2.04 CARDIAC ARREST

ALL Cardiac Arrests – High Performance CPR

See Appendix 2 for High Performance Team Organization.

Start CAB (compressions, airway, breathing) when patient is unconscious/unresponsive, not breathing normally and no pulse is detected within 10 seconds.

Compressions

Do 5 cycles of chest compressions at 30:2 compression/ventilation ratio:

- Push hard (at least 2") and fast (100/120/min).
- Allow complete chest recoil.
- Minimize compression interruptions.
- Next up team compressor is continuously checking quality of femoral pulse and is ready to rotate to the compressor position at the end of the cardiac cycle (2 minutes).
- Rotate compressors every 2 minutes or sooner if fatigued.
- If transported with compressions ongoing and LUCAS device is employed (and no evidence of spinal trauma) elevate head of gurney 30 degrees.

Airway/Ventilation:

- Open airway. Provide bag-mask ventilation. Pause compressions 2 seconds or less to ventilate during 30:2.
- Ventilate enough to cause chest rise. Avoid excessive ventilation (too fast or too much volume).
- Inserts airway adjuncts as appropriate. Do NOT stop chest compressions during advanced airway insertions.
- Asynchronous ventilations every 6 seconds once advanced airway is in place or every 10th compression

AED/Defibrillator

- While CPR is in progress, turn on AED/defibrillator and apply pads and puck.
- Shock on a 2-minute cycle. Pre-charge AED/Defibrillator at 1:45 to get ready to deliver shock at 2 minutes.
- Minimize perishock pause to less than 5 seconds.
- Change out rescuer on chest compressions during perishock pause.
- After first 30 compressions, analyze rhythm. Clear patient and shock if indicated. Resume compressions for another 2 minutes before next rhythm analysis.
- Always resume chest compressions immediately after rhythm analysis or shock.
- **EXCEPTION**: If patient goes into VF/pulseless VT while monitored or attached to an AED or defibrillator, a shock must be administered immediately.
- If no shock advised, resume compressions for another 2 minutes before next rhythm analysis/femoral pulse check.
- If a shockable rhythm continues past the third shock, attach a second set of defibrillator

pads in a chest position to provide alternate vector defibrillation and switch vectors, or attach a second defibrillator with a second set of defibrillator pads as soon as one is available to provide alternate vector defibrillation.

IV/IO Medications:

- ALS provider gets IV/IO access and gives medications as appropriate.

TREAT REVERSIBLE CAUSES FOR PULSELESS ELECTRICAL ACTIVTY (PEA)	
1. **H**ypoxia	1. **T**ension Pneumothorax
2. **H**ydrogen Ion (Acidosis)	2. **T**orsades
3. **H**ypovolemia	3. **T**oxins
4. **H**ypothermia	4. **T**amponade (cardiac)
5. **H**ypo/**H**yperkalemia and Hypoglycemia	5. **T**hrombosis, pulmonary or cardiac

Hypoxia: Bag-mask ventilation with O2. Insert airway adjuncts as appropriate. Target O2 saturation 94 – 95%.

Hydrogen Ion (Acidosis): Assure adequate ventilation to blow off CO2.

Hypovolemia: **Normal Saline** bolus for an organized rhythm with SBP < 90.

- If hypotension persists, may administer **Epinephrine** infusion**.**

Hypothermia: Rewarm if patient is hypothermic.

Hyperkalemia: Suspect hyperkalemia if tall, peaked T waves on monitor or EKG (in all leads) and prolonged QRS (>0.12 sec).

- Give **Sodium Bicarbonate**.
- Give **Calcium Chloride**. May repeat in 10 min.

Hypoglycemia: Check a blood glucose and correct hypoglycemia with **Dextrose 10%** or **Glucagon.**

Tension Pneumothorax: Relieve tension pneumothorax per **Protocol 7.06 Needle Thoracostomy**

Torsades: Give **Magnesium Sulfate**.

Toxins: Treat signs and symptoms of drug toxicity:

- If QRS widening from Tricyclic Antidepressant Overdose, give **Sodium Bicarbonate**. May repeat.
- If calcium channel blocker overdose, give **Calcium Chloride**. May repeat in 10 min.
- If opiate overdose is suspected, give **Naloxone.**

Tamponade (cardiac) or Thrombosis, pulmonary or cardiac: In hospital treatment only.

CARDIAC ARREST IN PREGNANCY

- Anticipate difficult airway; experienced provider preferred.
- **Normal Saline** fluid bolus. Reassess and repeat as indicated.

- During CPR, have a provider manually displace gravid uterus to patient's left side. If ROSC is achieved, place patient in Left Lateral Decubitus Position.
- If patient is receiving IV/IO **Magnesium** pre-arrest, stop infusion and switch to **Normal Saline**. Flush line with **Normal Saline** prior to giving **Calcium Chloride**. May repeat in 10 min.

AFTER CARE IF ROSC

- Go to **Protocol 2.05 Adult Post-Cardiac Arrest or Return of Spontaneous Circulation**.

AFTER CARE IF NO ROSC

- Provide grief support and referrals for on-site survivors as needed.

DOCUMENTATION

- Initial "At Patient Side" Time.
- Intervention and medication times.
- Use accelerometer ("puck") to track CPR.
- Report cardiac arrest data to **SFCardiacCaseReview@sfdph.org**.
- Patient response to interventions and medications (rhythm changes; pulses with and without CPR, ROSC).
- ROSC or termination resuscitation time.

FIELD TREATMENT CONSIDERATIONS FOR PATIENTS WITH A LEFT VENTRICULAR ASSIST DEVICE (LVAD)

1. Attempt to locate a POLST form. Many patients have made end-of-life care decisions.

2. Provide pre-hospital care to the patient in a manner consistent with ALS and BLS treatment protocols for the patient's condition with the following exceptions:
   - Do NOT perform chest compressions since it will dislodge the LVAD and cause internal bleeding.
   - **Arrhythmias**: Do not disconnect power source, defibrillate per ACLS protocol.
   - DO follow the directions of the patient's caregiver when moving and transporting the patient.

3. The **HeartMate (HM) II LVAD** replaces the pumping action of the left ventricle via a continuous blood flow mechanism, where there is no filling or emptying phase.

- As a result, patients commonly have NO PALPABLE PULSE, NO OBTAINABLE PULSE OXIMETRY OR BLOOD PRESSURE, and only a "mean" arterial pressure detectable using a Doppler.
- An LVAD patient's ECG heart rate will differ from the pulse rate since the LVAD is not synchronized with the native heart rate.

4. Assess the patient's airway and intervene per protocol. If you are unable to obtain pulse oximetry readings, you should assume the patient is hypoxic and place the patient on supplemental oxygen.

5. If the patient has an altered level of consciousness, immediately check for end-tidal CO2 using capnography.

6. Auscultate heart sounds to determine if the device is functioning. You should expect to hear a continuous "whirling" sound for most devices.

7. Assess the device for any alarms / malfunctions. Check with patient or caregivers for device reference materials or contact the VAD Center.

8. Start at least 1 large bore IV, and give a 1L **Normal Saline** fluid bolus if you obtain a low blood pressure (systolic < 100) or are unable to obtain a blood pressure or the patient has an altered level on consciousness.

9. Call the LVAD Center (open 24/7) per patient or patient's caretaker's contact to get advice on caring for the patient.
   - You are authorized to take orders from professionals at the LVAD Center, as long as they are within your scope of practice.
   - Contact the Base Hospital with questions or if directed by patient's caregiver or LVAD Center personnel to do something outside of your protocol.

10. Always transport the patient to the LVAD Center that implanted the device (UCSF or CPMC-Pac). You are authorized to BYPASS the closest San Francisco LVAD Center to get the patient to the LVAD Center that implanted their device no matter the patient's condition. If the LVAD Center that implanted the device is not in San Francisco, take the patient to the closest San Francisco based LVAD Center.
    - Bring **ALL** of the patient's equipment. Bring the patient's caregiver to act as the information resource on the device. You are authorized to use the caregiver as an information resource on the device.

11. Upon arrival to Emergency Department, immediately plug in the device into an electrical socket.

12. Call the Base Hospital for in-field termination of care in the event there are no signs of life and end-tidal capnography is not consistent with life (< 10).

Appendix 1: Treatment of Cardiac Arrest

MOVE PATIENT TO A WORKABLE SPACE

0:00:00	**Begin Clock**	**HP CPR / Attach Monitor-Defibrillator Pads, Puck & Limb Leads / BLS Airway**	
		↓	
0:02:00	Analyze	Shock 120j if VF or puleseless VT Continue CPR if no shock indicated	**Start IV or IO**
		↓	
Obtain ALS Airway/ET			
0:04:00	Analyze	Shock 150j if VF or pulseless VT	**EPINEPHRINE for aystole/PEA/VF/VT**
		↓	
0:06:00	Analyze	Shock 200j if VF or pulseless VT	
		↓	
0:08:00	Analyze	Shock 200j if VF or pulseless VT	**EPINEPHRINE for aystole/PEA/VF/VT**
		↓	**Do alternate defib vector**
0:10:00	Analyze	Shock 200j if VF or pulseless VT	**Start 2nd IV or IO**
Treat PEA/Asystole Causes (H's/T's			
		↓	
0:12:00	Analyze	Shock 200j if VF or pulseless VT	**AMIODARONE for VF/VT**
		↓	**EPINEPHRINE for aystole/PEA**
0:14:00	Analyze	Shock 200j if VF or pulseless VT	
		↓	
0:16:00	Analyze	Shock 200j if VF or pulseless VT	**AMIODARONE for VF/VT**
		↓	**EPINEPHRINE for aystole/PEA**
0:18:00	Analyze	Shock 200j if VF or pulseless VT	
		↓	
0:20:00	Analyze	Shock 200j if VF or pulseless VT	**EPINEPHRINE for aystole/PEA/VF/VT**
		↓	
	PEA/Asystole OPTIONS: at 20 minutes	**1. Call Base Physician** **2. Transport to STAR center with CPR** **3. Stop resuscitation**	
		↓	
0:22:00	Analyze	Shock 200j if VF or pulseless VT	
		↓	
0:24:00	Analyze	Shock 200j if VF or pulseless VT	**EPINEPHRINE**
		↓	
0:26:00	Analyze	Shock 200j if VF or pulseless VT	
		↓	
0:28:00	Analyze	Shock 200j if VF or pulseless VT	**EPINEPHRINE**
		↓	
0:30:00	Analyze	Shock 200j with alternate vector if VF or pulseless VT	
	OPTIONS: at 30 minutes	**1. Call Base Physician** **2. Transport to STAR center with CPR** **3. Stop resuscitation**	

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			↓	
	0:08:00	Analyze	Shock 200j if VF or pulseless VT	**EPINEPHRINE for aystole/PEA/VF/VT**
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Treat PEA/Asystole Causes (H's/T's)	**0:12:00**	Analyze	Shock 200j if VF or pulseless VT	**AMIODARONE for VF/VT**
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		↓	
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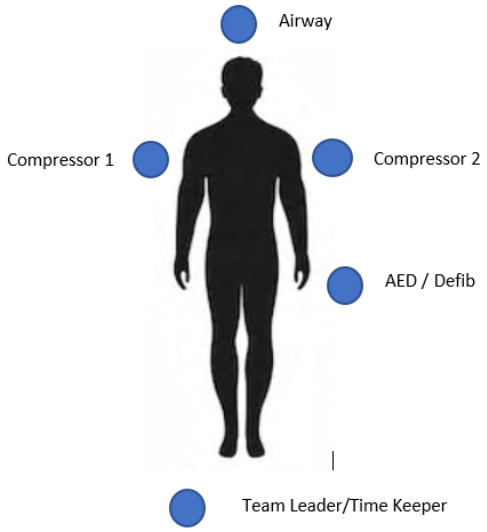
	OPTIONS: at 30 minutes	**1. Call Base Physician** **2. Transport to STAR center with CPR** **3. Stop resuscitation**	

APPENDIX 2: High Performance CPR Team Set Up

Assign functional positions based on available personnel. One person may do one or more of the recommended functional positions listed below:



Compressor:

- Does chest compressions.

Airway:

- Opens airway.
- Provides bag-mask ventilation with O2. Inserts airway adjuncts as appropriate.
- Target O2 saturation 94 – 95%.

AED/Monitor/Defibrillator:

- Bring and operates AED/monitor/defibrillator

IV/IO Medications:

- ALS role – gets IV/IO access and gives medications.

Team Leader /Time keeper:

- Assigns team roles (or assumes roles if not assigned).
- Provides team feedback.
- Records intervention and medication times. Announces when next interventions and medications due.
- Records frequency and duration of CPR interruptions.

Next Compressor:

- Continuously checking femoral pulse. Switch at end of cardiac cycle (2 minutes).