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 O_2 Sat (SVO_2) 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 mHg, cardiac index <2.0 L/min/m^2 *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*

Triggers for considering LVAD/Transplant: I-NEED-HELP (= stage D HF)

I: IV inotropes
N: NYHA IIIB/IV
Natriuretic peptides persistently elevated
E: End-organ dysfunction *(cardiorenal, liver involvement, lactate)*
E: Ejection fraction <25%
D: Defibrillator shocks
H: Hospitalizations recurrent
E: Edema, escalating diuretics
L: Low blood pressure, high heart rate
P: Prognostic medication = progressive intolerance or down-titration of GDMT

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/

Patient Referral Contact Information

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