maintain database to track cardiac arrest trends.
 - (2) Provide quarterly feedback to Department.
 - (3) Provide outcome reports to Fire Chief, Jurisdictional Medical Director and all battalion level supervisors.



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III. Procedures

A. Mechanical CPR – LUCAS2 Device

1. Consideration

- a) The Lucas2 device is retrieved from the unit by an EMS provider not assigned primary role in CRM process. Initial responders arriving on-scene will not delay response/compressions to move device to patient's side.
- b) Meets manufacturer's requirements for application and use.
- c) Have enough resources on scene to apply device without impacting the CPR fraction or the effectiveness of ongoing chest compressions.
- d) Meets requirements listed above, and;
 - (1) Anytime cardiac arrest patient is transported.
 - (2) Patients that have a high probability of a cardiac arrest while en route to hospital. Device should remain in place but in the off position for this situation.

2. Application

- a) Three phase application
 - (1) Phase 1 – Open case, turn device "on," remove backplate from case.
 - (2) Phase 2 – During 10-second pause in compressions, place LUCAS2 backplate under patient.
 - (3) Phase 3 – At the end of the next compression cycle (two-minutes), device is to be applied per manufacturers guidelines while pulse checks and rhythm analysis is ongoing. Goal is to limit application time to less than 10 seconds.

B. Adult Traumatic Arrest

1. The systematic approach of CRM is to be utilized in all incidents of Adult Traumatic Arrest that do not meet the considerations as defined in the Presumed Dead on Arrival set forth in the Maryland Medical Protocols for EMS Providers.
2. Providers must be aware that in traumatic arrest, interventions such as advanced airway management and needle decompression and rapid transport may be a higher priority than non-traumatic arrest.
3. The Lucas2 is used for any patient requiring transport that is in cardiac arrest or the device will be applied (but not turned on) if patient has a high probability to require CPR during transport, as long as the device does not interfere or exacerbate traumatic injury.



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C. Pediatric Arrest

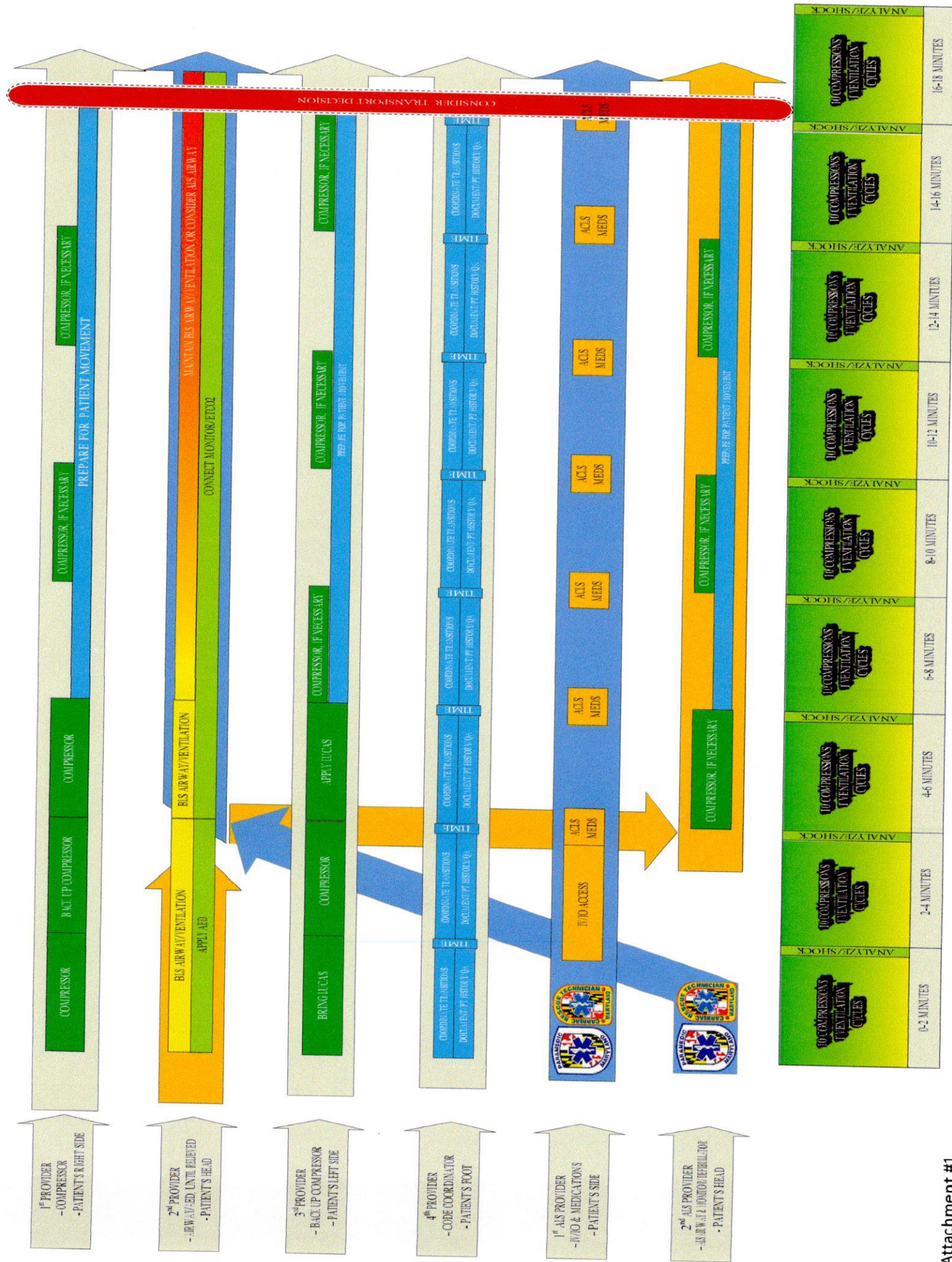
1. The concept of CRM can be deployed for defining roles during pediatric arrests as well as limiting interruptions in chest compressions; however ventilation and ALS epinephrine administration are scientifically proven effective treatments. Providers should ensure CPR and other medical care is provided in accordance to the Maryland Medical Protocols for EMS providers while ensuring appropriate and effective ventilations with oxygen.
2. The Lucas2 device is not indicated on pediatric patients.

REFERENCES

Code of Maryland Annotated Regulations (COMAR) Title 30
Maryland Medical Protocols for EMS Providers
Howard County General Order 320.15- *Code Resource Management/Improving Out-of-Hospital Cardiac Arrest Survival*

FORMS / ATTACHMENTS

Attachment 1 – CRM Workflow chart
Attachment 2 – CRM Provider Assignment Diagram
Attachment 3 – CRM Worksheet
Attachment 4 – CRM Worksheet ROSC



ALS provider


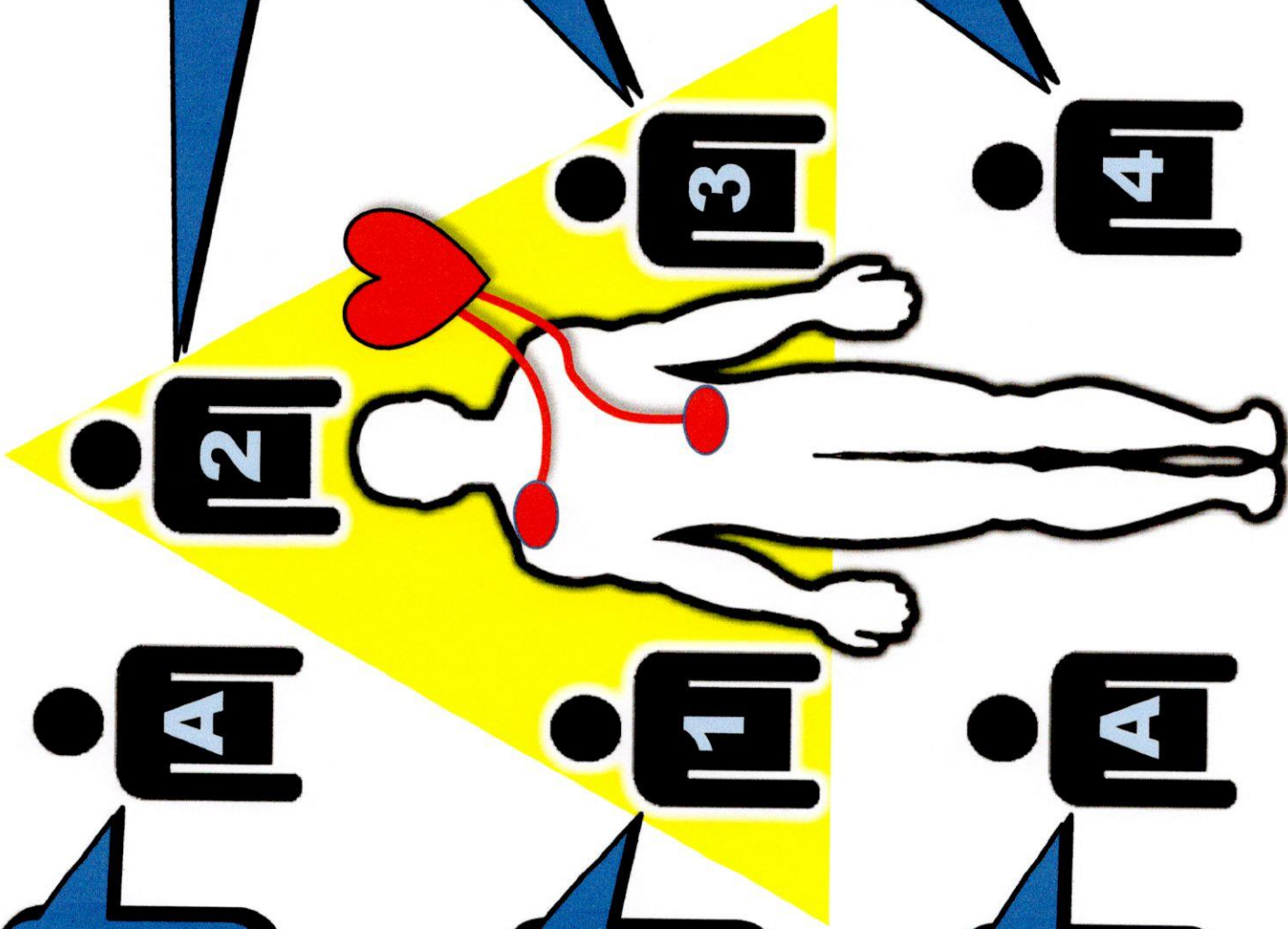
- PATIENT'S HEAD
- AIRWAY / VENTILATION
- LIFEPAK 15



1st EMS Provider

COMPRESSOR

- BLS/ALS
- PATIENT'S RIGHT SIDE
- COMPRESSOR

2nd EMS Provider

AIRWAY/AED PROVIDER

- BLS
- AED
- AIRWAY / VENTILATION

**** WILL BE REASSIGNED BY CODE COORDINATOR, AFTER ALS TAKES OVER**



3rd EMS Provider

BACKUP COMPRESSOR

- BLS/ALS
- PATIENT'S LEFT SIDE
- COMPRESSOR



4th EMS Provider

CODE COORDINATOR

- BLS/ ALS (IF EXTRA PROVIDERS)
- OUTSIDE CPR TRIANGLE
- TIMEKEEPER/ RECORDER



ALS Provider

- PATIENT'S SIDE
- ALS ASSESSMENT
- IV/IO & MEDS





PRINCE GEORGE'S COUNTY FIRE/EMS DEPARTMENT **EMERGENCY MEDICAL SERVICES** **Code Resource Management Worksheet**

Order of Arrival at patient Side:

1 st EMS provider:		2 nd EMS provider:	
Compressor	Patient's Right Side	Airway/AED provider	Patient's Head
BLS (If ALS, should be relieved as soon as practical with BLS) <input type="checkbox"/> Assess Patient <input type="checkbox"/> Gain 360° access to patient <input type="checkbox"/> Proper Hand placement <input type="checkbox"/> Compressions (rate 100-120 beats per minute) <input type="checkbox"/> Adequate Depth (Adult 2" or more, Infant 1 ½") <input type="checkbox"/> Compress & Release equally, no bouncing <input type="checkbox"/> Continue compressions while monitor charging <input type="checkbox"/> Rotate after 2 min. to back-up compressor		ALS (If BLS, should be relieved as soon as practical with ALS) <input type="checkbox"/> Attach AED/Monitor <input type="checkbox"/> Insert BLS airway (OPA/NPA), Suction if needed <input type="checkbox"/> Maintain tight seal with BVM & 100% oxygen <input type="checkbox"/> Ventilate enough for chest rise <input type="checkbox"/> (1) Interposed ventilation on every 10 th compression <input type="checkbox"/> Check carotid pulse at end of 2 minute cycle <input type="checkbox"/> Provider should remain in place throughout If ALS provider, if needed, consider advanced airway	
Equipment: Gloves, Eye protection, Gown (if indicated)		Equipment: Gloves, Eye protection, Gown (if indicated), Airway Equipment, AED/LifePak15 (if available), Suction	
3 rd EMS Provider		4 th EMS Provider	
Back-Up Compressor	Patient's Left Side	Code Coordinator	Patient's Feet (outside CPR triangle)
BLS (If ALS, should be relieved as soon as practical with BLS) <input type="checkbox"/> Timekeeper until arrival of Code Coordinator <input type="checkbox"/> Monitor/ Audible announcement of times in 2 – min cycle (1:30, 1:45 & count down last 10 seconds) <input type="checkbox"/> Stand-By until end of 2-minute cycle <input type="checkbox"/> "Hovers" hand over chest during 10-second pause <input type="checkbox"/> Resume compressor responsibilities		BLS/ALS (if extra ALS providers available) <input type="checkbox"/> Time keeper <input type="checkbox"/> Monitor/ Audible announcement of times in 2 – min cycle (1:30, 1:45 & count down last 10 seconds) <input type="checkbox"/> Assign/Rotate compressors every 2 minute <input type="checkbox"/> Coordinate application of Lucas2 device <input type="checkbox"/> Documentation	
Equipment: Gloves, Eye protection, Gown (if indicated), Watch/Timer		Equipment: Gloves, Eye protection, Gown (if indicated), Watch/Timer, Bring in LUCAS 2 device	
ALS Provider		ALS Provider	
Patient's Side		Patient's Head	
*Should only be assumed after Compressor duties are assumed by other providers <input type="checkbox"/> ALS Assessment <input type="checkbox"/> Establish IV/IO <input type="checkbox"/> Administration of ALS medications		<input type="checkbox"/> Assume duties as Airway/AED Provider <input type="checkbox"/> Lifepak 15	
Equipment: Gloves, Eye protection, Gown (if indicated), ALS Statpac		Equipment: Gloves, Eye protection, Gown (if indicated)	
Extra Providers			
<input type="checkbox"/> Rotation as compressor/back-up compressor <input type="checkbox"/> Logistics (Lucas Device, etc) <input type="checkbox"/> Family Liaison			
Equipment: Gloves, Eye protection, Gown (if indicated)			



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Code Resource Management Treatment
Return Of Spontaneous Circulation

Complete	ROSC Treatment
<input type="checkbox"/>	Obtain Vital Signs
<input type="checkbox"/>	Perform 12 Lead
<input type="checkbox"/>	Transmit 12-Lead to CIC
<input type="checkbox"/>	Consult with CIC
<input type="checkbox"/>	Transport to CIC <30 min. (consider aviation if > 30 min)
<input type="checkbox"/>	Perform Neuroprotective Hypothermia
<input type="checkbox"/>	Monitor Status