

POLICY: 554.11  
TITLE: Cardiac Arrest Algorithms

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

APPROVAL SIGNATURES ON FILE IN EMS OFFICE

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## 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.*

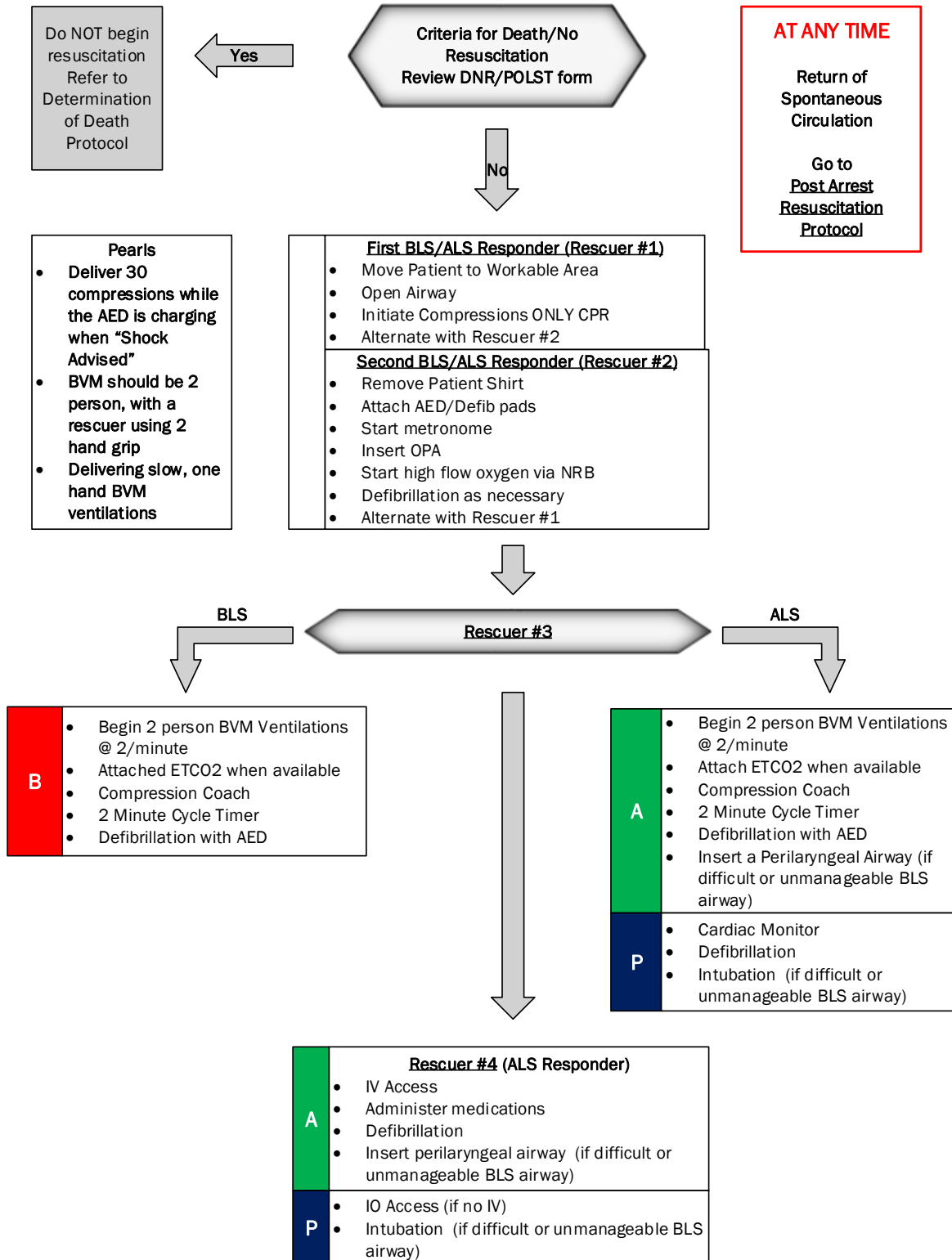
**E. POST ARREST RESUSCITATION ALGORITHM**

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 life 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



## Ventricular Fibrillation/Pulseless Ventricular Tachycardia Algorithm

### History

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

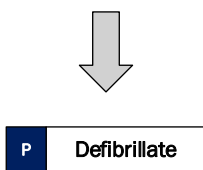
### Signs and Symptoms

- Unresponsive
- Apneic
- Pulseless
- VF/Pulseless VT on EKG

### Differential

- Primary Cardiac
- Endocrine
- Drugs/Medication
- Pulmonary

### High Performance CPR Algorithm



<b>B</b>	<ul style="list-style-type: none"> <li>• Resume CPR WITHOUT pulse check</li> <li>• Change compressors every 2 minutes</li> <li>• Limit any pauses to &lt;6 seconds</li> </ul>
<b>A</b>	Start IV
<b>P</b>	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

<b>B</b>	<ul style="list-style-type: none"> <li>• Pre-charge the defibrillator</li> <li>• Locate pulse during compressions</li> <li>• Pre-shock pause &lt;3 seconds</li> </ul>
<b>P</b>	<b>Defibrillate</b> Post-shock Pause <3 seconds

B	<ul style="list-style-type: none"><li>• Resume CPR WITHOUT pulse check</li><li>• Change compressors every 2 minutes</li><li>• Limit any pauses to &lt;6 seconds</li></ul>		
P	Lidocaine 1.5 mg/kg IV/IO May repeat x1 in 4 minutes if VF/VT persists	OR	Amiodarone 300mg IV/IO May repeat with 150mg IV/IO in 4 minutes if VF/VT persists
P	Defibrillate (Post-shock Pause <3 seconds)		

B	Continue High Quality, Continuous Compressions
P	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

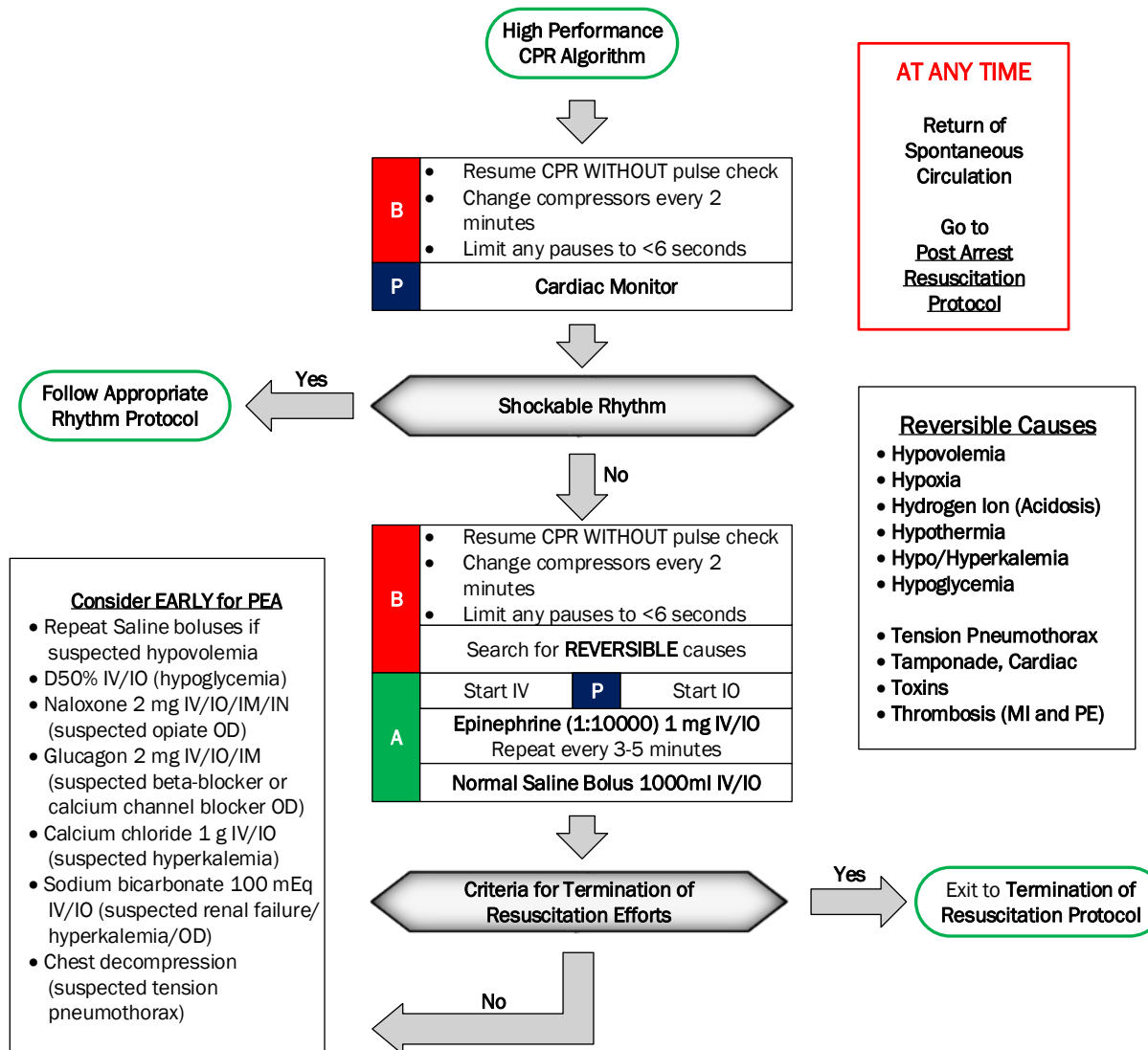
Exit to Return of Spontaneous Circulation Protocol

### 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

## Asystole/Pulseless Electrical Activity Algorithm

<b>History</b> <ul style="list-style-type: none"> <li>Events leading to arrest</li> <li>Estimated downtime</li> <li>Past medical history</li> <li>Medications</li> <li>DNR/POLST forms</li> <li>Renal Failure/Dialysis</li> <li>Suspected Overdose</li> <li>Suspected hypothermia</li> </ul>	<b>Signs and Symptoms</b> <ul style="list-style-type: none"> <li>Unresponsive</li> <li>Apneic</li> <li>Pulseless</li> <li>Asystole or PEA on cardiac monitor</li> </ul>	<b>Differential</b> <ul style="list-style-type: none"> <li>Hypovolemia (trauma/AAA)</li> <li>Hypothermia</li> <li>Hypoxia</li> <li>Pulmonary Embolus</li> <li>Hyperkalemia</li> <li>Cardiac tamponade</li> <li>Drug overdose</li> <li>Acute MI</li> </ul>
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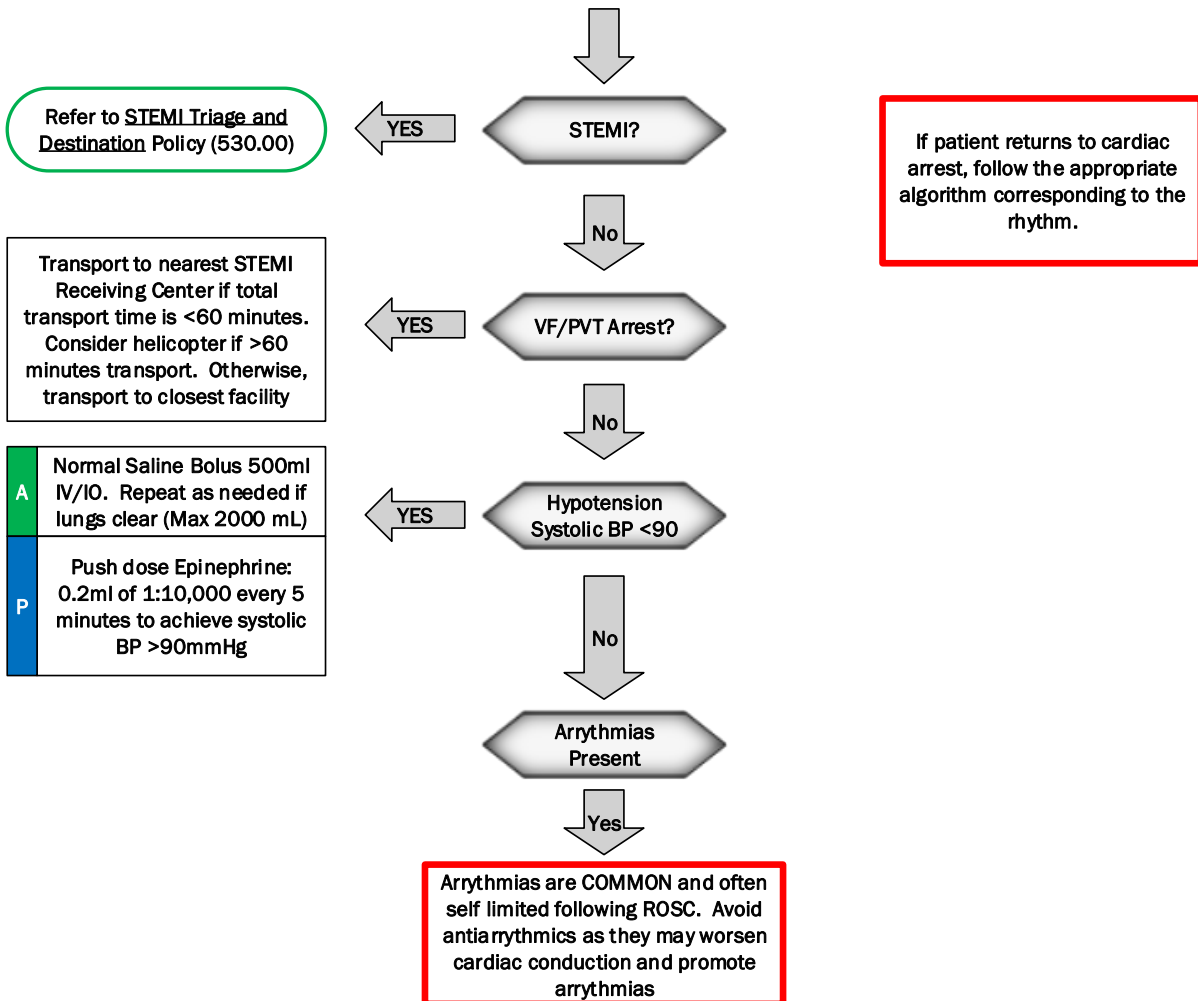


## Post Arrest Resuscitation Algorithm

<b>History</b> <ul style="list-style-type: none"> <li>Respiratory Arrest</li> <li>Cardiac Arrest</li> </ul>	<b>Signs and Symptoms</b> <ul style="list-style-type: none"> <li>Return of Pulse</li> </ul>	<b>Differential</b> <ul style="list-style-type: none"> <li>Continue to address specific differentials associated with the original dysrhythmia</li> </ul>
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**Repeat Primary Assessment**  
**DO NOT** move the patient for at least 5 minutes to allow for post-arrest stabilization

<b>Optimize Ventilation</b> <ul style="list-style-type: none"> <li>Maintain ETCO<sub>2</sub> 35-45 (roughly 6-12 ventilations/minute)</li> <li><b>DO NOT HYPERVENTILATE</b></li> </ul>	
<b>A</b> <ul style="list-style-type: none"> <li>Start IV</li> <li>Perilaryngeal airway, as indicated</li> </ul>	<b>P</b> <ul style="list-style-type: none"> <li>Start IV/IO</li> <li>Advanced airway, as indicated</li> </ul>
<b>P</b> Cardiac Monitor 12 Lead EKG	



## 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 **POOR** 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.