Cardiac Shock Recognition and Acute Management Pathway

**AHA Definition Cardiogenic Shock:** Inadequate tissue and end-organ perfusion due to cardiac dysfunction
- Clinical Assessment: cool extremities, ↓ urine output, altered mental status
- Labs: lactate>4, AST or ALT>1000, SVO2<50%, ↑ BUN/Cr, ↓ Na
- Hemodynamics: SBP <90 mmHg or MAP 30 mmHg lower than baseline
- Cardiac index (<1.8 L/min/m² without support or <2.0 L/min/m² with inotropic support) with adequate or elevated filling pressure (PCWP>15 or RAP>10 mmHg)

**If Cardiogenic Shock Suspected**
- Diagnose and treat reversible causes (acute MI, arrhythmias, myxedema, etc.) AND
- Diagnose and treat exacerbants (congestion, hypoxia, infection, anemia, etc.) AND
- Consider pulmonary artery catheter guided therapy* if capabilities exist AND
- Start inotrope if there is evidence of low cardiac output with adequate SBP
  - Dobutamine 5-20 mcg/kg/min (discontinue beta-blocker)
  - Milrinone 0.125-0.5 mcg/kg/min
- Start vasopressor if SBP <90 / MAP <60 mmHg
  - Norepinephrine 0.05-0.4 mcg/kg/min
- Optimize volume: Goal RAP ~8-14 mmHg, PCWP ~16-20 mmHg: diuresis or volume PRN
* A Central Venous O₂ Sat (SVO₂) and RAP from central venous line may serve as surrogates

**Rapid Reassessment of end-organ perfusion within 1-4 hours**
- ↓ urine output, lactate>4, AST or ALT>1000, SVO2<50%, ↑ BUN/Cr, ↓ Na, SBP <90 mmHg, MAP <60 mmHg, cardiac index <2.0 L/min/m² indicate persistent cardiogenic shock.

**Cardiogenic Shock Stabilized**

**Patient Remains in Cardiogenic Shock**

**Escalate Therapies for Cardiogenic Shock and Reassess**
- ↑ Dose of Inotrope or Vasopressor AND/OR
- Add second inotropes AND/OR
- Temporary Mechanical Circulatory Support (MCS) Devices*
  - Primary LV Failure: IABP, Impella, Tandem Heart, Centrimag LVAD
  - Primary RV Failure: Impella RP, Protek Duo, Centrimag RVAD
  - Biventricular Failure: ECMO, Biventricular Centrimag, BiV-Impella
* Depending on center capabilities, transfer to a center with a higher level of MCS capabilities may be indicated

**Reversible Causes of Cardiogenic Shock**
(e.g. acute MI s/p immediate PCI, Takotsubo, viral myocarditis)
- Step-wise weaning of inotropes and temporary MCS devices with cardiology consultation

**Non-Reversible Causes Cardiogenic Shock**
(e.g. late presentation MI, troponin >200, chronic HF without obvious reversible exacerbant, giant cell myocarditis)
- Evaluation for transplant or durable LVAD in appropriate candidates (see back)
- Palliative care consultation
- Attempted step-wise weaning of inotropes and temporary MCS devices with cardiology consultation, but lower likelihood of success
Contraindications to LVAD/Transplant

- Advanced age (>85 yrs LVAD, >75 yrs transplant, >70 yrs ECMO)
- Severe multi-morbidity, non-cardiac limitations, e.g.:
  - Cancer, active
  - COPD/lung disease (severe, ? CHF contributing)
  - Dementia (moderate to severe, consider MoCA testing)
  - ESRD precludes LVAD; in otherwise good candidates consider heart-kidney transplant
- Nonadherence, persistent (LVAD=OAC, txplt=immunos)
  - Hemoglobin A1c control, INRs, digoxin level
  - Prescription fills
- Substance abuse, active
  - UDS on everyone (marijuana is legal, treat like EtOH/tobacco)
  - Serum phosphatidyl ethanol (send out), concerning EtOH history (e.g. DUIs)
- Socioeconomic limitations
  - No health insurance and no option to initiate
  - No caregiver
- Patient absolutely would not want / inconsistent with goals of care:
  - LVAD information: [https://patientdecisionaid.org/lvad/](https://patientdecisionaid.org/lvad/)

Patient Referral Contact Information

- Center with Temporary MCS Capabilities: ______________________
- Center with Transplant/LVAD Capabilities: ______________________