

When to Use Mechanical Circulatory Support (MCS) in the Catheterization Laboratory?

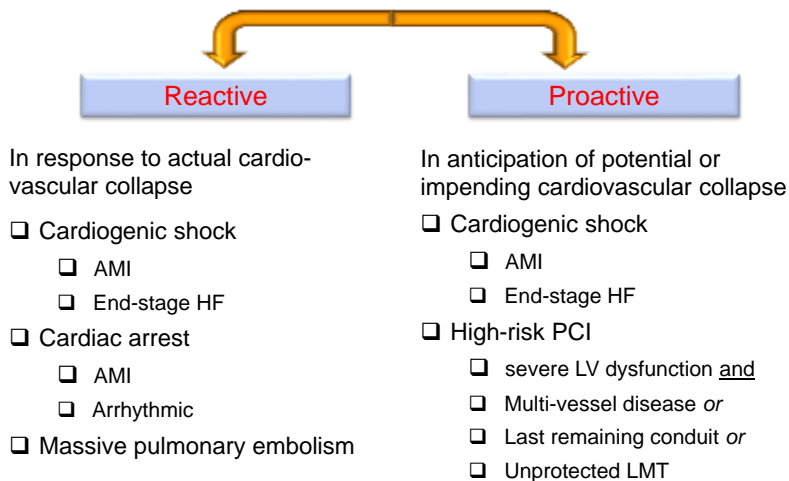


Khaled M. Ziada, MD, FACC, FSCAI

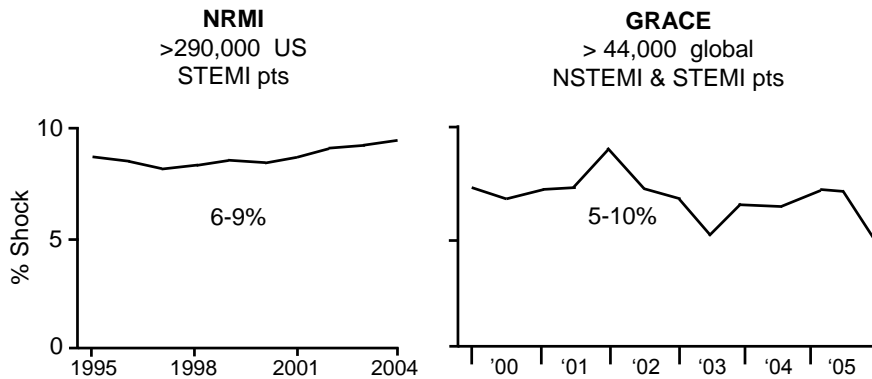
Professor of Medicine
Gill Foundation Professor of Interventional Cardiology
Gill Heart Institute, University of Kentucky



Need for Mechanical Circulatory Support (MCS)

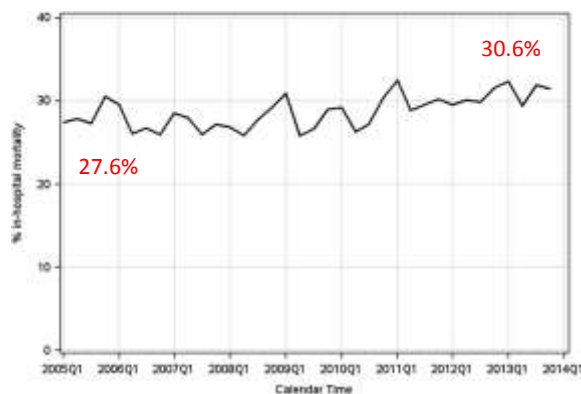


Incidence of Cardiogenic Shock



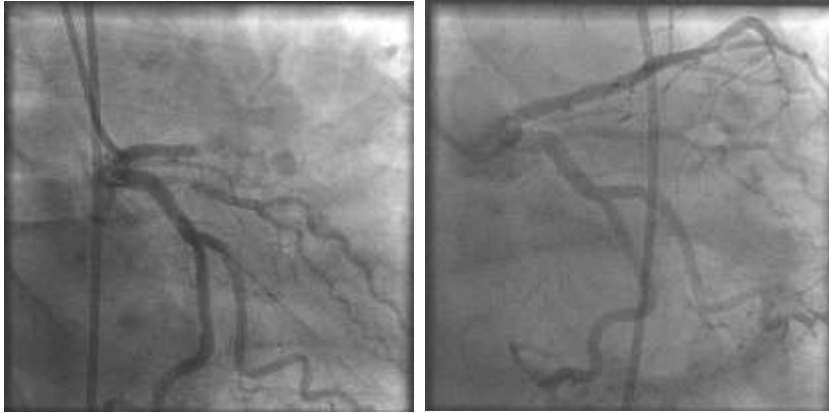
The #1 cause of death in patients presenting with AMI

Mortality of Cardiogenic Shock with AMI



Wayangankar SA et al. J Am Coll Cardiol Intv. 2016;9(4):341-351.

Cornerstone of Therapy – Primary PCI



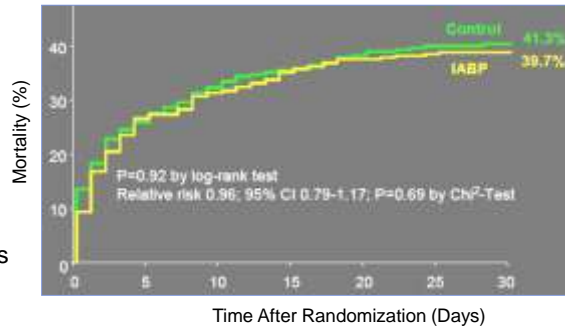
Percutaneous MCS Devices



Does IABP Support Improve Outcome?

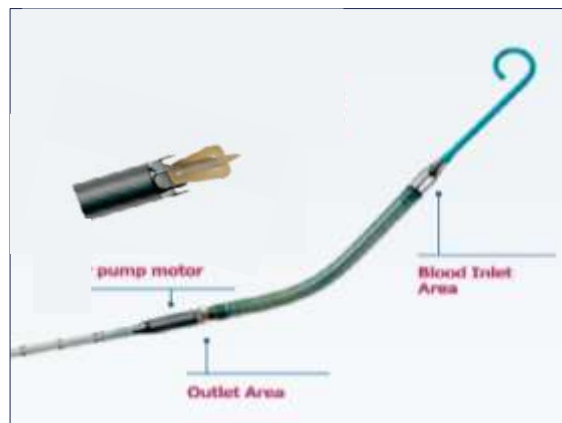
Randomized Comparison of IABP vs. OMT in Addition to Revascularization in Patients with Acute Myocardial Infarction Complicated by Cardiogenic Shock (The SHOCK II Trial)

- ❑ 600 pts with AMI + CS
- ❑ >95% revascularization
- ❑ 1:1 randomization to IABP+OMT vs. OMT alone
- ❑ Primary Endpoint: All-cause mortality at 30 days



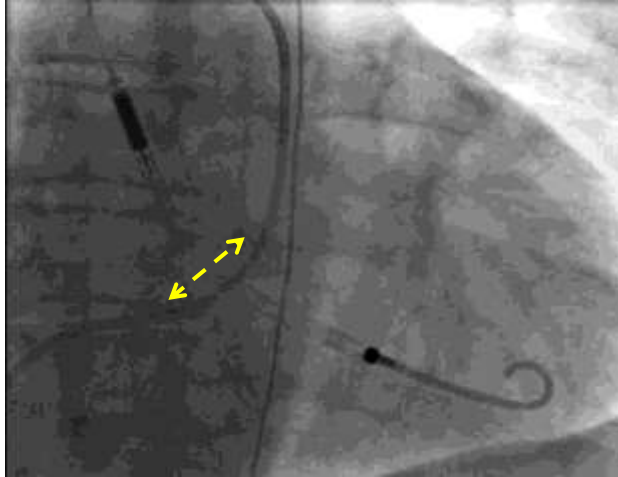
Thiele H et al. N Engl J Med 2012, 367: 1287-96

Impella®



- Impella 2.5 – 13 F access
- Impella CP – 3.5-3.8 L/min, 14 F access
- Impella 5.0 – 22 F, requires surgical cutdown

Fluoroscopic Appearance of Impella Device

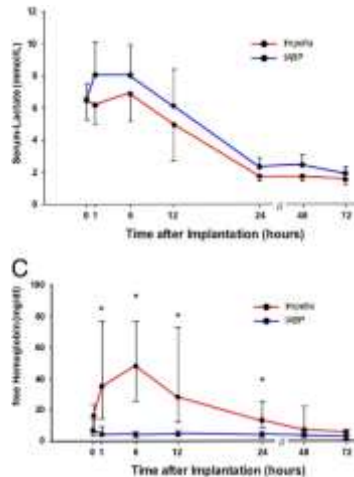


Does Impella[®] Support Improve Outcomes?



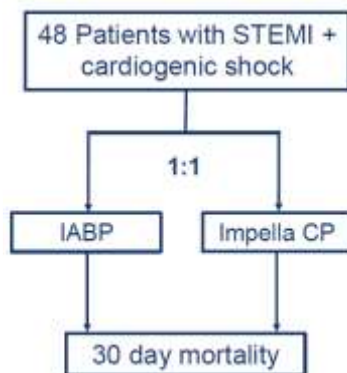
ISAR SHOCK Trial - Impella®

- ❑ 26 patients with STEMI and shock randomly assigned to IABP and Impella 2.5L
- ❑ Reduced lactate demonstrates better perfusion
- ❑ Hemolysis was a problem with Impella



Seyfarth M et al. J Am Coll Cardiol 2008; 52: 1584-88

IMPRESS Study



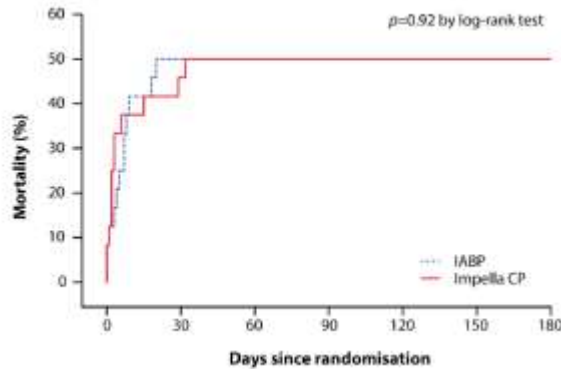
- ❑ Randomized 2-center trial
- ❑ STEMI Patients in cardiogenic shock, requiring pressors to stay out of shock and requiring mechanical ventilation
- ❑ Powered with an assumption of 35% reduction in primary endpoint mortality with Impella CP

Ouweneel DM et al. J Am Coll Cardiol 2017; 27: 1-11

IMPRESS Study

Primary Endpoint: 30 day Mortality

Secondary Endpoint: 6 months Mortality



Ouweneel DM et al. J Am Coll Cardiol 2017; 27: 1-11

IMPRESS Study

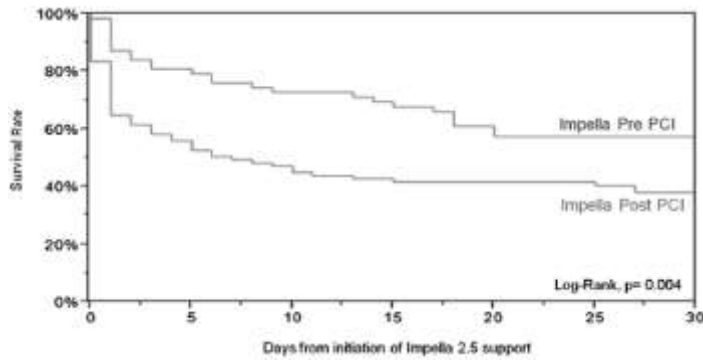
Significant Limitations

- Grossly underpowered
- Lactate levels high in both groups
- Most deaths were caused by anoxic brain injury
- Major bleeding complications
- Timing of support

Most Importantly: Is MCS the answer to CS?

Timing of Impella Support

Results from the Uspella Registry

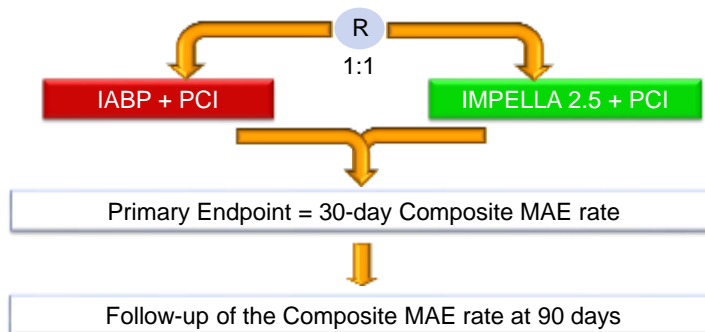


O'Neill WW et al. J Interv Cardiol 2014; 27: 1-11

“Prophylactic” or “Proactive” MCS

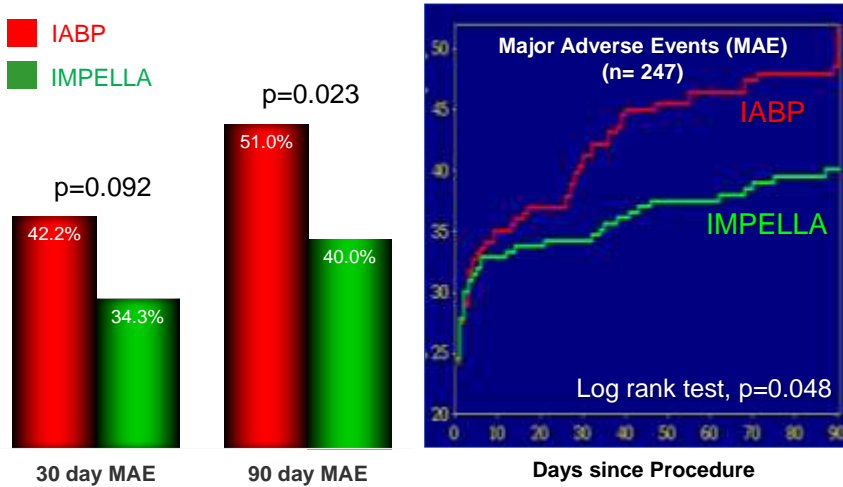
The PROTECT II Trial

Non-Emergent high-risk PCI patients requiring prophylactic hemodynamic support:
LVEF \leq 35% with unprotected LM, last patent conduit, or 3 vessel disease



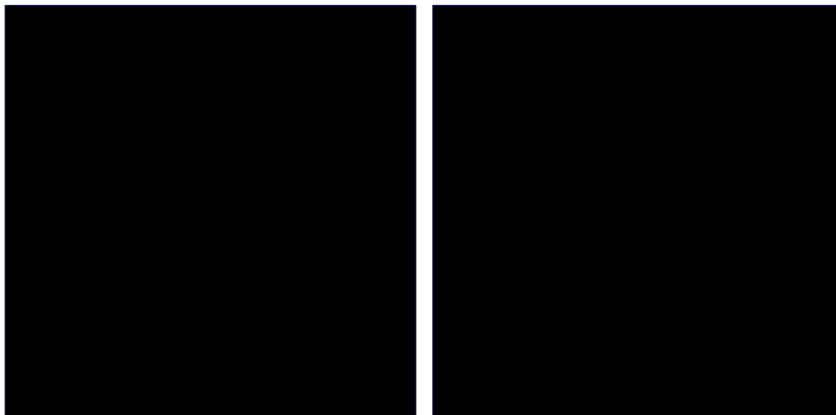
O'Neill et al, Circulation. 2012;126(14):1717-27

PROTECT II: Per Protocol Analysis

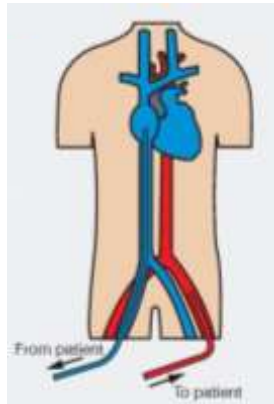


O'Neill et al, Circulation. 2012;126(14):1717-27

High Risk PCI



Extra-Corporeal Life Support – ECMO



- ❑ A cardiopulmonary circuit system
- ❑ Complete support of cardiac output and oxygenation function
- ❑ Femoral and/or neck access, typically percutaneous in the cath lab
- ❑ Requires arterial and venous access
- ❑ Not time consuming to insert, but requires a perfusionist

No randomized study data available for ECMO/ECLS use in cardiogenic shock / cardiovascular collapse

ECLS: Bridging Strategy

Cardiopulmonary collapse (circulatory arrest)

↓ CPR

"salvage" ECLS

"bridge to decision" ... end organ injury

"bridge to recovery" ... myocardial injury

"bridge to definitive therapy" ... non-durable to durable support

"emergent" ECLS

↑
Cardiogenic shock

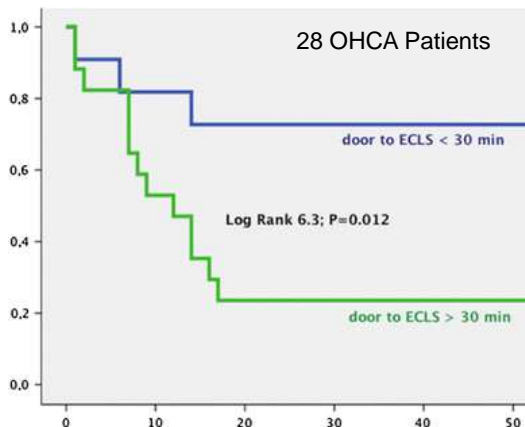
Variation in Outcome of ECMO Support

Cause of Cardiogenic Shock	n	Survival to discharge (n, %)	
Cardiac Arrest	32	9	28.1%
Decompensated Congestive Heart Failure	26	15	57.7% ←
Acute Myocardial Infarction	11	4	36.4%
Right Ventricular Failure	16	4	25.0%
Postcardiotomy Syndrome	13	1	7.7%
Acute Pulmonary Embolism	6	5	83.3% ←

Burchett A et al. JACC April 2016 – Scientific Sessions Abstract Supplement #1291



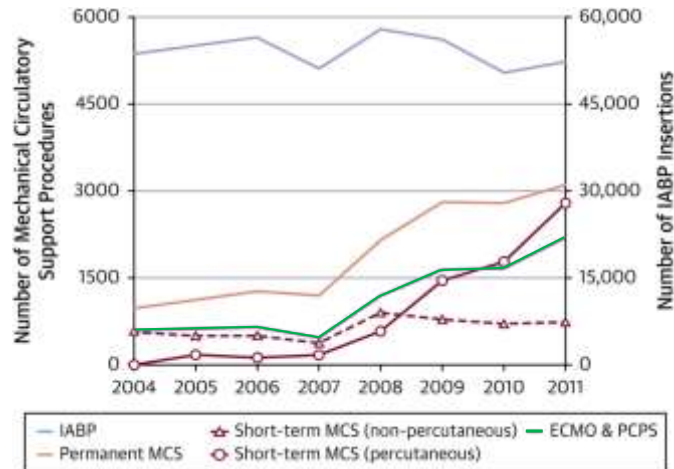
ECLS: Timing is Everything



Leick J et al. Clin Resarch Cardiol 2013;102:661-9.



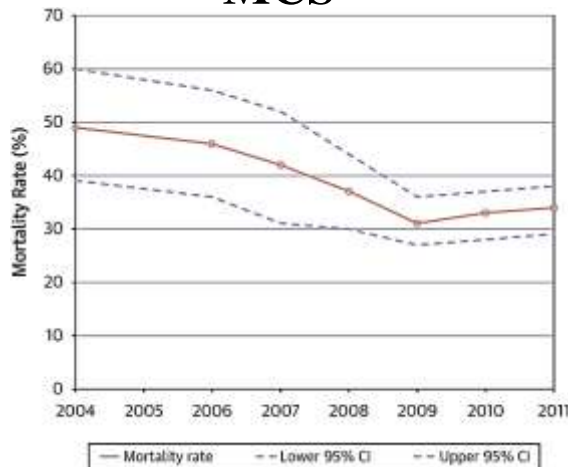
Exponential Growth in MCS Utilization



Stretch R et al. J Am Coll Cardiol. 2014;64(14):1407-1415.



Trend Towards Reduced Mortality with MCS



Stretch R et al. J Am Coll Cardiol. 2014;64(14):1407-1415.



Final Conclusions

Reactive Settings – After Beginning of the Downward Spiral

- Cardiogenic shock, cardiac arrest and circulatory collapse are highly fatal conditions (>40-50% in-hospital mortality).
- Rapid diagnosis and mechanical reperfusion (1ry PCI or CABG) improve chances of survival.
- MCS is essential in profound shock or cardiovascular collapse, but timing and patient selection are critical for success
- ECLS is an easy decision in a complex and protracted process

Final Conclusions

Proactive Settings – Before Beginning of the Downward Spiral

- Patients referred PCI today are more complex and critically ill than ever before
- Availability and effectiveness of percutaneous MCS represent a paradigm shift in the care of critically ill patients undergoing complex procedures
- Randomized and non-randomized studies are providing some evidence that clinical outcomes are improving, though more definitive clinical trials are needed.

Thank You

