



ORANGE COUNTY EMERGENCY MEDICAL SERVICES
BASE HOSPITAL TREATMENT GUIDELINES

#: BH-C-10
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Orig. Date: 12/2006
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CARDIOPULMONARY ARREST- ADULT/ADOLESCENT NON-TRAUMATIC

BASE GUIDELINES

- Determine ALS Standing Order treatments/procedures provided prior to Base Hospital contact. Use ALS standing order as guidelines for treatments/procedures not initiated prior to Base Hospital contact.
- If at any time patient develops a rhythm with a pulse/return of spontaneous circulation (ROSC), patient should be routed to the nearest open Cardiovascular Receiving Center (CVRC) with an available cardiac catheterization laboratory.
- As soon as possible, remind field personnel to assess for **reversible causes** for arrest:

hypovolemia	acidosis
tension pneumothorax	hypothermia
hypoxia	toxins
- For return of spontaneous circulation (ROSC) with systolic **blood pressure less than 90 systolic**:
 - ▶ If **NO** signs of congestive heart failure (lungs are clear to auscultation), administer 250 mL **Normal Saline Bolus**.

If systolic blood pressure does not respond to initial 250 mL Normal Saline bolus or signs of congestive heart failure (pulmonary rales), proceed with:

▶ If available, push-dose Epinephrine (per procedure #230)

Mixing instructions:

- Take Epinephrine 1 mg of 0.1 mg/mL preparation (cardiac Epinephrine) and waste 9 mL of Epinephrine.
- Into that syringe, withdraw 9 mL of normal saline from the patient's IV bag. Shake well.
- Mixture now provides 10 mL of Epinephrine at a 10 mcg/mL concentration.

Push-Dose:

- Epinephrine 0.5 mL (5mcg) IV/IO, every 3 minutes titrate to a SBP >90.

ALS STANDING ORDER

Ventricular Fibrillation (VF) OR Pulseless Wide Complex Tachycardia (VT)

- Initiate an organized CPR management approach with responders placed in designated positions around the patient and continue high quality CPR without interruption of continuous compressions unless pulse obtained during any step below:
 - If cardiopulmonary arrest was witnessed by bystanders or EMS personnel, consider passive ventilation procedure (OCEMS PR-025) for total of 6 minutes. Otherwise use BVM/ETCO2 sensor for initial ventilation or other non-endotracheal airway unless endotracheal tube is clearly indicated (example: laryngeal edema from smoke inhalation)
 - If possible at scene, elevate patient head to 30 degrees semi-fowlers position
 - Continue chest compressions for a total of 200 compressions (approximately 2 minutes), then reassess

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- After 2 minutes of high-quality CPR, identify rhythm
 - If rhythm is coarse VF/pulseless Wide Complex Tachycardia and defibrillator is available:
 - ▶ *Defibrillate once at maximum energy setting or pre-programmed/manufacturer's recommended defibrillator setting*
 - If rhythm is fine ventricular fibrillation, continue compressions for 2 minutes then reassess

▼
- If a rhythm with pulse develops at any time (return of spontaneous circulation [ROSC]):
 - Ventilate and oxygenate (BVM or high flow oxygen as appropriate)
 - Assess for and correct hypoxia, hypovolemia, hypoglycemia, or hypothermia
 - Perform 12-lead ECG, if possible. If STEMI is identified, transmit to Base Hospital and/or CVRC
 - Make Base contact for CVRC destination
 - If respiratory depression or not breathing, consider *Advanced Airway* and confirm tube placement

▼

Approved:

Carl Schultz, MD

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BASE GUIDELINES

5. Once ALS Standing Orders treatment sequence is completed, if patient is still pulseless and continues in cardiac arrest, survival with the intact neurological function is highly unlikely. **Pronouncement** in the field is appropriate at this point (requires direct Base Physician order).
6. There are circumstances in which the field EMS team will find pronouncement difficult and inadvisable once the treatment sequence in completed, in these situations continue with the following and transport to the nearest ERC:
 - ▶ Maintain CPR
 - ▶ Administer *Epinephrine 1 mg IV/IO (0.1 mg/mL preparation)*, repeat approximately every 3-5 minutes for continued VF/pulseless Wide Complex Tachycardia/PEA/Asystole
 - ▶ Defibrillate at maximum energy setting or pre-programmed defibrillator setting **if indicated**.
 - ▶ Repeat defibrillation sequence after approximately every 2 minutes of CPR if there is continued VF/Pulseless Wide Complex Tachycardia.
7. 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.
8. If patient is a **dialysis patient** or known to have renal failure, consider hyperkalemia and administer:
 - ▶ *Sodium Bicarbonate (NaHCO₃) 1 ampule IV/IO, may repeat in approximately 5 minutes if there is a response to the initial dose.*

ALS STANDING ORDER

4. If remains pulseless:
 - a. Continue high quality CPR without interruption of continuous compressions, with personnel rotation every 2 minutes and provide
 - ▶ *High-flow oxygen by either BVM with ETCO₂ sensor or passive ventilation*
 - b. IV/IO vascular access after initial 2 minutes of high quality CPR without interruption of compressions
 - c. Apply Automatic Chest Compression Device (ACCD) when available
 - d. Providers can consider transport to nearest ERC any time after placement of ACCD

▼
5. Monitor cardiac rhythm:
 - a. If coarse VF or pulseless Wide Complex Tachycardia
 - ▶ *Defibrillate once at maximum energy setting or pre-programmed manufacture's recommended defibrillator setting*
 - b. If rhythm is identified as fine ventricular fibrillation, continue compressions for 2 minutes then reassess. If fine V-fib persists, then treat as PEA/asystole
 - c. If PEA or asystole: refer to PEA/Asystole treatment sequence

▼
6. For continued VF/pulseless Wide Complex Tachycardia or if reverts back to VF/pulseless Wide Complex Tachycardia:
 - a. Maintain high quality CPR without interruption of continuous compressions
 - b. Administer *Epinephrine 1 mg IV/IO (0.1 mg/ml preparation)*, repeat approximately every 3-5 minutes for continued VF/pulseless Wide Complex Tachycardia

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7. For continued coarse VF/pulseless Wide Complex Tachycardia:
 - a. Maintain high quality CPR without interruption of continuous compressions
 - b. *Defibrillate once at maximum energy setting or pre-programmed/ manufacture's recommended defibrillator setting*

▼
8. For continued coarse VF/pulseless Wide Complex Tachycardia:
 - a. Maintain high quality CPR without interruption of continuous compressions
 - b. Administer *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.*

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ALS STANDING ORDER

9. After approximately 2 minutes of high quality CPR, if there is continued coarse VF/pulseless Wide Complex Tachycardia:
 - a. *Defibrillate once at maximum energy setting or pre-programmed/manufacture's recommended defibrillator setting*

▼
10. For continued VF/pulseless Wide Complex Tachycardia:
 - a. Maintain high quality CPR without interruption of continuous compressions
 - b. After 10 minutes of initial cardiopulmonary arrest management, or immediately after ROSC is achieved and an advanced airway is indicated, consider placement of an *endotracheal tube* (if other ALS airways have not been utilized). Confirm tube placement without interruption of continuous compressions, maintaining high quality CPR
 - c. After 10 minutes of initial cardiopulmonary arrest management, administer either: *Sodium Bicarbonate 50 mL of 7.5% solution IV/IO or Sodium Bicarbonate 50 mL of 8.4% solution IV/IO*

▼
11. After 20 minutes of management on scene without ROSC, consider one of the following actions. After 30 minutes on scene without ROSC, select option b or c
 - a. Remain on scene and continue with treatment
 - b. Initiate transport to the nearest ERC
 - c. Make Base contact for further resuscitation orders or request pronouncement of patient in the field

Pulseless Electrical Activity (PEA) or Asystole

1. Initiate an organized CPR management approach with responders placed in designated positions around the patient and continue high quality CPR without interruption of continuous compressions unless pulses obtained during any step below:
 - a. If cardiopulmonary arrest was witnessed by bystanders or EMS personnel, consider passive ventilation procedure (**OCEMS PR-025**) for a total of 3 cycles. Otherwise use BVM/ETCO₂ sensor for initial ventilation or other non-endotracheal airway unless endotracheal tube is clearly indicated (example: laryngeal edema from smoke inhalation).

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ALS STANDING ORDER

- b. Continue chest compressions for a total of 200 compressions (approximately 2 minutes), then reassess
- c. If possible at scene, elevate patient head 30 degrees semi-fowler position
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- 2. For **PEA** and **Asystole**, continually monitor cardiac rhythm, give oxygen, and maintain high quality chest compressions without any interruption of continuous compressions and
 - a. Establish IV/IO access
 - b. Administer *Epinephrine 1 mg IV/IO (0.1 mg/mL preparation)* approximately 3-5 minutes
▼
- 3. If remains pulseless in PEA or in asystole:
 - a. Apply Automatic Chest Compression Device when available
 - b. Assess for reversible causes:
Hypovolemia; Acidosis; Hypoxia; Tension pneumothorax;
Hypothermia; Toxins
 - c. Give *250 mL normal saline bolus, may repeat 3 times (total 1 liter) if no pulse obtained*
 - d. If pulses obtained, continue saline infusion up to 1 liter (auscultate lungs and stop saline if rales develop); transport to CVRC per Base Contact
 - e. Providers can consider transport to nearest ERC any time after placement of ACCD
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- 4. If coarse VF/pulseless Wide Complex Tachycardia develops:
 - a. Defibrillate once at maximum energy setting or pre-programmed/manufacturer's recommended defibrillator setting and follow VF/pulseless Wide Complex Tachycardia algorithm
 - b. If rhythm is identified as fine ventricular fibrillation, continue compressions for 2 minutes then reassess. If fine V-fib persists, then treat as PEA/asystole
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ALS STANDING ORDER

Pulseless Electrical Activity (PEA) or Asystole

5. If a rhythm with pulse develops (return of spontaneous circulation [ROSC]):
 - a. Ventilate and oxygenate
 - b. Assess for and correct hypoxia, hypovolemia, hypoglycemia, or hypothermia
 - c. Perform 12 lead ECG if possible. If STEMI is identified, transmit to Base Hospital and/or CVRC
 - d. Make Base contact for CVRC destination
 - e. Consider placement of an *Advanced Airway* and confirm tube placement

▼
6. For continued PEA or asystole:
 - a. Maintain high quality CPR without interruption of continuous compressions
 - b. After 10 mins of initial cardiopulmonary arrest management, or immediately after ROSC is achieved and an advanced airway is indicated, consider placement of an endotracheal tube (if other ALS airways have not been utilized). Confirm tube placement without interruption of continuous compressions, maintaining high quality CPR
 - c. After 10 minutes initial cardiopulmonary arrest management, administer either:
Sodium Bicarbonate 50mL of 7.5 % solution IV/IO or Sodium Bicarbonate 50 mL of 8.4% solution IV/IO

▼
7. After 20 minutes of management on scene without ROSC, consider one of the following actions. After 30 minutes on scene without ROSC, select option b or c.
 - a. Remain on scene and continue with treatment
 - b. Initiate transport to nearest ERC
 - c. Make Base contact for further resuscitation orders or request pronouncement of patient in the field.

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TREATMENT GUIDELINES:

Priority in cardiopulmonary arrest management emphasizes high quality CPR with minimal interruptions of chest compressions. To maintain high quality CPR without interruption of continuous compressions, personnel should rotate through the compressor position 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).

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, as long as paramedics utilize a CPR feedback device to deliver and monitor high quality compressions with minimal interruptions, then the ACCD should be applied as soon as possible.

A position-based CPR response plane (e.g., Pit Crew CPR) will facilitate 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 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.

Unless passive ventilation is in use, alternate ALS airways (e.g., iGel, etc.) may be placed at any time during the management of a cardiac arrest patient as long as CPR is not interrupted. Endotracheal intubation should be withheld until at least 10 minutes into the management of the cardiac arrest patient unless more urgent clinical indications are present (e.g., swelling, burns, etc.).

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ALS STANDING ORDER

Use of the passive ventilation procedure is indicated for any cardiopulmonary arrest that is witnessed by either bystanders or EMS personnel. Refer to OCEMS PR-025, Passive Ventilation Procedure, for further information.

Patients in a cardiac rhythm of fine ventricular fibrillation benefit from an additional 2 minutes of high quality CPR without interruption of continuous compressions. Fine ventricular fibrillation does not have a high success rate for conversion with defibrillation, thus continuing high quality CPR without interruptions 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.

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.

If the patient has an implanted pacemaker or defibrillator/pacemaker, place electrode pads to either side and not directly on top of the implanted device.

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 the 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.

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If Base Hospital orders push-dose epinephrine for refractory hypotension, refer to ALS Procedure #230 (Push-Dose Epinephrine) for technique in performing procedure.

ALS providers should maintain an adequate supply of epinephrine to ensure enough supply is present to treat cardiac arrest patients according to this policy. Should supplies become limited, consider withholding further doses of epinephrine after 20 minutes of CPR. If consideration is being given to using expired epinephrine, only administer a total of 3 doses during a cardiac arrest.

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