CARDIAC ARREST ON MECHANICAL LIFE SUPPORT

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PURPOSE:

- Patients undergoing ***mechanical circulatory support (MCS) devices*** are at risk for cardiac arrest due to the underlying illness.
- When these patients experience cardiac arrest, resuscitation protocols should be modified to reflect ***device*** & ***clinical context*** (e.g. recent surgery, anticoagulation, etc)

IDENTIFY/CONFIRM CARDIAC ARREST

Patients with certain **MCS** (VA-ECMO, LVAD) may be non-pulsatile *at baseline* (pseudo-PEA). Obtaining a manual BP using a doppler probe can be useful to measure MAP & detect arrest. Signs of adequate perfusion without a pulse:

- MAP > 50 mmHg
- pETCO2 > 20
- Normal breathing
- Normal capillary refill

CONSIDER REVERSIBLE CAUSES OF ARREST

Modified H&T approach. The most common causes of circulatory arrest in patients with **MCS devices** include:

- Hemorrhage/hypovolemia
- Low cardiac output / severe bradycardia
- Pericardial Tamponade
- Tension pneumothorax
- Pulmonary embolism
- ***Mechanical failure of device*** (see approaches below)

Initiate ACLS (most patients) **or** **CSU-ALS** (post sternotomy patients)

CARDIAC SURGICAL UNIT – ADVANCED LIFE SUPPORT (CSU-ALS):

- **Most cases of cardiac arrest following cardiac surgery are reversible.**
- ***CSU-ALS*** (also called ***CALS***) is an evidence-based approach for resuscitation of postoperative cardiac patients. CSU-ALS is Indicated for inpatients in the immediate post op setting (typically 10 days post-op) & performed by trained personnel at participating institutions
- It is similar to ACLS, but prioritizes ***treatment of reversible conditions*** likely to occur in the post cardiac surgery setting:
  - For patients in VT/VF **attempt defibrillation x3** followed by **amiodarone 300 mg**
  - For bradycardia/asystole: **Pace** via epicardial wires, then TC/TVP. If refractory, **atropine 3 mg.**
  - For all patients in persistent arrest, **perform Re-sternotomy at the bedside**
  - **Consider lower doses of epinephrine (reference) e.g. 50-100 mcg**

Assess Rhythm			Begin CPR		Prepare for resternotomy		Perform Resternotomy
VT/VF	→	Shock x3		Amiodarone		CPR+Shock	
Asystole Bradycardia	→	Initiate pacing (via wires)		TC/TVP pacing Atropine		CPR	
PEA	→	Low dose epi				CPR	

(Modified from CSU-ALS CALS-S; see their course for details)

Customize resuscitation based on the **MCS device(s)** present

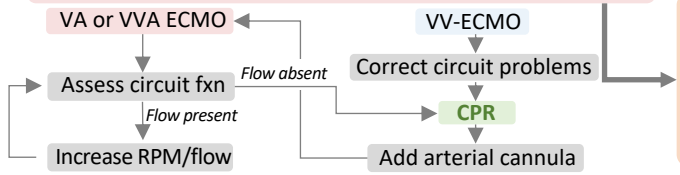
ECMO

VV ECMO *See ECMO Troubleshooting OnePager*

- **VV ECMO does NOT** provide circulatory support;
- Assess **circuit for failure**, **initiate CPR**
- **Increase F_DO_2** to 100%
- **Increase vent settings** (full support)
- **Consider adding arterial cannula** → VVA configuration

VA ECMO

- **VA ECMO does** provide circulatory support; do NOT initiate CPR if the ECMO circuit is functioning normally
- Assess for pump or membrane failure
- **Increase Pump Speed/Flow**
- Increase preload (administer bolus)



Temporary MCS

IMPELLA *See Impella OnePager*

Impella ***can*** provide significant circulatory support during arrest, however if there is no evidence of perfusion, should assume that it has become displaced. (**examine placement signal waveform**).

Approach:

- Set Impella to the lowest speed: P2 (as recommended by manufacturer)
- Begin **CPR**
- If able to confirm proper Impella placement (e.g. with POCUS) consider **increasing flow** to provide additional hemodynamic support.

INTRA-AORTIC BALLOON PUMP *See IABP OnePager*

- IABP may be combined with VA ECMO as LV vent.
- In cardiac arrest patients with VA ECMO & IABP, the IABP should be switched from EKG to **pressure trigger**. It should remain in **1:1** with **full augmentation**.

Implanted MCS

LEFT VENTRICULAR ASSIST DEVICE *See LVAD OnePager*

- LVAD patients may be not pulsatile *at baseline* but still have adequate circulation. Unconsciousness in an LVAD patient may be unrelated to LVAD failure. If the device is functioning without alarms consider alternative causes (hypoxemia, stroke, hypoglycemia, overdose, etc).

Approach to an unconscious LVAD patient:

- If signs of adequate perfusion, **do not** perform CPR.
- **Examine the controller:** determine if LVAD is operating: check controller, battery, driveline integrity & connection, auscultate for hum.
- If LVAD is stopped: **restart pump**.
- If the pump is stopped & cannot be restarted, **begin CPR** (there is a *theoretical* risk of displacing the device)
- It is OK to defibrillate or perform cardioversion
- If the pump is operating but signs of inadequate perfusion are present, consider **increase RPMs**. Obtain TTE
- **Consider VA-ECMO** if inadequate support w/ LVAD