

# Patient selection: ECLS in Cardiogenic Shock

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# Disclosures

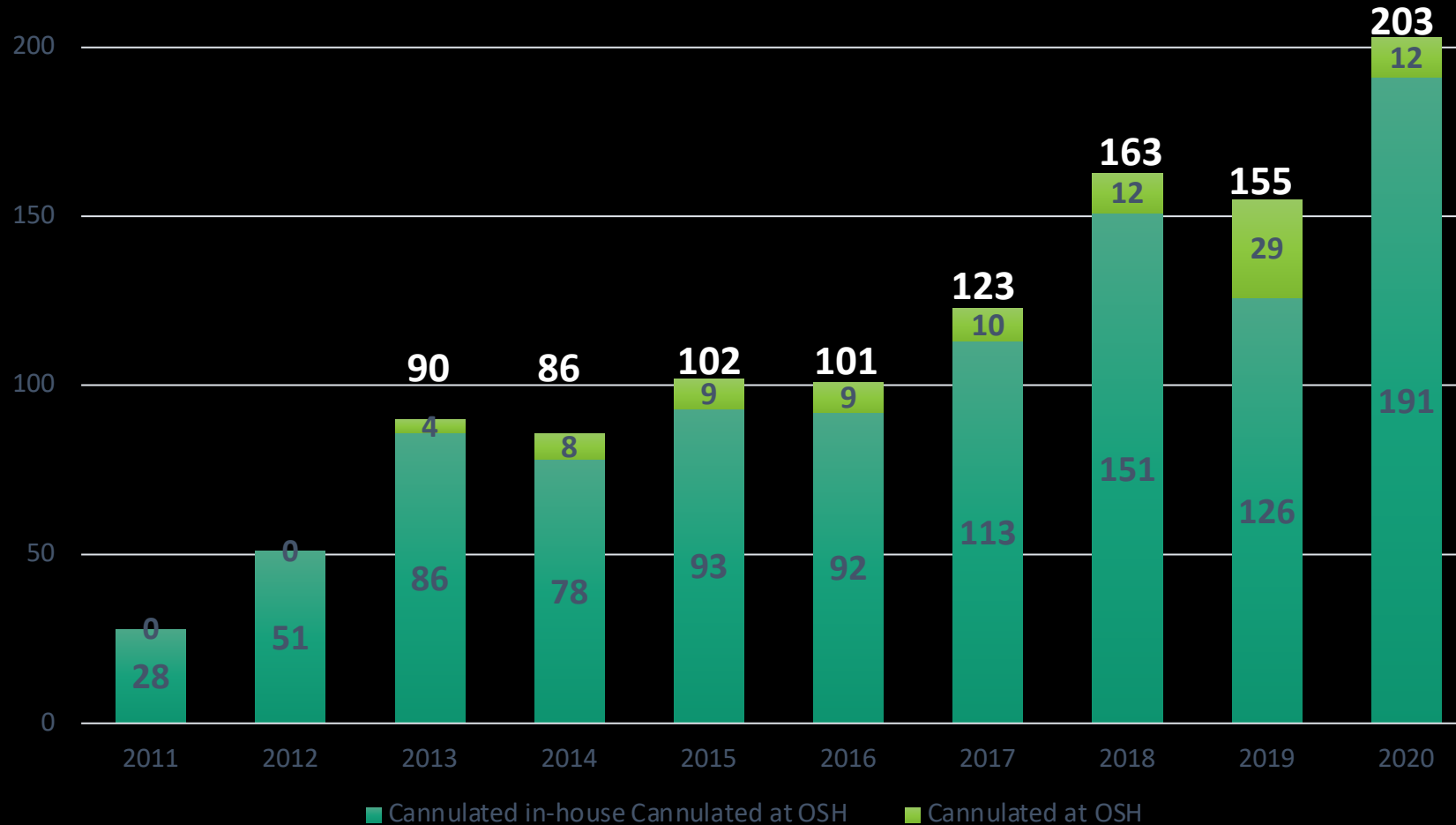
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Abbott: Surgical advisory, Surgical Proctor, Speaker honoraria

Abiomed: Speaker Honoraria, Surgical advisory

I will not discuss off label use and/or investigational use of drugs/devices

# ECLS Management BJH/WU





Are you aware who is dying?

# Shock Stages

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- Initial stage - Cardiac output (CO) ↓ Tissue perfusion ↓
- Compensatory - Attempt to maintain CO, blood pressure, and tissue perfusion.
- Progressive - The compensatory mechanisms fails: Metabolic decomp, Shock cycle is perpetuated.
- Refractory - Shock becomes unresponsive to therapy considered **irreversible**.

Urden, Stacy, & Lough (2014)

# SCAI Shock Stages



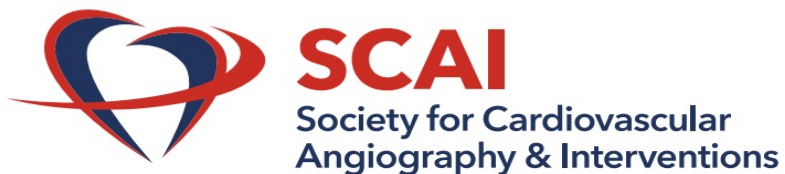
## SCAI Stages of Cardiogenic Shock

Adapted from the SCAI Clinical Expert Consensus Statement on the Classification of Cardiogenic Shock  
Endorsed by ACC, AHA, SCCM, and STS

**Arrest (A) Modifier:**  
CPR, including defibrillation



Baran DA, Grines CL, Bailey S, et al. SCAI clinical expert consensus statement on the classification of cardiogenic shock. Catheter Cardiovasc Interv. 2019;1-9. <https://doi.org/10.1002/ccd.28329>  
For more information, please visit: [www.scai.org/shockdefinition](http://www.scai.org/shockdefinition)



# Awareness of Cardiogenic Shock

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# Two Important Numbers

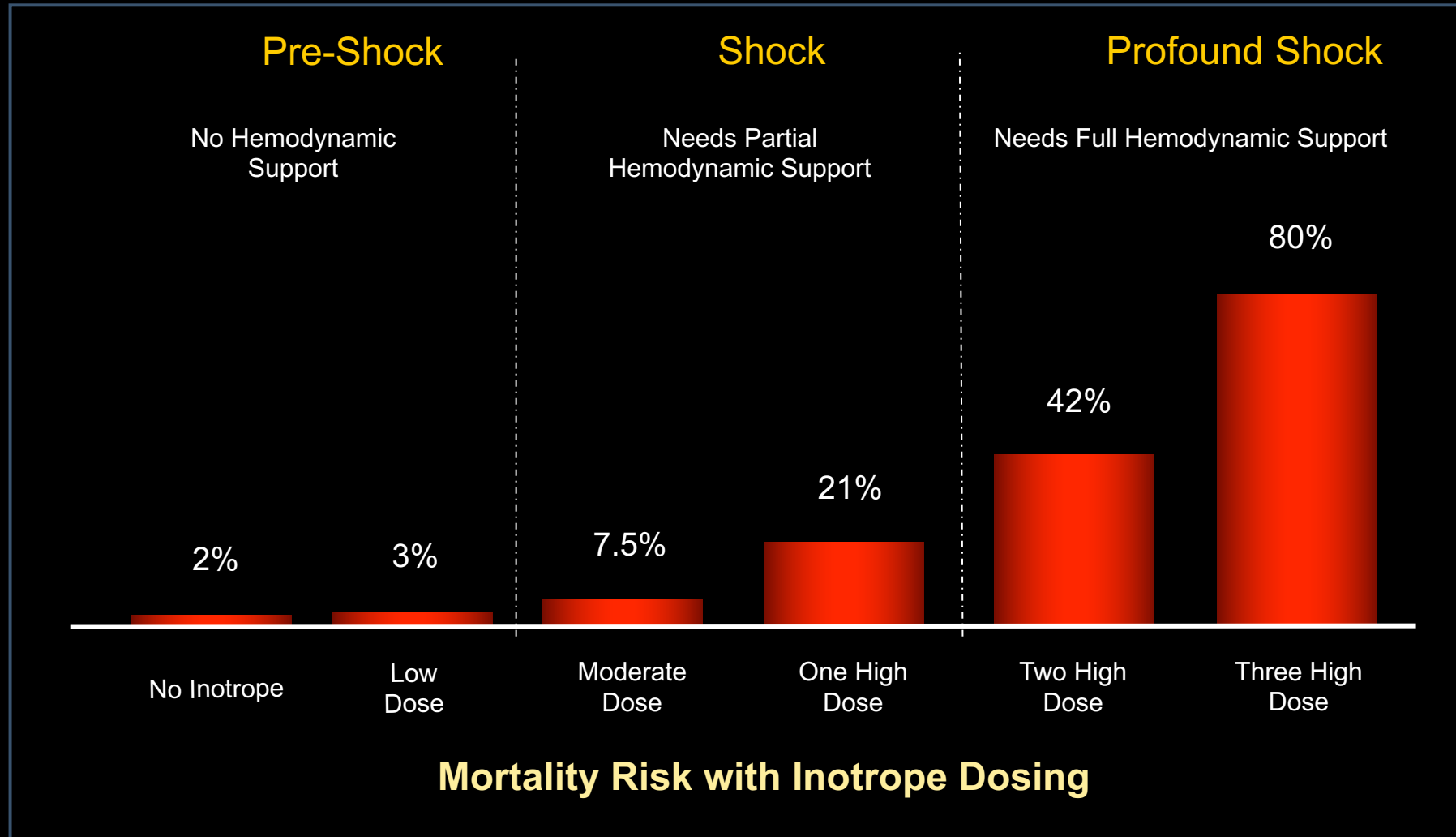
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-VIS

-CPO (CI)



# Support before Profound Shock



Adapted from Samuels LE et al, J Card Surg. 1999;14(4):288-93

# Vasoactive Inotropic Score

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Epinephrine  
x100

Norepinephrine  
x100

Dobutamine x1

Over 20-30: high dose requirement of Inotropic-vasopressor  
Poor prognosis, DO SOMETHING!!! (Volume, stop bleeding, MCS)

e.g.) Norepinephrine 0.3mcg/kg/min equals VIS 30  
Epi 0.15, NE 0.15, Vaso 0.04 equals 34

# Cardiac Power Output (Index)

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Cardiac Output (L) x MAP / 451

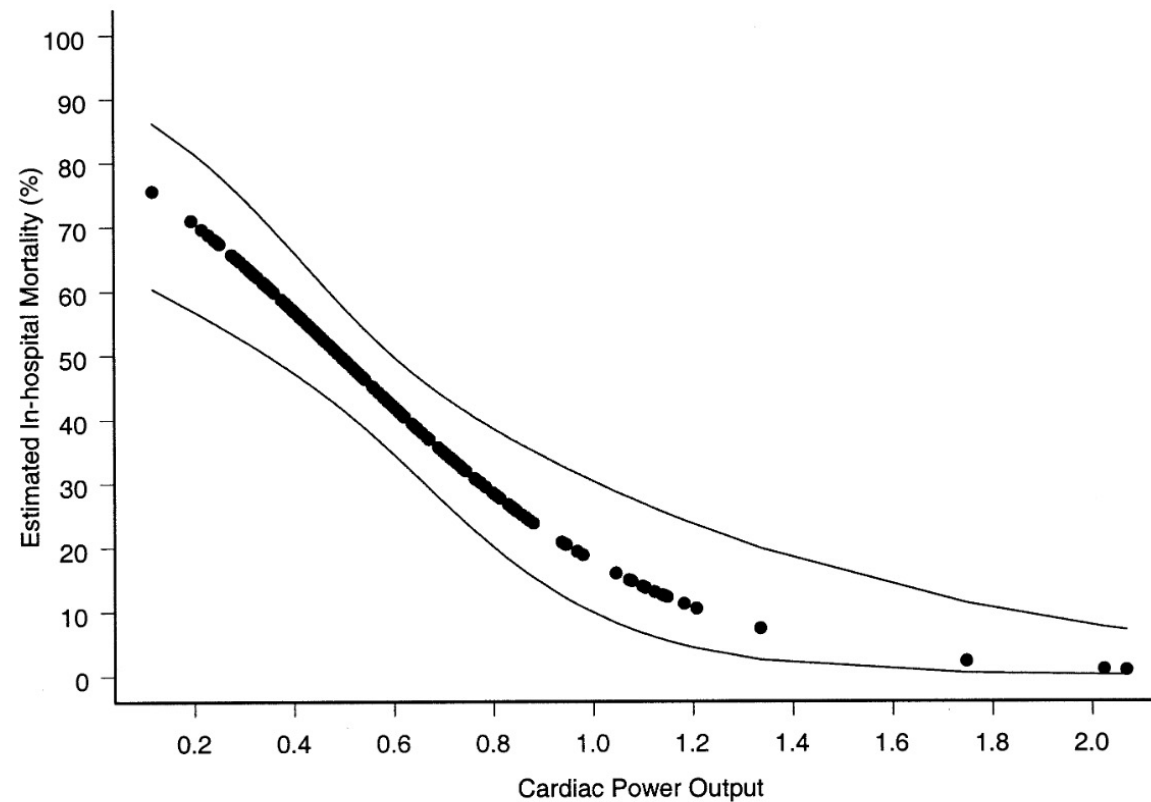
Cardiac Index (L/m<sup>2</sup>)x MAP /451

- CO 4L, MAP 70 gives 0.62 w of Cardiac Power Output
- CI of 2.0, MAP 70 CPO Index 0.3

# Cardiac Power Output and Mortality

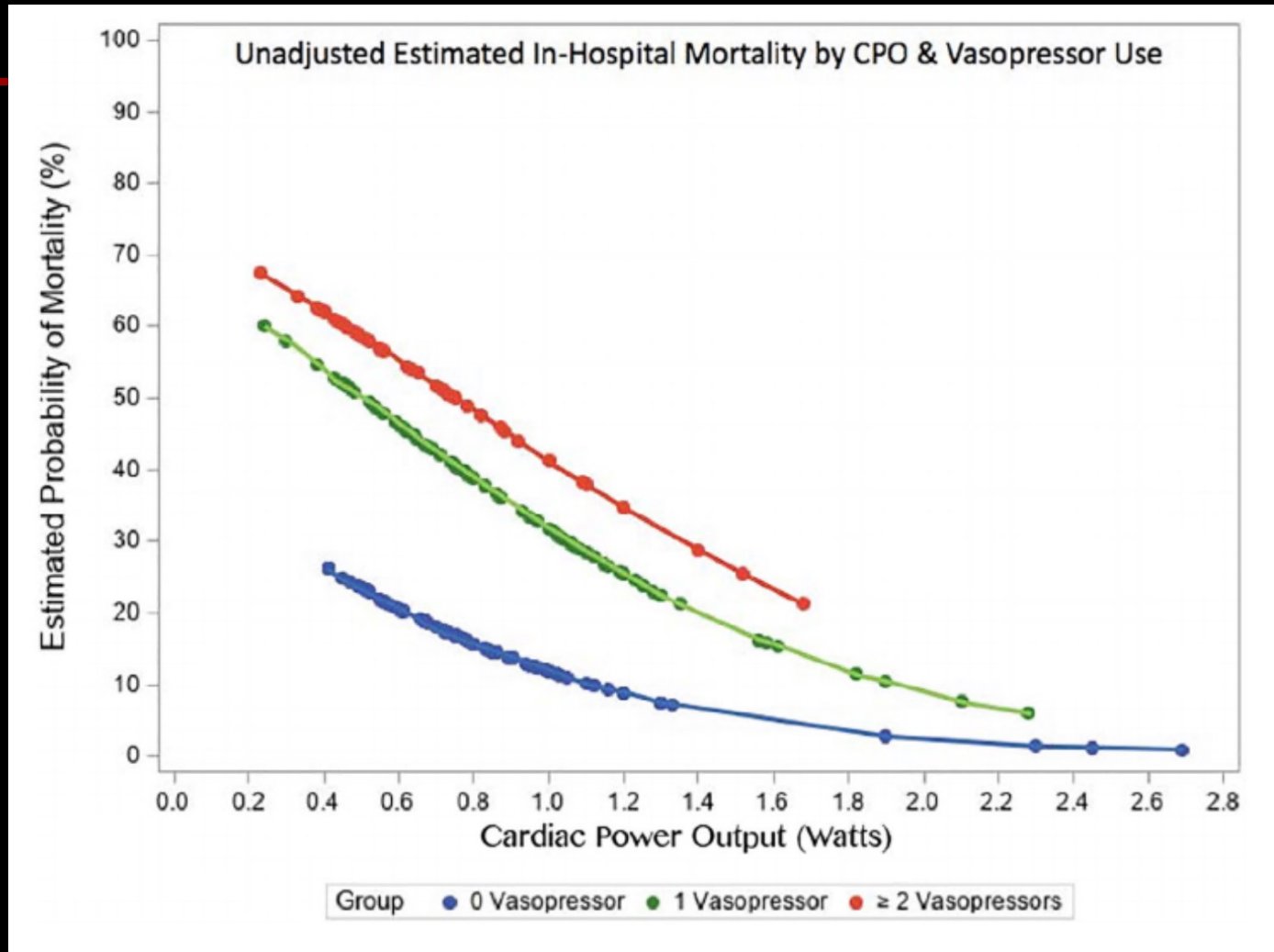
Fincke *et al.*  
Cardiac Power in Cardiogenic Shock

JACC Vol. 44, No. 2, 2004  
July 21, 2004:340-8



**Figure 2.** Unadjusted estimated in-hospital mortality by cardiac power output (n = 189) with pointwise 95% confidence bands.

National CSI  
data



*Catheter Cardiovasc Interv.* 2021;1-8.

# Clinical Features of CS

- SBP <90mmHg, MAP <70mmHg
- (Vasopressors to maintain SBP >90mmHg)
- CI<2.2 (Fick, SG, Non-invasive) , CPO <0.6 W
- End-organ damage
  - Altered mental status
  - Mottled skin, cold extremities
  - Low urine output <0.5ml/kg/hr
  - Metabolic/Lactic acidosis

**Table 1.** Clinical Features of CS as Defined in Contemporary Trials and Guidelines

Clinical Trial/Guideline	CS Criteria
SHOCK Trial (1999) <sup>3</sup>	<ul style="list-style-type: none"> <li>• SBP &lt;90 mm Hg for &gt;30 min or vasopressor support to maintain SBP &gt;90 mm Hg</li> <li>• Evidence of end-organ damage (UO &lt;30 mL/h or cool extremities)</li> <li>• Hemodynamic criteria: CI &lt;2.2 and PCWP &gt;15 mm Hg</li> </ul>
IABP-SOAP II (2012) <sup>4</sup>	<ul style="list-style-type: none"> <li>• MAP &lt;70 mm Hg or SBP &lt;100 mm Hg despite adequate fluid resuscitation (at least 1 L of crystalloids or 500 mL of colloids)</li> <li>• Evidence of end-organ damage (AMS, mottled skin, UO &lt;0.5 mL/kg for 1 h, or serum lactate &gt;2 mmol/L)</li> </ul>
EHS-PCI (2012) <sup>5</sup>	<ul style="list-style-type: none"> <li>• SBP &lt;90 mm Hg for 30 min or inotropes use to maintain SBP &gt;90 mm Hg</li> <li>• Evidence of end-organ damage and increased filling pressures</li> </ul>
ESC-HF Guidelines (2016) <sup>6</sup>	<ul style="list-style-type: none"> <li>• SBP &lt;90 mm Hg with appropriate fluid resuscitation with clinical and laboratory evidence of end-organ damage</li> <li>• Clinical: cold extremities, oliguria, AMS, narrow pulse pressure. Laboratory: metabolic acidosis, elevated serum lactate, elevated serum creatinine</li> </ul>
KAMIR-NIH (2018) <sup>7</sup>	<ul style="list-style-type: none"> <li>• SBP &lt;90 mm Hg for &gt;30 min or supportive intervention to maintain SBP &gt;90 mm Hg</li> <li>• Evidence of end-organ damage (AMS, UO &lt;30 mL/h, or cool extremities)</li> </ul>

AMS indicates altered mental status; CI, cardiac index; EHS PCI, Euro Heart Survey Percutaneous Coronary Intervention Registry; ESC HF, European Society of Cardiology Heart Failure; IABP-SOAP II, intra-aortic balloon pump in cardiogenic shock II; KAMIR-NIH, Korean Acute Myocardial Infarction Registry-National Institutes of Health; MAP, mean arterial pressure; PCWP, pulmonary capillary wedge pressure; SBP, systolic blood pressure; SHOCK, Should We Emergently Revascularize Occluded Coronaries for Cardiogenic Shock; UO, urine output.

# Know your limits

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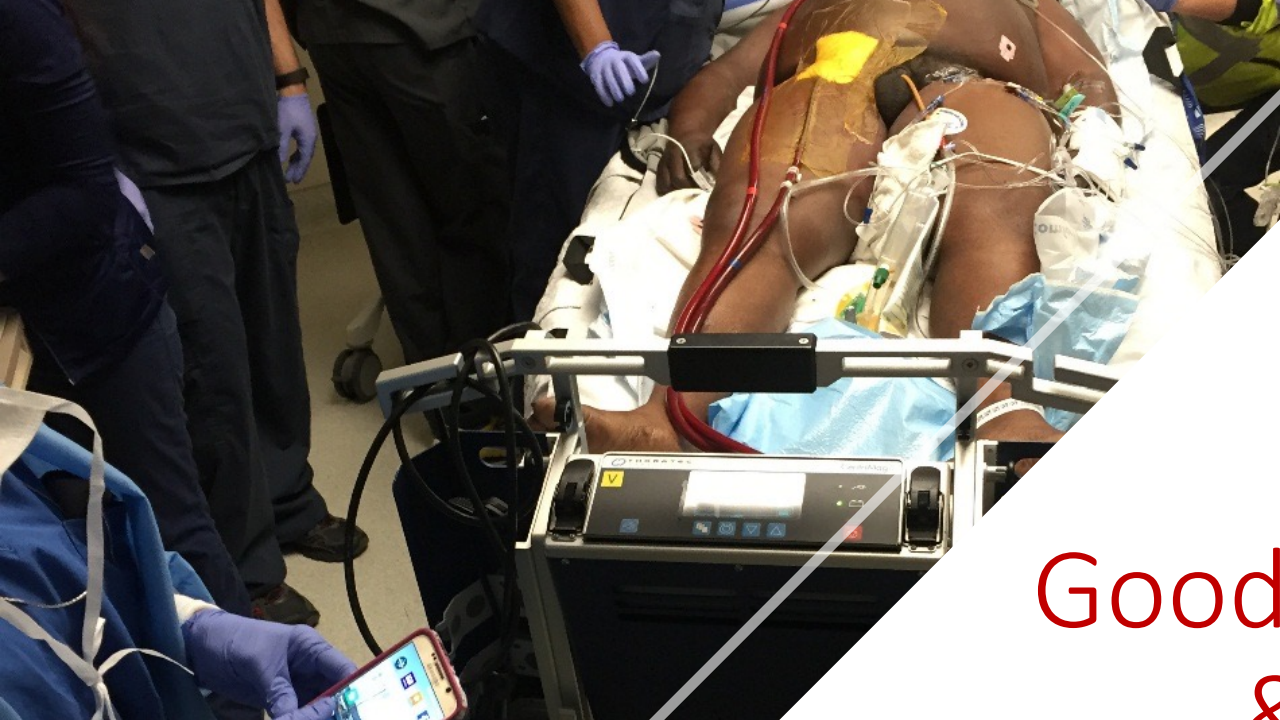
# CS who do not have benefits from ECLS/MCS

## Contra-indication

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- Age >80
- Unwitnessed cardiopulmonary arrest
- Chest compressions not initiated within 10 min of arrest
- Asystole
- CPR >60 min
- Hemorrhagic shock
  
- Pre-existing medical conditions:
  - Ischemic/hemorrhagic Stroke
  - COPD severe
  - ESLD
  - ESRD
  - PVD
  - Malignancy with poor prognosis
  - Hypercoagulable state/coagulopathy
  
- Poor socioeconomic situation
  - No Insurance, No Family support, Institutionalized patient





Good Luck  
&  
Thank you!

