


Cardiogenic Shock Working Group Report

OCTOBER 9 2025

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Introduction

- Project developed in 2021 under the direction of Behnam Tehrani, MD (Inova)
- Relunched in 2024 under the direction of Chalak Berzingi, MD, and Mark Joseph, MD (Carilion) and Francesco Moroni, MD (UVA)
- This year Drs Alex Treusdell from Inova and Raj Patel from UVA Joined.

Purpose:

- Establish a unified approach to improving the care of patients with cardiogenic shock across the state.

Goal:

- Develop a unified statewide protocol for managing cardiogenic shock, with continuous improvement driven by data sharing and collaboration.
- The group intends to maintain momentum through regular meetings and consistent follow-up on action items.

Vision

Opportunities	Long-term Goals
Inconsistent Diagnosis and Early Recognition	Implement standardized screening tools and protocols for early recognition of cardiogenic shock. Provide training programs for healthcare providers to enhance their ability to identify early signs of shock
Variability in Treatment Protocols	Develop and disseminate statewide standardized protocols for the management of cardiogenic shock. Encourage the formation of dedicated shock teams in hospitals to ensure consistent application of best practices.
Data Collection and Outcome Tracking	Establish an outcome metrics for analyzing data on cardiogenic shock cases, including patient outcomes and treatment methods.
Training and Education	Ensure all relevant healthcare providers are up-to-date with the latest treatment guidelines and technologies.
Disparities in Care	Expand access to advanced care by increasing the availability of specialized cardiac centers and mechanical support devices in underserved areas.
Coordination of Care	Develop clear communication protocols to ensure seamless transitions between different stages of care. "Spoke and Hub Model"
Patient and Family Education	Create comprehensive educational resources for patients and families, explaining the condition, treatment options, and what to expect during and after treatment.
Outcome Disparities	Conduct regular outcome reviews and quality improvement initiatives to reduce variability in care.
Resource Limitations	Advocate for increased funding and resources to ensure all institutions have access to necessary therapies. Explore partnerships and funding opportunities to alleviate financial burdens on patients and healthcare providers.

VHAC Cardiogenic Shock Working Group

Monthly meeting

- **Review of Scientific Principles or Guidelines**
- **Current Best Practices**
- **Align patient care with these guidelines**
- **To produce:**
 - **Cardiogenic shock management protocol**
 - **Shock Data Collection Form**
 - **To promote creation of Cardiogenic shock management teams**
 - **Cardiogenic shock case presentation**

Carilion Clinic CVI Acute Myocardial Infarction Cardiogenic Shock Algorithm

Goals of management:

- Rapid identification
- Early mechanical circulatory support
- Right heart catheterization (pressures, CPO, & PAPi)
- Identify shock phenotype (LV, RV, or both)
- De-escalate inotropes and vasopressors

Suspect Shock: STEMI/NSTEMI

- Hypotension SBP < 90 for 30 min or requirement for vasopressors/inotropes to keep SBP > 90
- Organ hypoperfusion:
 - Cool, clammy
 - Confusion, anxiety
 - Decreased urine output
 - Rapid shallow breathing

STEMI

NSTEMI

STAT Cardiology Consult:
Shock confirmed

Activate cardiac cath Lab

Initial Stabilization:

- Volume resuscitation
- Vasopressors/Inotropes
- Initial Labs (lactate, troponin, Pro-BNP, AST/ALT, creatinine, mVO₂, ABG)
- Bedside Echo

Cath lab:

- Assessment for vascular access
- Diagnostic Coronary Angiogram, LVDEP
- RHC: filling pressures, CO, CI, CPO & PAPI
- Consider MCS devices prior to PCI
- Culprit vessel only PCI

CPO < 0.6
PAPi < 1

Consider R & L-pVAD

CPO < 0.6
PAPi > 1

Consider L-pVAD

CPO > 0.6
PAPi < 1

Consider R -pVAD

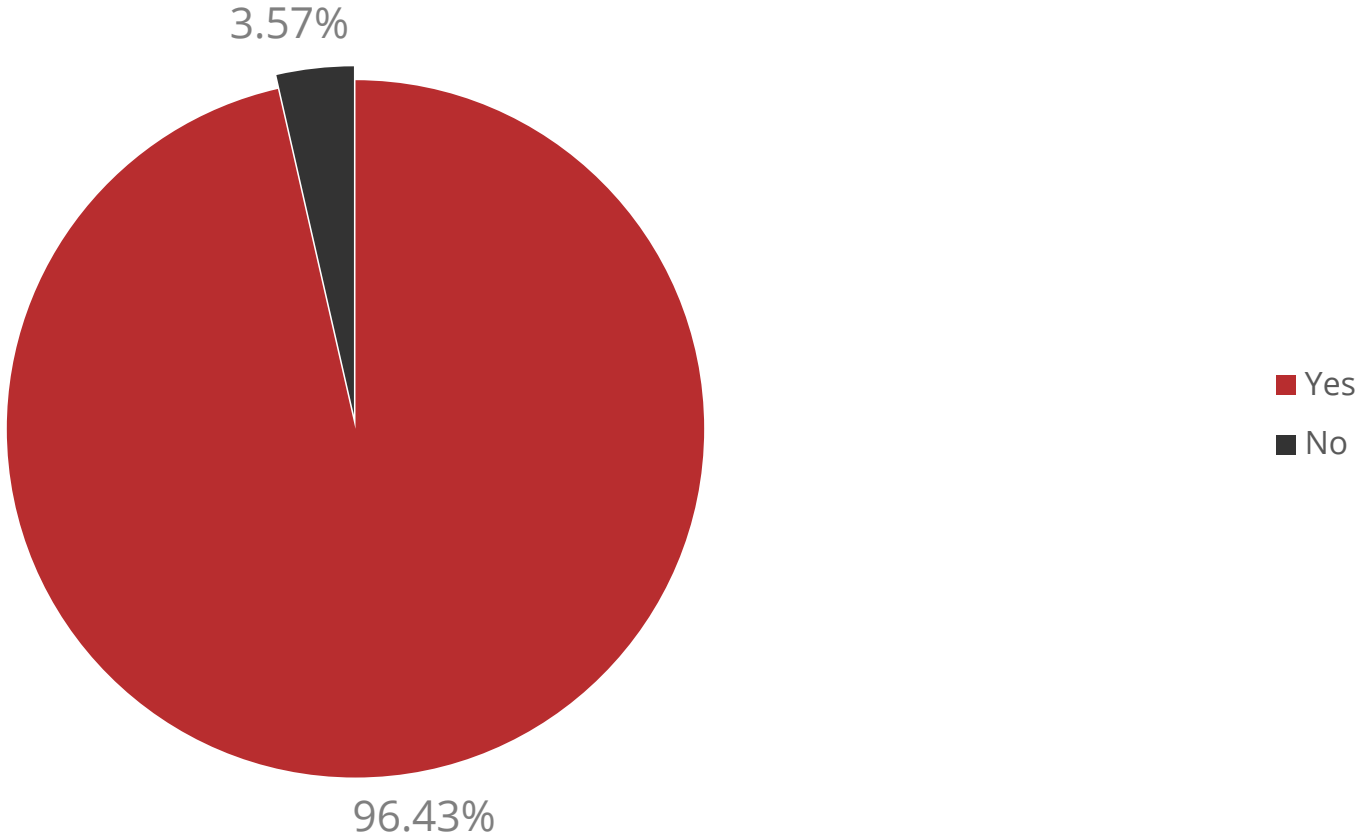
- Reassess hemodynamics after MCS in cath lab
- Consider weaning Vasopressors/inotropes
- Admit to CCU
- Assess for myocardial recovery

Survey Results

N=28

Initial Survey 2021/ Repeat Survey 2024

Does your institution have a 24-7 capable cardiac cath lab with primary PCI capability?

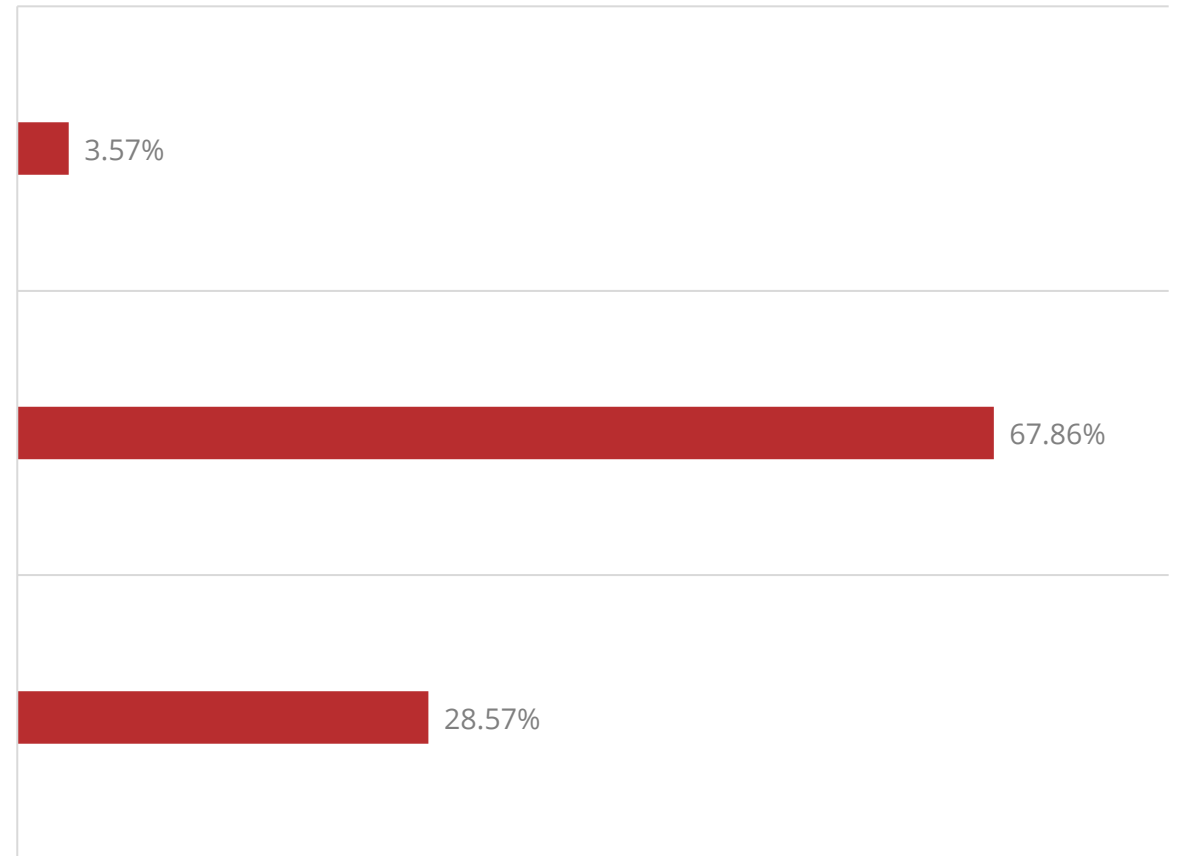


Please choose the category which would best describe your institution's shock classification in a regionalized shock network:

Level 3 Shock Center – Non-PCI capable with primary referrals to Level 1 and Level 2 centers.

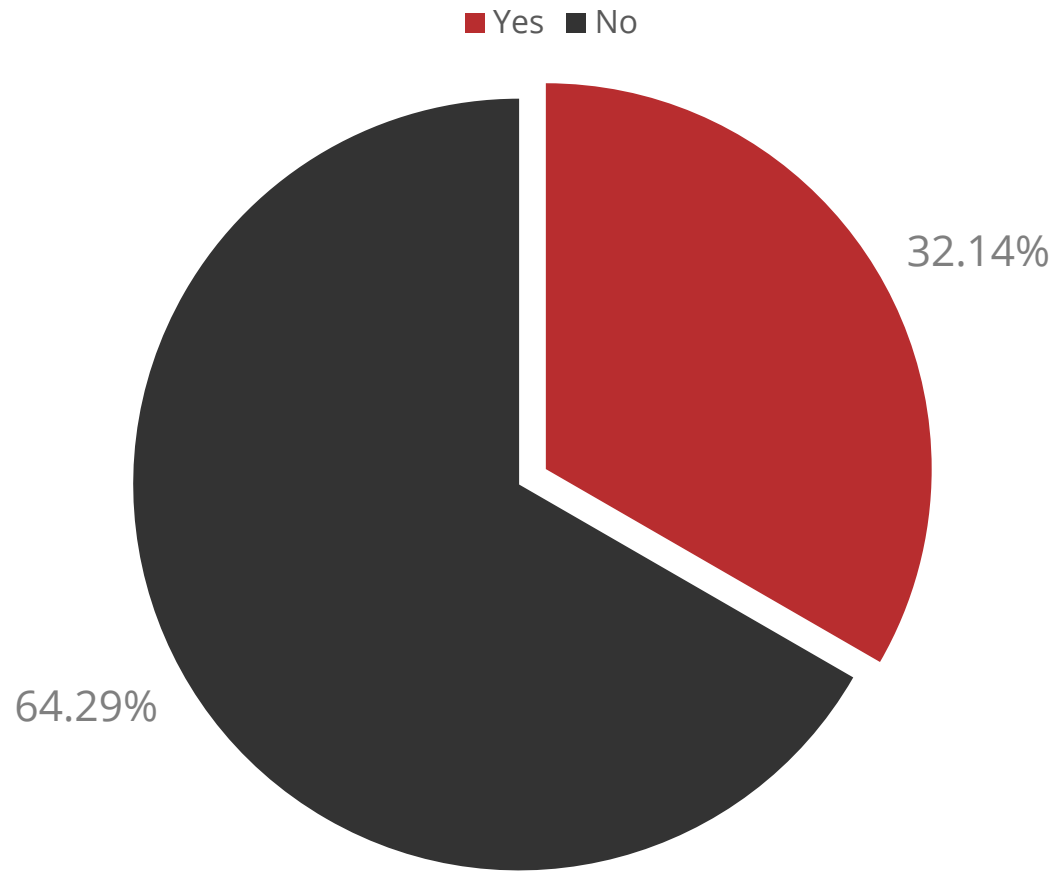
Level 2 Shock Center – 24/7 cardiac cath lab with primary PCI and IABP capability. May be able to implant Impella and ECMO on site but would transfer to Level 1 center for LVAD and/or transplant evaluation if destination therapies needed.

Level 1 Shock center: LVAD/transplant, High Risk PCI, ECMO and Impella capabilities.

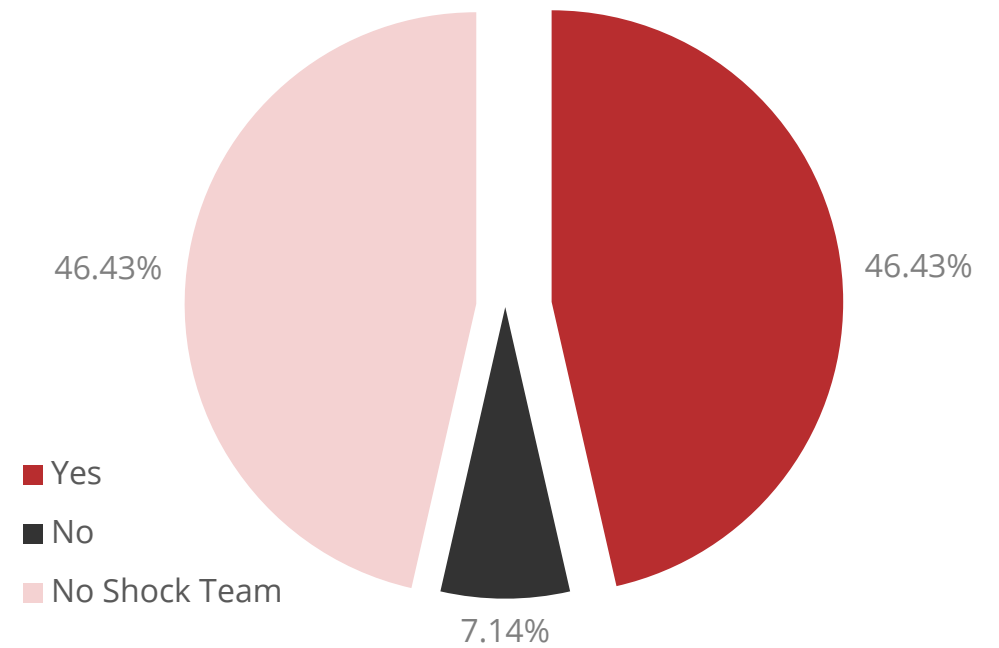


Does your institution have a dedicated shock team?

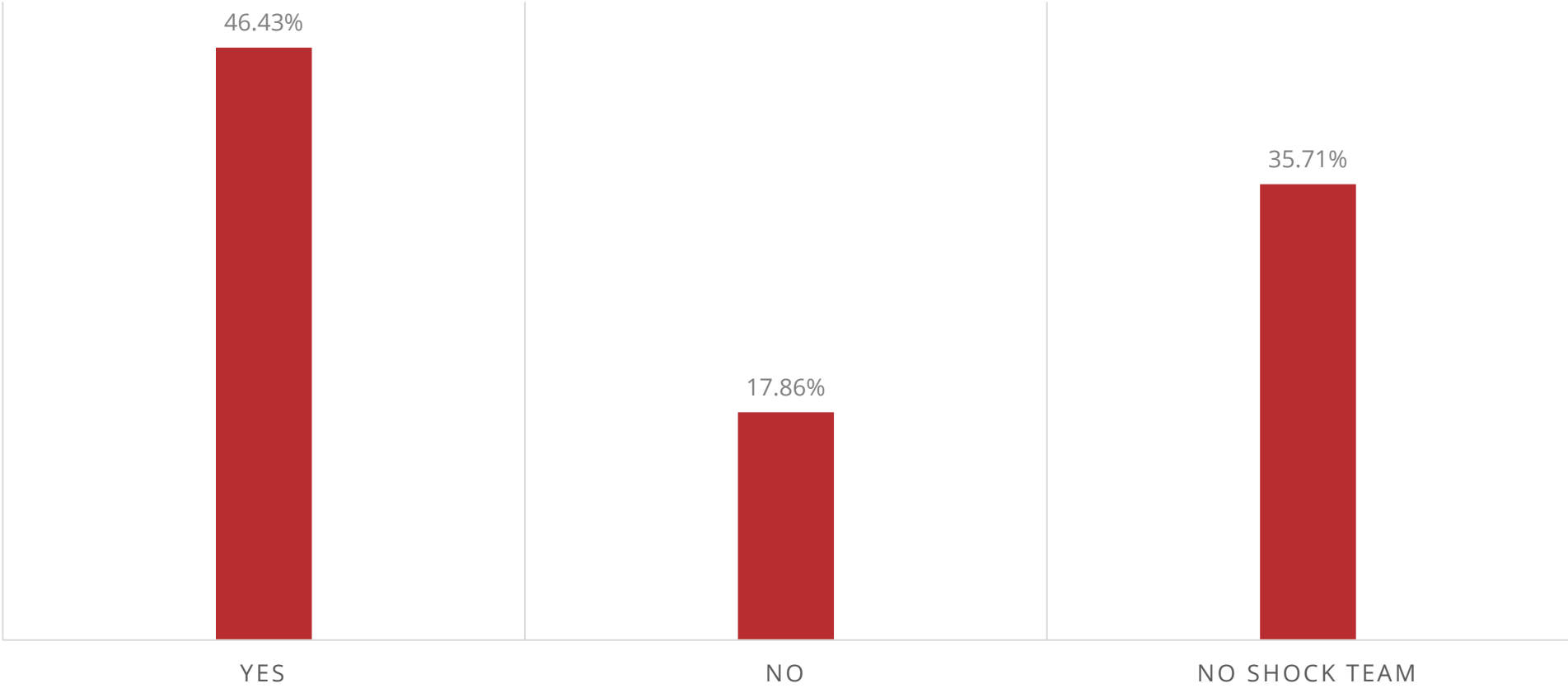
2024 N=12 / 2021 N=24



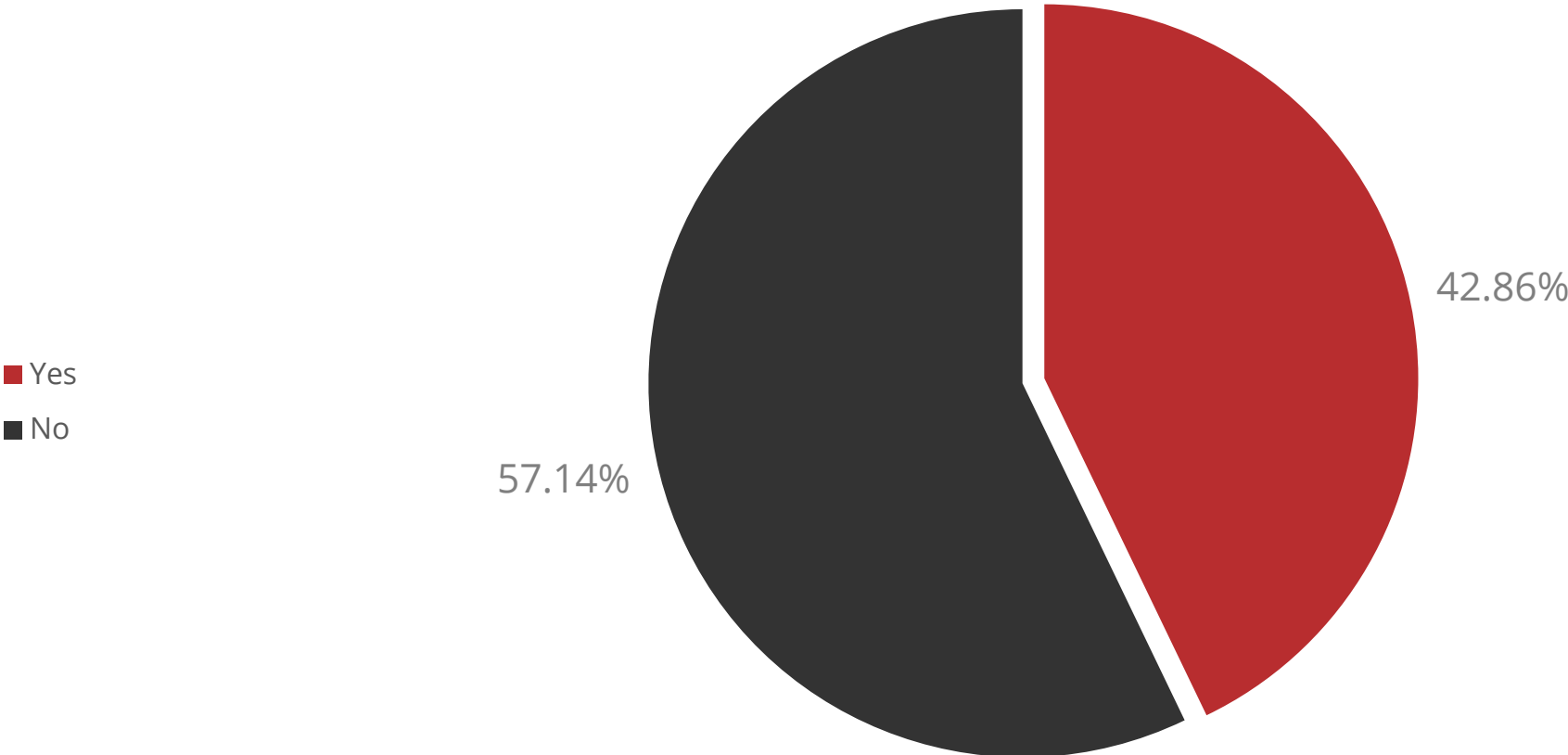
Is your shock team available on a 24-7 basis?



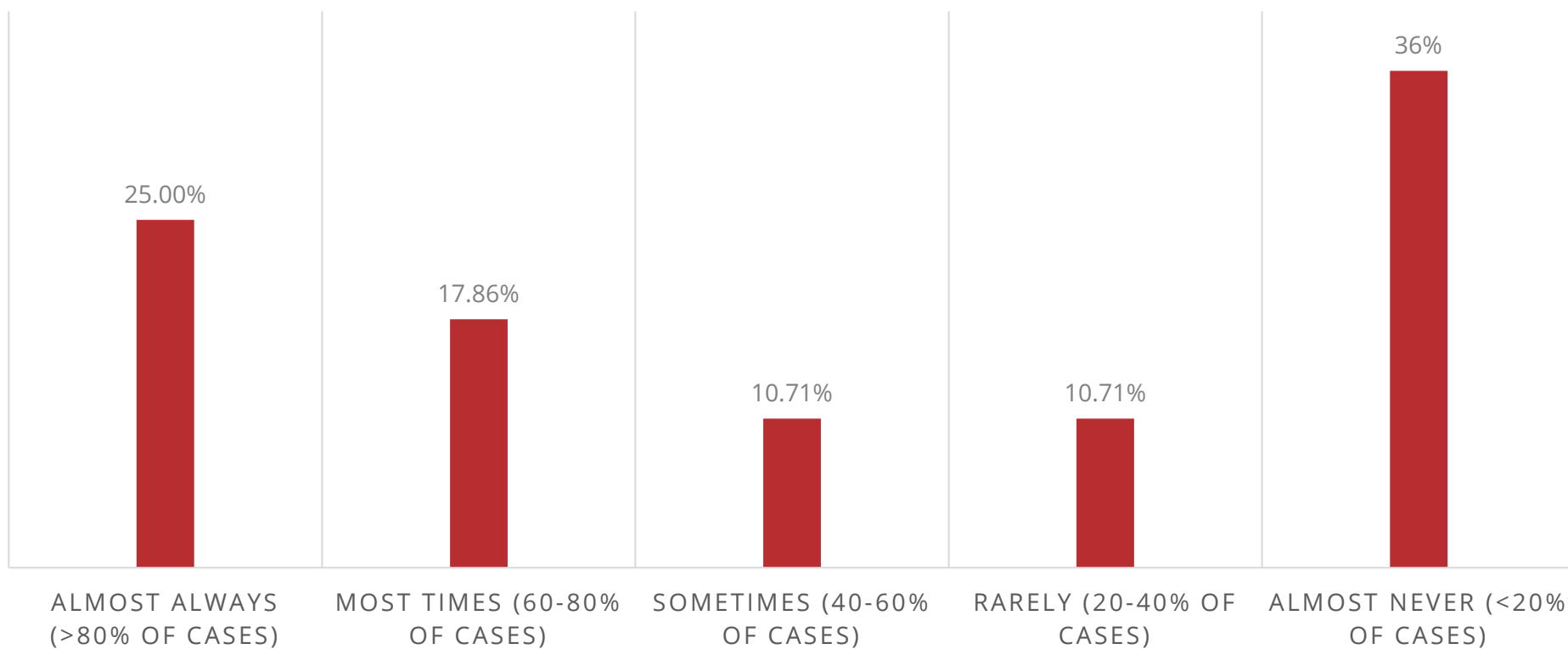
Does your institution have a call line for cardiogenic shock management?



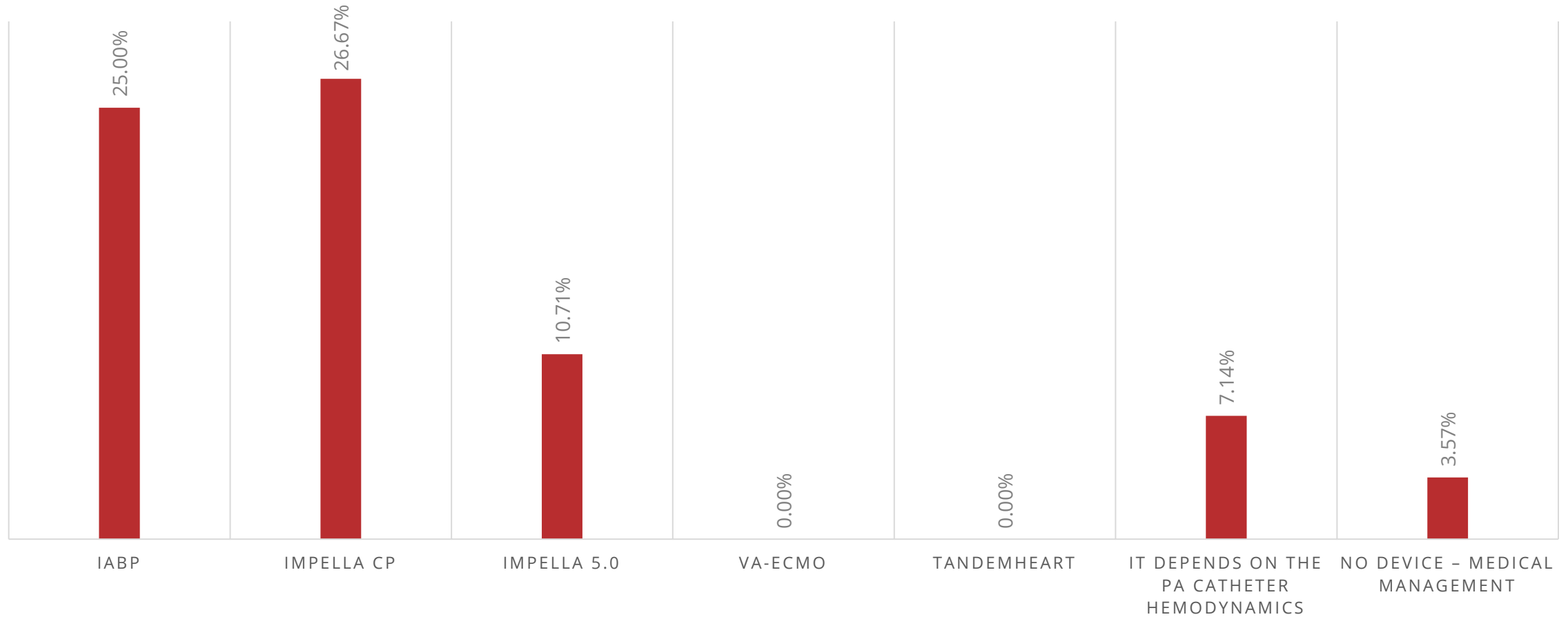
Does your institution use any risk scores or staging systems in the stratification of patients with cardiogenic shock?



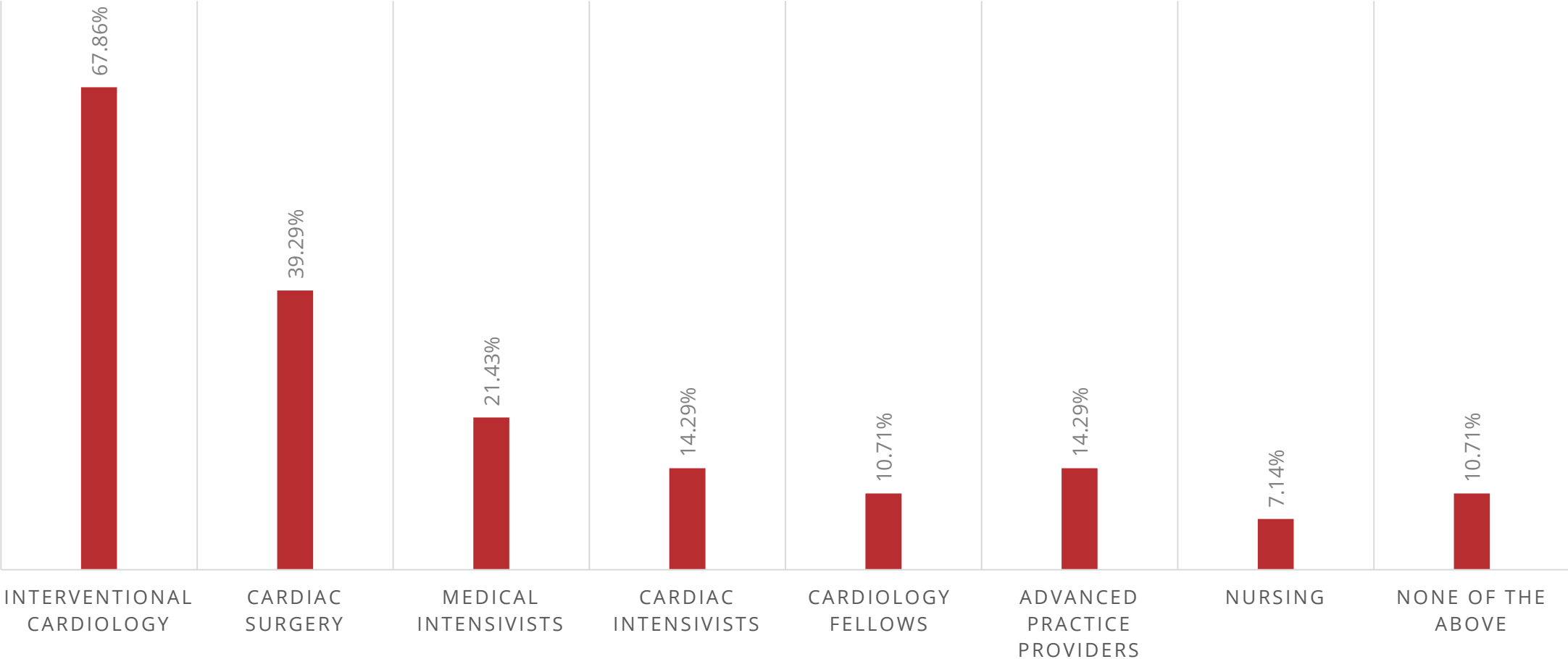
Which of the following best describes your practice with regards to utilizing pulmonary arterial catheters to diagnose cardiogenic shock?



In the management of refractory LV-dominant shock, what is your initial MCS device of choice?



Who is primarily responsible for management of mechanical circulatory support devices at your institution? (Select all that apply)



Does your institution's ICU have dedicated weaning and escalation protocols for circulatory support device management?



Cardiogenic Shock Team Activation

WHY is there a Shock Team?

Early identification and treatment improves survival in Cardiogenic Shock

WHAT is the Cardiogenic Shock Team?

A **multidisciplinary team** dedicated to optimizing the care of Cardiogenic Shock patients via:

- Rapid identification
- Coordinated consultation
- Early transfer/admission to Cardiac ICU, Cath Lab or Operating Room

WHO comprises the Shock Team?

- Interventional Cardiologist
- Cardiac Surgeon
- Advanced Heart Failure
- Cardiac Critical Care

HOW is the Shock Team activated?

Transfer Center:

WHO activates the Shock Team?

- Emergency Department
- Other units in the hospital (eg, Cath Lab or ICUs)
- Other hospitals

WHEN is the Team Activated?

Call the Shock Team as soon as Cardiogenic Shock is suspected

Clinical Criteria

- SBP < 90mmHg (for 30 min) or use of vasopressors/inotropes
- Lactate > 2 mmol/L
- Evidence of end-organ (eg, renal, hepatic, cerebral) hypoperfusion
- ACS or Heart Failure

Hemodynamic Criteria (if known)

- CI < 1.8 (or 2.2 L/min/m² with inotropes or vasopressors)
- CPO < 0.6
- PAPI < 1.0
- PCWP ≥ 15 mmHg

Contraindications*

- DNAR
- Terminal Illness

» Note: for STEMI, follow STEMI pathway

**If any questions, contact Shock Team*

AFTER the team has been activated

- Obtain ongoing Vital Signs, ECG, Labs (eg, BNP, Tn I, Lactate, CBC, CMP)
- Maintain 2 large bore IVs (consider central line as needed)
- Minimize vasopressors/inotropes to maintain MAP of ≥ 60 mmHg
- Preferential use of norepinephrine for vasopressor support
- **Avoid** use of phenylephrine
- Preferential use of amiodarone for control of VT or AF
- **Avoid** negative inotropes (eg, β-blockers, Ca⁺⁺ channel blockers)
- Consider airway stabilization

Cardiogenic Shock Team Coordination

Heart Team Goals

- Early identification of CS patients
- Early CS phenotyping
- Selective and tailored PMCS
- Optimize hemodynamics
- Native heart recovery

*Clinical Considerations for PMCS

- Shock phenotype (AMI-CS vs HF-CS)
- Shock severity (SCAI Classification)
- Shock profile (LV, RV, Bi-V)
- Lactate level
- Severity of end-organ dysfunction
- Amount of vasopressor/inotropic support
- Presence of hypoxia
- Presence of arrhythmias

Relative PMCS

CONTRAINDICATIONS

- Terminal illness
- Unable to anticoagulate
- Cardiac arrest with neurocatastrophe
- Advanced multi-system organ failure
- LA or LV thrombus

CPO = MAP x CO/451

PAPi = (sPAP-dPAP)/RA

Cardiogenic Shock Team Activation

Activate your local Cardiogenic Shock Team via your institution's 24/7 shock team activation line (insert facility-specific number). Obtain ongoing Vital Signs, ECG, Labs, etc.

HF-CS

- Echocardiography
- Right Heart Catheterization

AMI-CS

- Coronary angiography with LVEDP
- Right Heart Catheterization

Are Criteria for Cardiogenic Shock Met?

- SBP < 90mmHg or use of vasopressors/inotropes **AND:**
- CI < 1.8 (or < 2.2 L/min/m² with inotropes/vasopressors)
- PCWP ≥ 15 mmHg and/or LVEDP ≥ 15 mmHg
- CPO < 0.6
- PAPi < 1.0
- Lactate > 2 mmol/L
- Evidence of end-organ hypoperfusion

YES

- Consider Percutaneous Mechanical Circulatory Support (PMCS) based on **Clinical Considerations for PMCS***
- Coronary revascularization prn (consider IV antiplatelet agent)

NO

- Coronary revascularization as needed
- Recommend invasive hemodynamic monitoring

Cardiac Intensive Care Unit for ongoing CS Management

- Serial reassessment of hemodynamics & end-organ perfusion
- Optimize Preload, Afterload, and Contractility
- Timely, tailored *escalation of treatment* for **Worsening Shock**
- Assess for ability to wean PMCS

Call _____ to activate Cardiogenic Shock Team

CS Management Goals

- **Serial reassessment** ($\leq q$ 6hr) of hemodynamics & end-organ perfusion
 - Lactate
 - Renal, hepatic function
 - Continuous hemodynamics
 - CPO & PAPI
- Optimize *Preload, Afterload* and *Contractility*
 - Volume or diuresis
 - Vasodilators or Vasopressors
 - Inotropes
- Timely, tailored treatment *escalation* for **Worsening Shock**:
 - Rising Lactate
 - Increasing pressor requirement
 - Worsening end-organ function
 - CPO < 0.6 and/or PAPI < 1
 - RA > 15 and/or PCWP > 15
- Assess for LV and RV recovery
 - Wean PMCS, vasopressors and inotropes

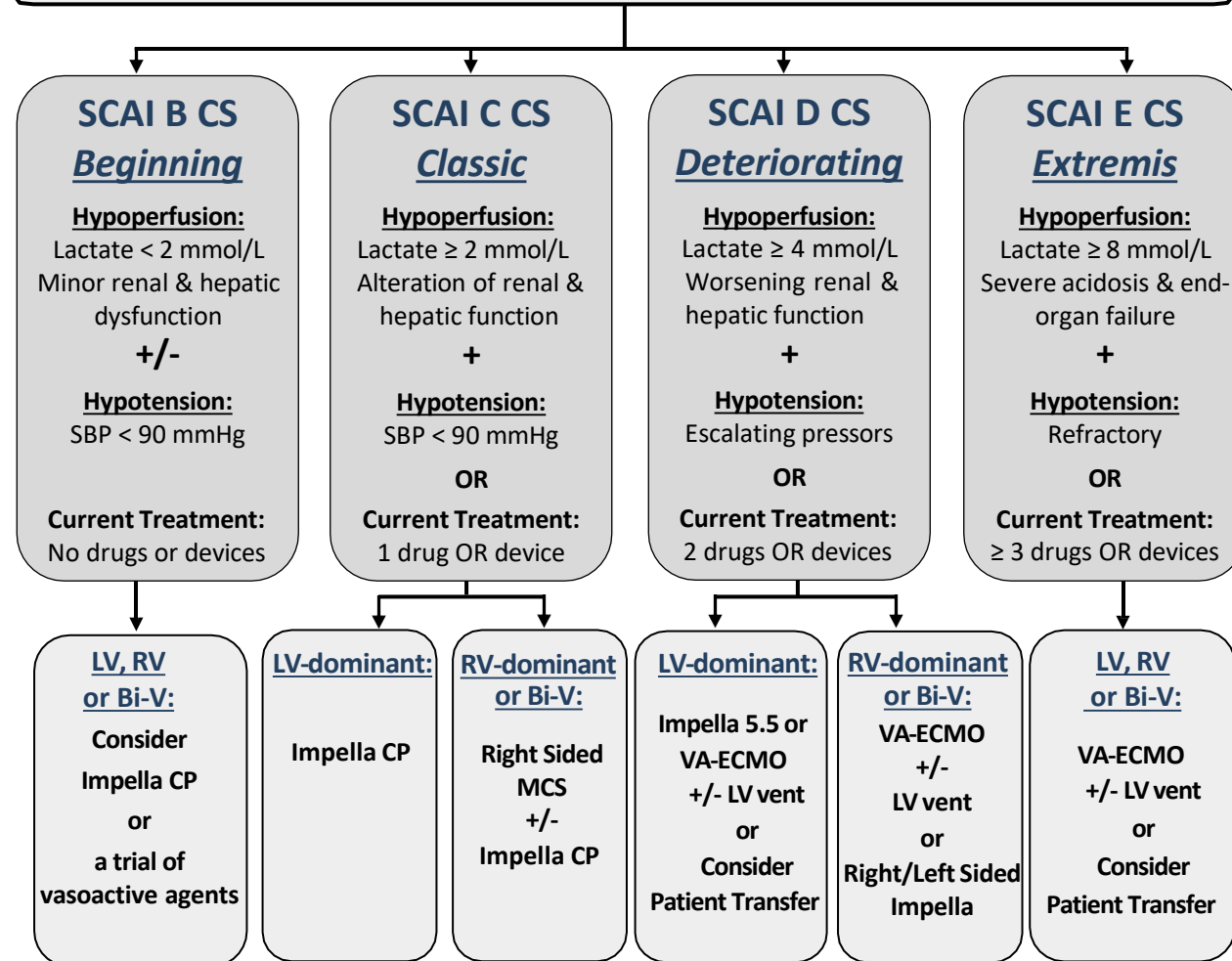
CS Hemodynamic Profile

	LV-dominant	RV-dominant	Bi-V
RA	< 15	> 15	> 15
PCWP	> 15	< 15	> 15
CPO	< 0.6	< 0.6	< 0.6
PAPi	> 1.0	< 1.0	< 1.0

CPO = MAP x CO/451
 PAPI = (sPAP-dPAP)/RA

Treatment Considerations for AMI-CS

- **Shock severity (SCAI stage)**
- **Shock profile (LV, RV or Bi-V)**
- Revascularization status (mode and completeness)
- Presence of mechanical complications (eg, VSD, MR)
- Presence of hypoxia
- Presence of arrhythmias
- Contraindications to PMCS
- Use of IV antiplatelet agent



Thank You

A special thank you to the members of the VHAC Cardiogenic Shock Workgroup.

Contact Sherri@vcsqi.org for information for further inquiries

Website: VAHeartAttackCoalition.org



Next Steps

- Engage Stakeholders
 - At least one representative from each institution
- Meet regularly (Monthly/Bimonthly) to Review Literature, Case presentations, etc.
- Data Collection Framework & Outcome Metrics
 - Develop Preliminary Reports
 - Consider Participation in AHA's Cardiogenic shock registry