Notes/Definitions

- Efforts should focus on performance of high-quality CPR with continuous compressions, airway management without hyperventilation, minimal pauses for rhythm recognition, and systematic ALS interventions that do not interrupt CPR.
  - Operate in approximately 2-minute CPR cycles with brief end of cycle rhythm checks driving interventions performed over the next cycle.

Base Hospital Contact Required for Conditions Below

BLS Interventions

- Initiate an organized, team-based CPR management approach and continue high quality CPR without interruption of continuous compressions unless pulse obtained.
  - Utilize BVM with OPA for initial airway management and add EtCO2 when available.
  - If cardiopulmonary arrest was witnessed by bystanders or EMS personnel and resources are limited, consider passive ventilation procedure (OCEMS PR-025) for up to 6 minutes.
  - Apply an AED and follow instructions until an ALS crew takes over care.
  - If suspected opioid overdose, consider:
    - ▶ **Naloxone pre-load nasal spray** (SO-B-002)

ALS Interventions

ALL CARDIAC ARRESTS

- The following are indicated as appropriate during CPR cycles until ROSC is obtained or resuscitation is discontinued:
  - Operate in CPR cycles with the rhythm identified at the end of each cycle driving the interventions performed during the next cycle (shockable, non-shockable, or ROSC).
  - Early application of EtCO2 measurement (including airways managed by BVM).
  - An advanced airway (ETT/SGA) may be placed at any time as long as chest compressions remain uninterrupted, and tube placement can be confirmed with EtCO2.
  - IV/IO access
  - Use of Automatic Chest Compression Device (ACCD) when available and with minimal interruption of compressions. Consider head elevation not to exceed 30 degrees semi-fowlers position.
  - If suspected opioid overdose, consider:
    - ▶ **Naloxone IV / IO or pre-load nasal spray** (SO-M-050)
  - If Return of Spontaneous Circulation (ROSC) occurs at any time, see section below for Post-ROSC care.

RHYTHM BASED MANAGEMENT (determined at end of each CPR cycle rhythm check)

- Shockable rhythm (VF/pVT):
  - ▶ **Defibrillate** once at pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting, then resume CPR cycle. Repeat for VF/pVT identified at the end of each CPR cycle
  - Medication administration (beginning after second defibrillation)
    - ▶ **Epinephrine 1 mg IV / IO** (0.1 mg / mL concentration), repeat every 3-5 minutes for continued VF/pVT
      - Alternated between CPR cycles with:
    - ▶ **Amiodarone 300 mg IV / IO**, may repeat 150 mg IV / IO in approximately 3-5 minutes **or Lidocaine 1 mg / kg IV / IO**, may repeat 0.5 mg / kg in approximately 3-5 minutes one time
  - After 10 minutes of initial cardiopulmonary arrest management, may consider administering:
    - ▶ **Sodium Bicarbonate 50 mL IV / IO** (7.5% or 8.4% solution)

- Non-shockable rhythm (Asystole/PEA):
  - Medication administration:
    - ▶ **Epinephrine 1 mg IV / IO** (0.1 mg / mL concentration), repeat every 3-5 minutes for continued Asystole/PEA
    - ▶ **Normal Saline 250 mL** bolus, may repeat 3 times (total 1 liter) if no pulse obtained
  - Administer early if indicated by etiology; otherwise, consider after 10 minutes.
    - ▶ **Sodium Bicarbonate 50 mL IV / IO** (7.5% or 8.4% solution)

RETURN OF SPONTANEOUS CIRCULATION CARE

- If a rhythm with a pulse develops at any time during resuscitation:
  - Continue to ventilate and oxygenate (via advanced airway, BVM or high flow oxygen as appropriate).Assess for and correct hypoxia, hypovolemia, hypoglycemia, or hypothermia.
  - **Make Base Contact** for CVRC destination. For a systolic BP < 90 mmHg,
    - ▶ **Push-dose Epinephrine 1 mL IV / IO** every 3 minutes to maintain a systolic BP > 90 mmHg (PR-230).
    - ▶ **Normal Saline 250 mL IV**, may repeat 3 times (total 1 liter).
  - Perform 12-lead ECG, if possible. If STEMI is identified, transmit it to Base Hospital and/or CVRC.
  - Continually monitor for re-arrest by palpating a pulse and monitoring EtCO2.
  - If respiratory depression or not breathing, and if not already done, consider Advanced Airway and confirm tube placement.

Transport Consideration

- ALS escort required for all transported patients.
- Patients with ROSC require **Base Contact** for transport to a CVRC.
- After 20 minutes on scene without ROSC, consider one of the following:
  - Continue treatment on scene
  - Transport to nearest ERC
  - **Base Contact** for further orders or to request field pronouncement
- After 30 minutes on scene without ROSC, select one of the following actions:
  - Transport to nearest ERC
  - **Base Contact** for further orders or to request field pronouncement
- Based on scene factors, providers can consider transport to the nearest ERC any time after placement of ACCD, however the goal is to obtain ROSC with transport to a CVRC.

Additional Considerations

- **Team-Based CPR** - A position-based CPR response plan (e.g., Pit Crew CPR) that facilitates a coordinated effort in the management of cardiac arrest patients. Assigning personnel pre-determined positions and duties will support a focused and coordinated strategy maximizing the effectiveness of each EMS provider on scene. Each ALS provider agency needs to implement this type of formal position-based CPR response plan, although some flexibility is appropriate based on which delivery model is selected.
- **High Quality CPR** - Priority in cardiopulmonary arrest management that emphasizes high quality CPR with minimal interruptions of chest compressions and with adequate depth and recoil. To maintain high quality CPR without interruption of continuous compressions, personnel should rotate through the compressor position when possible, every 2 minutes. High quality CPR includes: 1) the use of a CPR feedback device that can provide immediate feedback on compression depth, rate, and proper recoil; or 2) the placement of an automatic chest compression device (ACCD).
  - **Minimizing Pauses** - High quality CPR should be performed while the defibrillator is charging with immediate CPR resumption post defibrillation. Focus should be to minimize the time off the chest during the defibrillation procedure while providing for personnel safety. A “hovering” technique is most widely used to accomplish minimal time off the chest before and after defibrillation.
  - **CPR Cycles** - Structured intervals of high-quality CPR with brief rhythm checks performed approximately every two minutes. The identified rhythm guides the treatments delivered during the next CPR cycle. This approach is designed to minimize interruptions in chest compressions and aid in treatment decision making. While two minutes is considered best practice, the interval may be adjusted based on scene conditions and patient care needs.

- **Automatic Chest Compression Device (ACCD)** - ACCD placement is indicated for pulseless patients where CPR is needed. If high quality CPR can be accomplished with a CPR feedback device, then placement of the ACCD can occur at any point in the management of cardiac arrest patients prior to their movement or transport. Once providers initiate patient movement or transport, an ACCD is required since the ability to perform high quality manual compressions diminishes during this activity. Patients can be managed with manual CPR on scene, if paramedics utilize a CPR feedback device to deliver and monitor high quality compressions with minimal interruptions. If providers cannot perform manual high-quality compressions with minimal interruptions, then the ACCD should be applied as soon as possible.
- **Positive Pressure Ventilation** – This is the preferred method of ventilating a cardiac arrest patient. Avoid hyperventilation during cardiac arrest management and post ROSC care. Ventilations should be approximately 10 breaths/minute with just enough volume to see the chest rise. A two-person technique (when resources allow) should be utilized when delivering ventilations using a BVM. AHA guidelines recommend a 30:2 ventilation to compression ratio, but continuous CPR is acceptable as well.
- **ALS Airway** - An ALS airway (e.g., SGA, ETT) may be placed at any time during the management of a cardiac arrest patient if CPR is not interrupted. ALS airway selection by paramedics should be based upon patient presentation, scene conditions, and confidence in successful placement. If Endotracheal Intubation is attempted and unsuccessful, an SGA should be utilized.
- **End-Tidal CO2** - Obtaining initial EtCO2 values when utilizing a BVM and then monitoring the values will provide additional information on patient perfusion status while performing high quality CPR.
    - Due to lack of perfusion, EtCO2 is low during cardiac arrest (<10 mmHg), EtCO2 values of 10 – 20 mmHg suggest effective CPR, and a jump in EtCO2 during CPR may indicate ROSC.
    - A persistent EtCO2 <10 mmHg after 20 minutes of CPR has very low predicted survival. Consider BHC for termination of resuscitation.
- **Passive Ventilation** – The use of the passive ventilation procedure is indicated for any cardiopulmonary arrest that is witnessed by either bystanders or EMS personnel to prioritize chest compressions when there are scarce resources available. However, passive oxygenation does not ensure adequate ventilation. Once an adequate number of personnel are on scene, positive pressure ventilations utilizing a BVM with an EtCO2 sensor should be performed. Refer to OCEMS PR-025, Passive Ventilation Procedure, for further information.
- **Defibrillation** – Emergent defibrillation is highly effective for terminating Ventricular Fibrillation (VF)/ Pulseless Wide Complex Tachycardia (pVT).
    - A single shock strategy is preferred over stacked shocks due to the long duration of CPR interruption for a series of stacked shocks.

  - The energy level is best based on the manufacturer recommendations, but if that is not available, a higher energy setting may be preferred.
- **Fine Ventricular Fibrillation (Fine VF)** - Patients in a cardiac rhythm of fine ventricular fibrillation (amplitude less than 2-3 mV) may benefit from an additional 2 minutes of high-quality CPR without interruption of continuous compressions. Fine ventricular fibrillation has a low success rate for conversion with defibrillation, thus continuing high quality CPR without interruption of continuous compressions for an additional 2 minutes may allow for further coronary perfusion and presentation of a coarser ventricular fibrillation upon reassessment of the rhythm.
- **Post ROSC Care** - Preventing re-arrest is the primary goal. Continually monitoring for a palpable pulse, rhythm changes and EtCO2 waveform is required. Maintaining a systolic BP > 90 mmHg should take priority over 12-lead acquisition post ROSC to prevent re-arrest. EtCO2 target range is 35-45 mmHg.
- **AICD** - If the patient has an implanted pacemaker or defibrillator/pacemaker, place electrode pads to either side or in the anterior/posterior position and not directly on top of the implanted device.
- **Medication Patches** - If the patient has a medication patch in place on the chest area, remove the patch and wipe the area clean before attaching an electrode pad.

If a patient is wearing a **LifeVest®**

- Proceed with standard evaluation and treatment measures.
- Initiate CPR unless the vest device is broadcasting "press the response buttons," "electrical shock possible, do not touch patient," or "bystanders do not interfere."
- Follow standard treatment as described in algorithms above, remove the LifeVest®, and monitor/treat the patient with the standard monitor-defibrillator.
- To remove the LifeVest®, first pull out or disconnect the battery, then remove the garment from the patient.
- Take vest, modem, charger, and extra battery to the hospital.

LVAD - If the patient has a Left Ventricular Assist Device (**LVAD**), no ACCD; Reference SO-C-045 (Cardiac Arrest with Left Ventricular Assist Device).

Base Hospital

- If patient is a dialysis patient or known to have renal failure, consider hyperkalemia and administer:

  ▶ **Sodium Bicarbonate 50 mL IV / IO** (7.5% or 8.4% solution), may repeat in 5 minutes if there is a response to initial dose.

ROSC:

Preventing re-arrest is the primary goal. Continually monitoring for a palpable pulse, rhythm changes and EtCO2 waveform is required. Maintaining a systolic BP > 90 mmHg should take priority. Anticipate the use of Push-Dose Epinephrine early to prevent re-arrest.

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Pronouncement:

Base hospital contact is required for physician pronouncement if resuscitation efforts are not successful. Considerations:

- Most contacts for pronouncement are made after at least 20 minutes of ACLS resuscitative efforts.
- A persistent EtCO2 <10 mmHg after 20 minutes of CPR has very low predicted survival.
- Termination of resuscitation (TOR) is recommended for patients who meet all of the following:
  - Unwitnessed arrest
  - No bystander CPR
  - No shockable rhythms during resuscitation
  - No ROSC at any time
- The following situations fall outside validated TOR criteria and warrant additional caution when considering termination of resuscitation:
  - Suspected poisoning
  - Hypothermia (core temperature < 30°C or unknown)
  - Drowning or submersion
  - Electrocution or lightning strike
  - Traumatic cardiac arrest
  - Pregnancy
  - Patients with ventricular assist devices or other mechanical circulatory support
- Refer to Policy 330.50 & 330.51 for POLST/DNR Considerations

Cross References:
SO-B-001 BLS Standing Orders
SO-B-002 (Naloxone Administration)
SO-C-045 (Left Ventricular Assist Device)
SO-M-050 (Substance Overdose)
PR-025 (Passive Ventilation)
PR-230 (Push Dose Epinephrine)