

POLICIES AND PROCEDURES

POLICY: 554.11

TITLE: Cardiac Arrest Algorithms

EFFECTIVE: 4/10/19 REVIEW: 4/2024

SUPERCEDES:

APPROVAL SIGNATURES ON FILE IN EMS OFFICE

TAOL. TOT

CARDIAC ARREST ALGORITHMS

I. AUTHORITY

Health and Safety Code, Division 2.5, California Code of Regulations, Title 22, Division 9

II. PURPOSE

To serve as a patient treatment standard for EMRs, EMTs, AEMTs and Paramedics within their scope of practice. To allow for the discontinuation of pre-hospital resuscitation by Paramedics in adult medical cardiac arrests after the delivery of adequate and appropriate ALS therapy.

III. PROTOCOL

A. HIGH PERFORMANCE CPR

The absence of a detectable pulse in the adult, medical cardiac arrest. Contraindicated in the patient with a valid DNR/POLST form and those meeting "Obviously Dead" criteria (policy 570.20). *Refer to High Performance CPR Algorithm for treatment standard*.

B. VENTRICULAR FIBRILLATION - PULSELESS VENTRICULAR TACHYCARDIA

V-FIB: Bizarre, rapid, irregular, ineffective rhythm with electrical waveforms varying in size and shape. There is no P wave. QRS complexes are absent. V-fib may masquerade in one lead as asystole. Be sure to check at least two leads to confirm asystole. **V-TACH**: Regular or slightly irregular rhythm with no pulse. Heart rate 100 to 200 (commonly about 120). A-V disassociation is present: P-waves may be seen unrelated to QRS complex. QRS complex distorted, wide (> 0.12 seconds) and bizarre. T-waves usually have opposite axis as QRS complex. Perform 12 Lead EKG if return of spontaneous circulation (ROSC). Refer to Ventricular Fibrillation/Pulseless Ventricular Tachycardia Algorithm for treatment standard.

C. PULSELESS ELECTRICAL ACTIVITY

The absence of a detectable pulse and the presence of some type of regular electrical activity other than V-Tach define this group of arrhythmias. Many of these patients do have cardiac mechanical activity without effective cardiac output (they are in profound shock). This category includes Electromechanical Dissociation (EMD), Idioventricular rhythms, Pseudo-EMD,

and Bradycardic rhythms. Perform 12 Lead EKG if return of spontaneous circulation (ROSC). Refer to Asystole/Pulseless Electrical Activity Algorithm for treatment standard.

Consider Possible Causes:

HYPOVOLEMIA (volume infusion)
PULMONARY EMBOLISM
HYPOXIA (ventilation)
DRUG OVERDOSE (appropriate antidote)
CARDIAC TAMPONADE
HYPERKALEMIA (sodium bicarb, calcium chloride)
TENSION PNEUMOTHORAX (needle decompression)
ACIDOSIS (ventilation)
HYPOTHERMIA (refer to Hypothermia Policy 554.62)
MYOCARDIAL INFARCTION

D. ASYSTOLE

Asystole represents the total absence of electrical activity in the ventricle. There is no rhythm, although an occasional P-wave or agonal QRS may be seen. Heart rate is less than five beats per minute. Note: Asystole should be confirmed by at least two leads, since low-amplitude ventricular fibrillation can mimic asystole. Perform 12 Lead EKG if return of spontaneous circulation (ROSC). Refer to Asystole/Pulseless Electrical Activity Algorithm for treatment standard.

E. POST ARREST RESUSCITATION ALGORITHM

Return of Spontaneous Circulation (ROSC) post-cardiac or respiratory arrest. Perform 12 Lead EKG if Return of Spontaneous Circulation (ROSC) and transport all VF/PVT and STEMI patients to a STEMI Receiving Center if transport time is less than 60 minutes (air or ground). Refer to Post Arrest Resuscitation Algorithm for treatment standard.

F. TERMINATION OF RESUSCITATION- ADULT MEDICAL CARDIAC ARREST

Cardiopulmonary resuscitation (CPR) and advanced live support (ALS) interventions may be discontinued prior to transport when this procedure is followed. *Refer to the Termination of Resuscitation- Adult Medical Cardiac Arrest guidelines for treatment standard.*

High Performance CPR Algorithm

Do NOT begin resuscitation Refer to Determination of Death Protocol Criteria for Death/No
Resuscitation
Review DNR/POLST form

No

AT ANY TIME

Return of Spontaneous Circulation

Go to
Post Arrest
Resuscitation
Protocol

Pearls

- Deliver 30 compressions while the AED is charging when "Shock Advised"
- BVM should be 2 person, with a rescuer using 2 hand grip
- Delivering slow, one hand BVM ventilations

First BLS/ALS Responder (Rescuer #1)

- Move Patient to Workable Area
- Open Airway
- Initiate Compressions ONLY CPR
- Alternate with Rescuer #2

Second BLS/ALS Responder (Rescuer #2)

- Remove Patient Shirt
- Attach AED/Defib pads
- Start metronome
- Insert OPA
- Start high flow oxygen via NRB
- Defibrillation as necessary
- Alternate with Rescuer #1



V

Begin 2 person BVM Ventilations
@ 2/minute

- Attached ETC02 when available
 - Compression Coach

В

- 2 Minute Cycle Timer
- Defibrillation with AED

Begin 2 person BVM Ventilations @ 2/minute

- Attach ETCO2 when available
- Compression Coach
- 2 Minute Cycle Timer
- Defibrillation with AED
- Insert a Perilaryngeal Airway (if difficult or unmanageable BLS airway)
- Cardiac Monitor

Р

- Defibrillation
 - Intubation (if difficult or unmanageable BLS airway)

Rescuer #4 (ALS Responder)

- IV Access
- Administer medications
- Defibrillation
- Insert perilaryngeal airway (if difficult or unmanageable BLS airway)
- IO Access (if no IV)
- Intubation (if difficult or unmanageable BLS airway)

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Ventricular Fibrillation/Pulseless Ventricular Tachycardia Algorithm

History

- Events leading to arrest
- Estimated downtime
- Past medical history
- Medications
- DNR/POLST forms
- Renal Failure/Dialysis

Signs and Symptoms

- Unresponsive
- Apneic

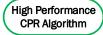
В

Α

- Pulseless
- VF/Pulseless VT on EKG

Differential

- Primary Cardiac
- Endocrine
- Drugs/Medication
- Pulmonary





P Defibrillate

- Resume CPR WITHOUT pulse check
 - Change compressors every 2 minutes
 - Limit any pauses to <6 seconds

Start IV

Epinephrine (1:10000) 1 mg IV/IO Repeat every 3-5 minutes

AT ANY TIME

Return of Spontaneous Circulation

Go to
Post Arrest
Resuscitation
Protocol

Pearls

- ROTATE compressors every 2 minutes to assure high quality CPR
- DO NOT over-ventilate
- AVOID PAUSES
- WATCH THE RATE (maintain compressions at 110-120/ minute)
- Defibrillation is ALWAYS at maximum dose per manufacturer's recommendations
- Defibrillation should occur with every 2 minute cycle
- VF/PVT does not meet Termination of Resuscitation criteria until 40 MINUTES following start of ETCO2 monitoring

- Pre-charge the defibrillator
 - Locate pulse during compressions
 - Pre-shock pause <3 seconds

Defibrillate

Post-shock Pause <3 seconds



- Resume CPR WITHOUT pulse check
- Change compressors every 2 minutes
- Limit any pauses to <6 seconds

Lidocaine 1.5 mg/kg IV/IO May repeat x1 in 4 minutes if VF/VT persists

OR May repeat with 150mg IV/IO in 4 minutes if VF/VT persists

Defibrillate (Post-shock Pause <3 seconds)



P Continue High Quality, Continuous Compressions

Sodium Bicarbonate 1 mEq/kg IV/IO (Max 100 mEq) for Dialysis patients or suspected hyperkalemia

Calcium Chloride 1 g IV/IO for Dialysis patients/suspected hyperkalemia



Return of Spontaneous Circulation

No

Yes

Exit to Return of Spontaneous Circulation Protocol

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Asystole/Pulseless Electrical Activity Algorithm

History

- Events leading to arrest
- Estimated downtime
- Past medical history
- Medications
- DNR/POLST forms
- Renal Failure/Dialysis
- Suspected Overdose
- Suspected hypothermia

Signs and Symptoms

- Unresponsive
- Apneic
- Pulseless
- Asystole or PEA on cardiac monitor

Differential

- Hypovolemia (trauma/AAA)
- Hypothermia
- Hypoxia
- Pulmonary Embolus
- Hyperkalemia
- Cardiac tamponade
- Drug overdose
- Acute MI

High Performance CPR Algorithm



- Resume CPR WITHOUT pulse check
 Change compressors every 2
 minutes
- Limit any pauses to <6 seconds

Cardiac Monitor

AT ANY TIME

Return of Spontaneous Circulation

Go to
Post Arrest
Resuscitation
Protocol

Follow Appropriate Rhythm Protocol



Shockable Rhythm



- Resume CPR WITHOUT pulse check
- Change compressors every 2 minutes
- Limit any pauses to <6 seconds

Search for **REVERSIBLE** causes

Start IV

Р

Start IO

Epinephrine (1:10000) 1 mg IV/IO Repeat every 3-5 minutes

Normal Saline Bolus 1000ml IV/IO

Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen Ion (Acidosis)
- Hypothermia
- Hypo/Hyperkalemia
- Hypoglycemia
- Tension Pneumothorax
- Tamponade, Cardiac
- Toxins
- Thrombosis (MI and PE)

Naloxone 2 mg IV/IO/IM/IN (suspected opiate OD)

Consider EARLY for PEA

• Repeat Saline boluses if

suspected hypovolemia

• D50% IV/IO (hypoglycemia)

- Glucagon 2 mg IV/IO/IM (suspected beta-blocker or calcium channel blocker OD)
- Calcium chloride 1 g IV/IO (suspected hyperkalemia)
- Sodium bicarbonate 100 mEq IV/IO (suspected renal failure/ hyperkalemia/OD)
- Chest decompression (suspected tension pneumothorax)

Criteria for Termination of Resuscitation Efforts Yes

Exit to **Termination of Resuscitation Protocol**

No

Post Arrest Resuscitation Algorithm History Differential Signs and Symptoms Continue to address specific Respiratory Arrest Return of Pulse differentials associated with the Cardiac Arrest original dysrhythmia Repeat Primary Assessment DO NOT move the patient for at least 5 minutes to allow for post-arrest stabilization Optimize Ventilation Maintain ETCO2 35-45 (roughly 6-12 ventilations/minute) DO NOT HYPERVENTILATE Start IV/IO Start IV Perilaryngeal Advanced airway, airway, as indicated as indicated Cardiac Monitor 12 Lead EKG MVEMSA Policy # 554.11 Refer to STEMI Triage and STEMI? **Destination Policy (530.00)** If patient returns to cardiac arrest, follow the appropriate algorithm corresponding to the rhythm. Transport to nearest STEMI Receiving Center if total transport time is <60 minutes. VF/PVT Arrest? Consider helicopter if >60 minutes transport. Otherwise, transport to closest facility Normal Saline Bolus 500ml IV/IO. Repeat as needed if Hypotension lungs clear (Max 2000 mL) Systolic BP <90 Push dose Epinephrine: 0.2ml of 1:10,000 every 5 minutes to achieve systolic No BP >90mmHg Arrythmias Present Arrythmias are COMMON and often self limited following ROSC. Avoid antiarrythmics as they may worsen cardiac conduction and promote arrythmias

Termination of Resuscitation - Adult Medical Cardiac Arrest

Policy:

Cardiopulmonary resuscitation (CPR) and advanced life support (ALS) interventions may be discontinued prior to transport when this procedure is followed.

Purpose:

To allow for the discontinuation of pre-hospital resuscitation in adult medical cardiac arrests after the delivery of adequate and appropriate ALS therapy.

Procedure:

CPR and ALS interventions may be discontinued if ALL of the following criteria have been met:

- Patient has suffered a presumed medical (non-traumatic) cardiac arrest,
- Patient is NOT pregnant,
- Patient is not a victim of hypothermia or drowning/submersion,
- Arrest was not witnessed by EMS providers,
- Adequate High Performance CPR (HPCPR) has been administered,
- Airway has been successfully managed. Acceptable management techniques for this policy include effective BLS airway maneuvers, a perilaryngeal airway, or endotracheal intubation (ETI),
- IV or IO access has been achieved,
- Rhythm appropriate medications and defibrillation have been administered according to algorithm and
- One of the three following criteria has been met:

Persistent ASYSTOLE with ETCO2 <10 despite effective and continuous HPCPR

May discontinue resuscitative efforts after 20 minutes from start of ETCO2 monitoring Make Base Contact

Persistent ASYSTOLE with ETCO2 >10 with effective and continuous HPCPR

May discontinue resuscitative efforts after 30 minutes from start of ETCO2 monitoring Make Base Contact

VF/PVT/PEA, with or without rhythm changes

May discontinue resuscitative efforts after 40 minutes from start of ETCO2 monitoring Make Base Contact

Important Pearls

- Changing rhythms from asystole to PEA, PEA to VF/PVT is a POSITIVE sign that therapy is effective.
 Keep working!
- ETCO2 is an excellent tool to determine adequacy of compressions and potential for resuscitation.
 ETCO2 readings persistently below 20 despite adequate CPR is a <u>POOR</u> prognostic indicator. However, climbing ETCO2 levels above 20 with adequate CPR indicate metabolically favorable changes ongoing with the resuscitation. Keep working!
- Expect resuscitative efforts to be long and demanding, every time! Keep working!
- Documentation is KEY! Be sure to include ETCO2 readings throughout resuscitation. Document medications given and response to the medications. Document reasons for termination.