Cardiac Arrest Checklist

- Assign roles for Pit Crew CPR
  - Compressors x 2
  - Airway
  - Lead – responsible for coordinating team, making decisions
- Continuous compressions at rate of 110 per minute (100-120) with metronome or Lucas
- ITD, if available, in place with light on if arrest <10 minutes from dispatch or VF/VT arrest
- ETCO2 being monitored
- Check BGL
- Family is receiving care at the patient's side

Consider Treatable Underlying Causes Early

- Hypovolemia (sepsis, non-traumatic hemorrhage)
- Hypoxia (airway obstruction, ventilation/perfusion deficit, CO, cyanide)
- Hydrogen Ions (Acidosis) (Renal failure, respiratory failure, prolonged down time, salicylate overdose)
- Hypothermia (environmental exposure, cold-water drowning)
- Hyper/Hypokalemia (renal failure, Hx of dialysis)
- Hypoglycemia (insulin overdose, Hx of diabetes)
- Tablets/Toxins (overdose, environmental poisoning)
- Tamponade
- Tension Pneumothorax (blunt/penetrating thoracoabdominal trauma)
- Thrombosis (MI) (identification and early transport for thrombolysis)
- Thrombosis (PE) (early transport for thrombolysis)
- Trauma (penetrating > blunt for resuscitation potential)

ROSC Timeout Checklist

- Remove ResQPOD® ITD, if placed
- Do NOT rush to move patient; continuously monitor pulse strength and quality post-ROSC
- Initiate Targeted Temperature Management
- Maintain SpO2 ≥ 94%

Principles of Cardiac Arrest Management

Cardiac arrest is universally fatal without prompt intervention. Even with the application of advanced therapeutic measures by highly trained personnel, survival rates from cardiac arrest have historically been poor. Cardiac arrest can generally be categorized into one of two etiologies: medical or traumatic. Cardiac arrest resulting from traumatic injuries has a particularly poor prognosis, with resuscitation from penetrating trauma conferring a somewhat better prognosis than resuscitation from traumatic arrest caused by blunt force injuries. In any case, early identification and treatment of suspected underlying causes of cardiac arrest provide the best chance for survival.

Physiology of Cardiopulmonary Resuscitation (CPR):

- External chest compressions create positive intrathoracic pressure during the down stroke, propelling blood forward through the vascular system.
- The upstroke of compressions, allowing for full chest wall recoil, creates negative intrathoracic pressure, drawing blood into the thoracic cavity from the systemic circulation.
    - This negative intrathoracic pressure is critical for returning blood to the lungs for oxygenation and to the heart to be circulated to the coronary vessels, brain, and systemic circulation. Without an adequate supply of nutrients and the removal of waste products provided by circulating blood, a cascade of events resulting in irreversible cellular injury and death quickly results.
- The blood present in the heart's ventricles at the beginning of the compression down stroke represents the cardiac preload, or the volume of blood available to be circulated from the heart to the body during manual contraction of the heart. Compressions performed at a rate greater than 110 bpm provide poor preload, thus decreasing survival.
- Positive pressure ventilations, such as those provided by BVM, endotracheal, or blind insertion airway devices interfere with the generation of the negative intrathoracic pressures necessary to create adequate preload, and consequently decrease cerebral and coronary blood flow during CPR. Ventilatory rates greater than 10/minute provide excessive positive intrathoracic pressure, thus decreasing survival.

Application of Scientific Findings:

- Greater emphasis on basic life support (BLS) measures in cardiopulmonary resuscitation (CPR).
- Survival appears best when resuscitation is provided by a coordinated team with continuous chest compressions at a rate of around 110 per minute.
    - Compressions below 100 per minute or above 120 per minute have been associated with lower survival; compression rates of about 110 per minute appear to be optimal.
- Compressors should be alternated at least every two minutes to minimize responder fatigue, with minimal interruptions in chest compressions for changing of compressors.
- Ventilation and advanced life support (ALS) therapies have been given secondary importance.
- Ventilation rates generally should not exceed 10 per minute, or one breath every 6 seconds, and should be delivered *asynchronously*, that is quickly during the upstroke or recoil phase of the chest compression.
- Passive oxygenation using a nasal cannula should be provided as an early part of CPR assuming there is not adequate providers initially.

Pit Crew CPR Rationale:
The Pit Crew CPR concept emphasizes the coordinated delivery of CPR, prioritizing uninterrupted chest compressions, passive oxygenation, delivery of defibrillation (when indicated) following a period of chest compressions, and movement of advanced procedures to a position of secondary importance. The Pit Crew approach provides for scalable management of the cardiac arrest, with secondary interventions provided as additional resources arrive.

- Initial responder recognizes the cardiac arrest and immediately begins uninterrupted chest compressions.
- Second responder positions himself at the patient's side opposite the initial responder, places the defibrillation pads on the patient, and begins passive oxygenation using a nasal cannula at 15 L/min before taking over chest compressions for the initial responder.
- Third responder positions himself at the patient's head and manages the airway, including set up and use of suction, airway adjuncts, and the BVM using a two-hand mask seal.
    - The first and second responders will provide BVM ventilations when they are not providing chest compressions, with the third rescuer maintaining the mask seal.
    - If available, A ResQPOD impedance threshold device (ITD) should be applied to the BVM, endotracheal tube, or blind-insertion airway devices to maintain a relatively negative intrathoracic pressure.
- After the first three roles are established, additional responders may place and SGA device, but must not interrupt continuous chest compressions.
- Even brief interruptions in chest compressions decrease perfusion of the heart and brain and reduce chances of successful resuscitation.
- Interruptions to change compressors or to assess the patient (rhythm and pulse checks) should take less than **six (6**) **seconds**.

Consideration of Underlying Causes of Cardiopulmonary Arrest:
Because some underlying causes of cardiac arrest are amenable to specific and potentially life-saving therapies, early consideration of the underlying causes of the cardiac arrest are imperative. For example, hypoglycemia resulting in cardiac arrest is unlikely to be reversed without administration of dextrose or mobilization of glycogen stores.

- **Hypovolemia:** relative versus absolute; should be considered in instances of vasodilatation or volume depletion such as sepsis, GI bleed, neurogenic shock.
    - *Treatment:* includes volume replacement.
- **Hypoxia:** multiple causes; should be considered in cases of airway obstruction, ventilation deficits, perfusion deficits, and interference with cellular respiration such as CO and cyanide poisoning.
    - *Treatment:* involves providing oxygenation and ventilation and specific antidote if applicable.
- **Hydrogen Ions (Acidosis):** metabolic, respiratory, or mixed; consider in the presence of known or suspected renal failure (impaired excretion of acids and impaired generation of bicarbonate), respiratory failure resulting in hypercapnia and respiratory acidosis, prolonged down-time or anaerobic metabolism resulting in lactic acidosis, salicylate (aspirin) overdose resulting in metabolic acidosis.

- **Hypoglycemia:** consider in the presence of diabetes, known or suspected insulin overdose.
- **Tablets/Toxins:** consider in cases of known or suspected overdose or environmental poisoning.
    - *Treatment:* depends on the type of toxin, consider contacting poison control for additional guidance on substance-specific treatment.
- **Tamponade:** consider in the presence of blunt or penetrating trauma to the thorax or abdomen, particularly when presenting with pulseless electrical activity (PEA).
- **Tension Pneumothorax:** consider in the presence of blunt or penetrating trauma to the thorax or abdomen, particularly when presenting with pulseless electrical activity (PEA).
- **Thrombosis (MI):** consider in the presence of complaints of chest pain or ACS symptoms prior to the arrest and when history suggests MI is likely.
    - *Treatment:* Thrombolysis and cardiac catheterization may be beneficial; this requires early transport to a facility with such capabilities and protocols to administer these therapies intra-arrest if initial resuscitation is not successful (i.e. recurrent VF/VT)
- **Thrombosis (PE):** consider when history is suggestive such as recent surgery or immobilization (long-distance flight, travel), malignancy, deep vein thrombosis (DVT), smoking history, oral contraceptive use particularly in the otherwise healthy female smoker.
    - *Treatment:* Thrombolysis may be beneficial; this requires early transport to a facility with such capabilities and protocols to administer thrombolytic intra-arrest.
- **Trauma:** blunt versus penetrating. Blunt trauma is generally not amenable to successful resuscitation; penetrating trauma confers a slightly improved yet remote opportunity for resuscitation.

Historical and Physical:

Historical Findings	Physical Findings
▪ Viable patient in cardiac arrest ▪ Suspected medical not trauma related	▪ Pulseless ▪ Apneic

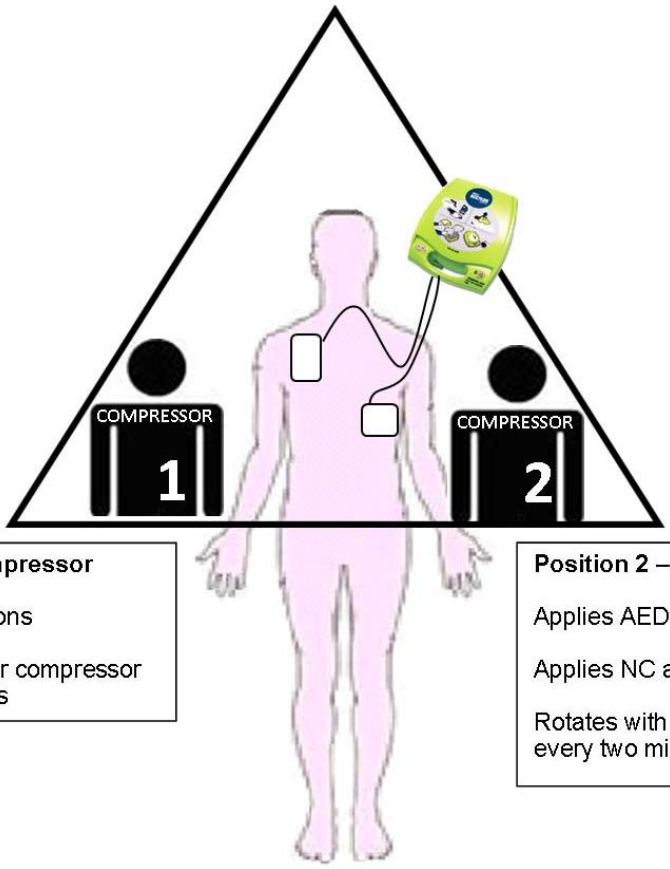
Assessment:

- CABC

Clinical Management Options:

Interventions	Focus On:
First arriving providers establish the following roles prior to arriving at patient's side: ▪ **Position 1 – "Compressor"** (patient's side) o Assesses responsiveness/pulses o Initiates chest compressions immediately if o needed o Alternates chest compressions with Position 2 o Ventilates BVM when not performing chest compressions (prior to SGA/ET placement) ▪ **Position 2 – "Compressor"** (patient's side) o Turns on and applies AED immediately (if no "lead" provider present) o Provides passive oxygenation with nasal cannula at 15 L/minute (if no "Position 3 Airway" provider present) o Alternates chest compressions with Position 1 o Ventilates BVM when not performing chest o compressions (prior to SGA placement) ▪ **Position 3 – "Airway"** (patient's head) o Assembles and appropriately applies all equipment for airway and ventilations (OPA, BVM, ITD (if available), Suction, O_2) o Opens/clears airway o Assembles and applies BVM and ITD o Maintains two-hand BVM mask seal allowing "Compressors" to ventilate when not performing chest compressions. o Inserts and secures SGA, if available. ▪ **Position 4** - **"Lead"** (patient's leg) o Makes all patient treatment decisions prior to arrival of EMS. o Operates AED	▪ **No interruption in compressions** other than < 6 seconds for change out, defibrillation, pulse check, etc. ▪ Asynchronous and upstroke BVM ventilations at a rate of 10 per minute ▪ Defibrillator is charged immediately prior to each 2 minute rhythm check ▪ Deliver shock and resume compressions within 6 seconds ▪ Appropriate depth, 2 inches, and quality of compressions ▪ Rate of 110 (100-120) – use of metronome, or LUCAS is optimal to achieve consistency ▪ Allow hands to partially come off chest for full recoil ▪ Apply ResQPOD (if available) if arrest <10 minutes from dispatch or VF/VT arrest ▪ Activate ResQPOD and utilize light for timing ventilations without stopping compressions ▪ Consider compressor fatigue and change compressors as needed ▪ If only one rescuer, focus on uninterrupted, high-quality compressions for 2 minutes, then apply defibrillator ▪ If there is only a 2-person crew, provide compressions and passive oxygenation via NC 15LPM

2-PROVIDER PIT CREW CPR



Position 1 - Compressor

Chest compressions

Rotates with other compressor every two minutes

Position 2 – Compressor

Applies AED

Applies NC at 15LPM

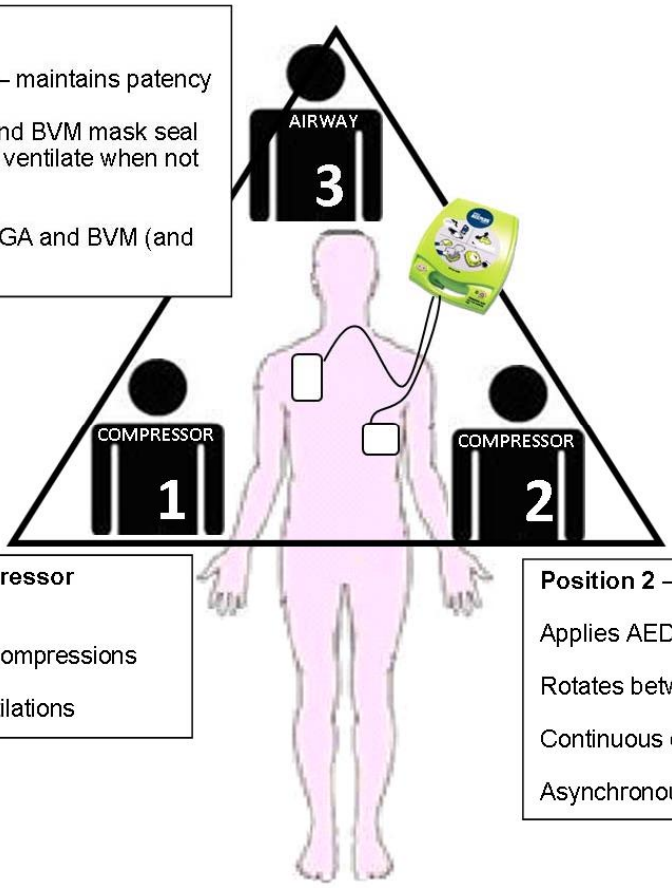
Rotates with other compressor every two minutes

3-PROVIDER PIT CREW CPR

Position 3 - Airway

Suction – airway adjuncts – maintains patency

Maintains constant two-hand BVM mask seal allowing "Compressors" to ventilate when not performing compressions
OR
Provides ventilations via SGA and BVM (and ITD if appropriate)



Position 1 - Compressor
Rotates between:

Continuous chest compressions

Asynchronous ventilations

Position 2 – Compressor

Applies AED immediately

Rotates between:

Continuous chest compressions

Asynchronous ventilations