Transfer of AMI Cardiogenic Shock Patients to a level 1 Shock Center

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disclosures

- No disclosures pertaining to this presentation

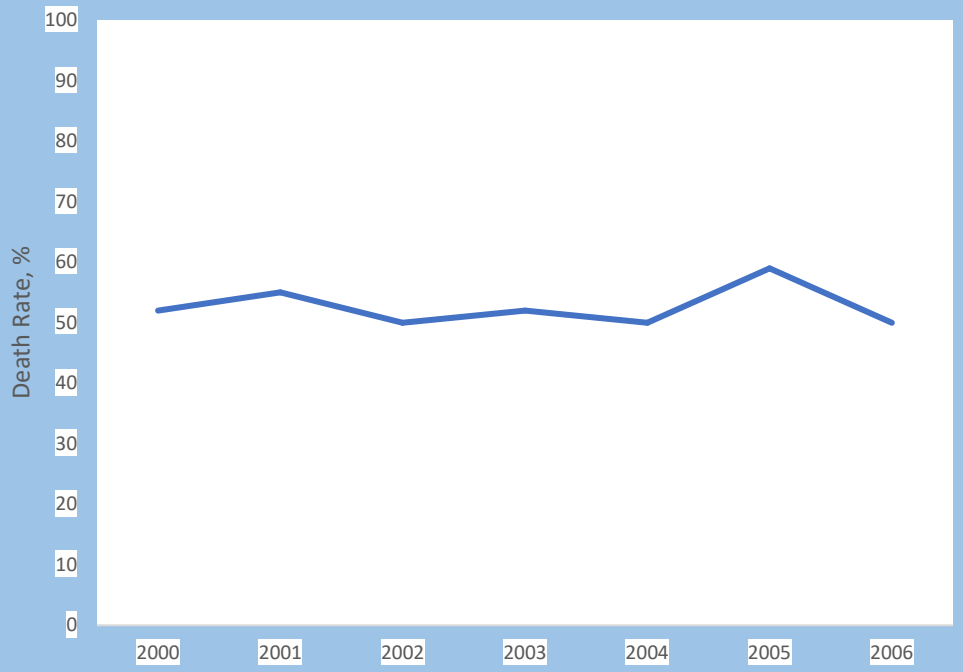
Definition cardiogenic shock

- Cardiogenic Shock was defined as the presence of at least 2 of the following:
  - Hypotension (defined as a SBP < 90 or use of inotropes or vasopressors to maintain SBP)
  - Signs of end organ hypoperfusion (cool extremities, oliguria/anuria, elevated lactate levels, altered mentation, etc)
  - Hemodynamic evidence of hypoperfusion represented by a cardiac index <2.2 L/min/m^2 or a CPO <0.6-0.8W. PCWP > 15mmhg

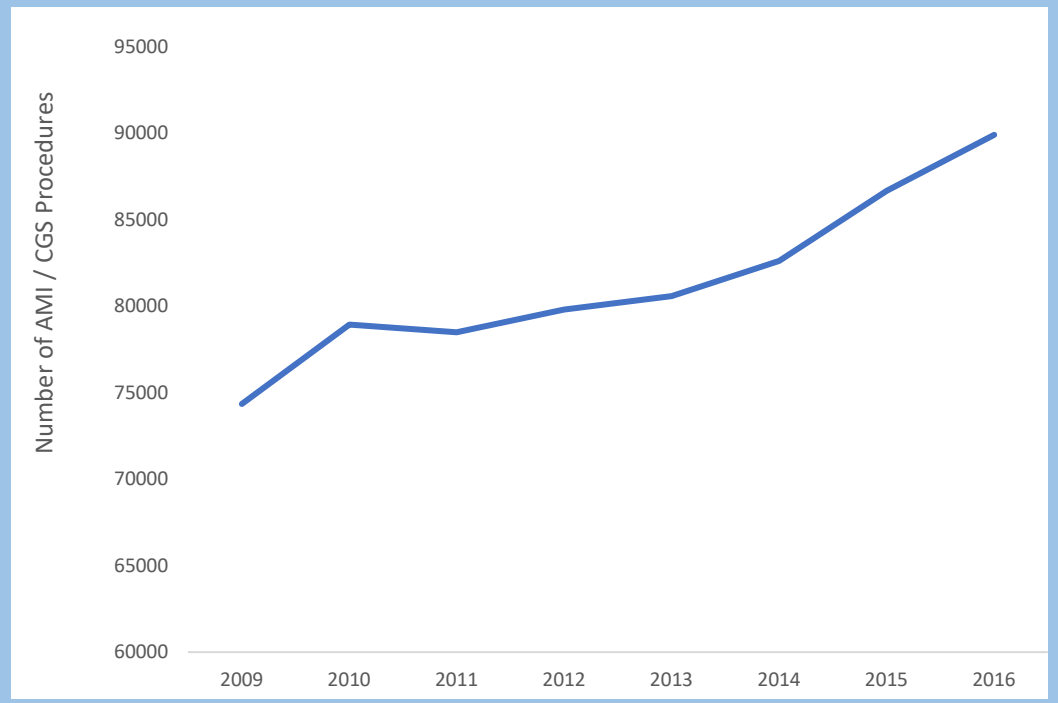
AMI Shock Mortality unchanged in > 20 Years

High In-Hospital Mortality During AMI Cardiogenic Shock[3]

N = 23,696



US AMI/CGS cases per year[1,2]

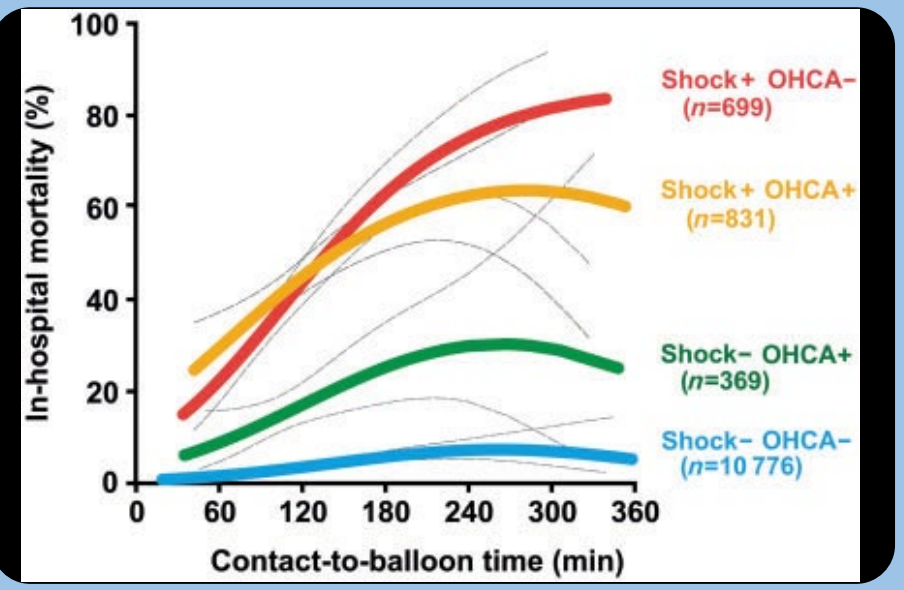


1. Sandhu A., et al. Circulation. 2015;132:1249-1251
2. Acute Cardiac Assist Report. Health Research International – August 2015
3. Jeger, et al. Ann Intern Med. 2008

Treatment Delay is Associated with Increase in Mortality

A 'golden hour' for care exists for AMI-CS

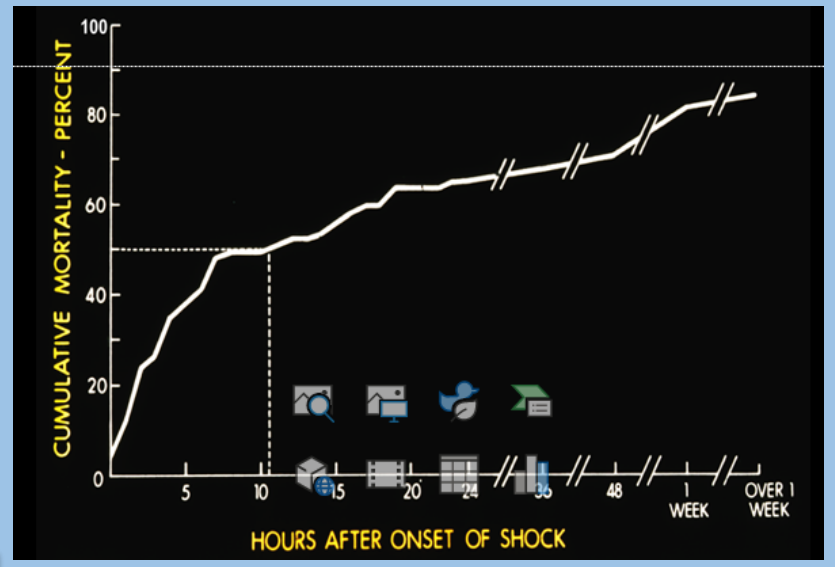
FITT-STEMI Trial



Scholz et al. *Eur Heart J.* 2018;39:1065-1074

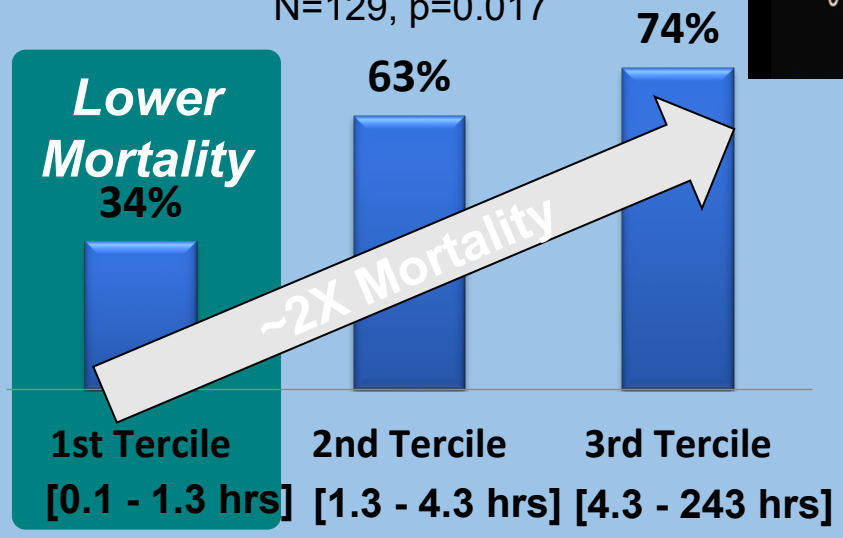
Every 10-min treatment delay resulted in 3.31% additional deaths in PCI-treated patients

Significant decrease in survival with >90 min after first medical contact



Mortality based on CS Onset to Impella Support Time

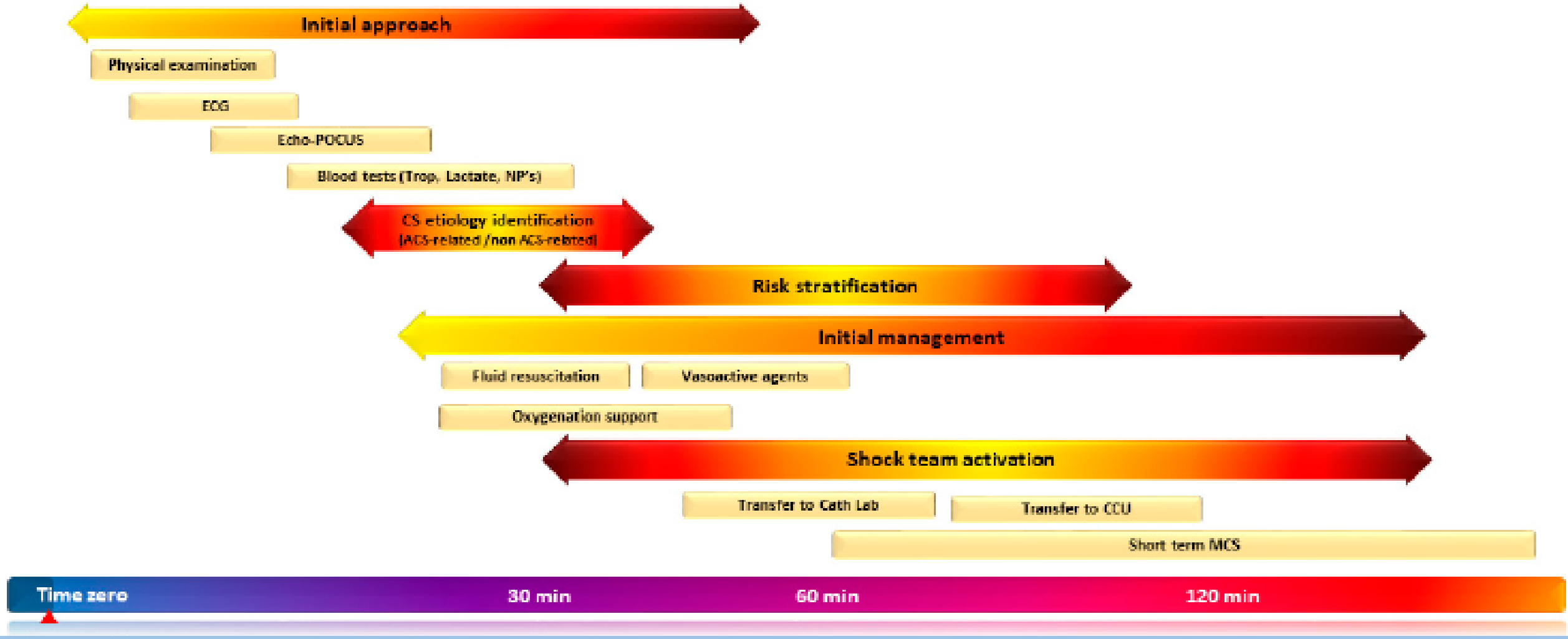
N=129, p=0.017



Basir et al. *Am J Cardiol.* 2017;119:845-851

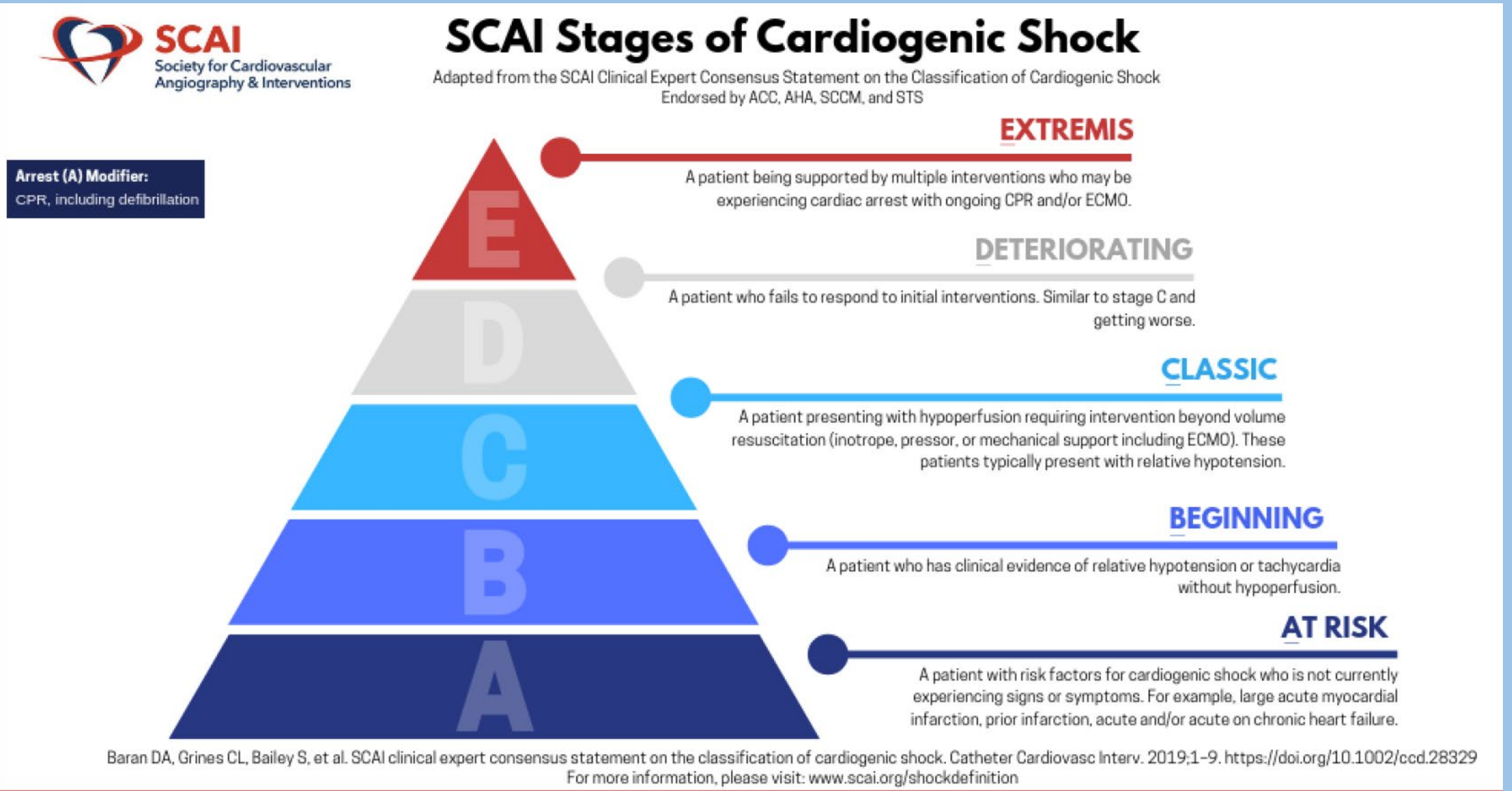
Time from onset to diagnosis and treatment is critical to survival

Cardiogenic Shock ED Roadmap

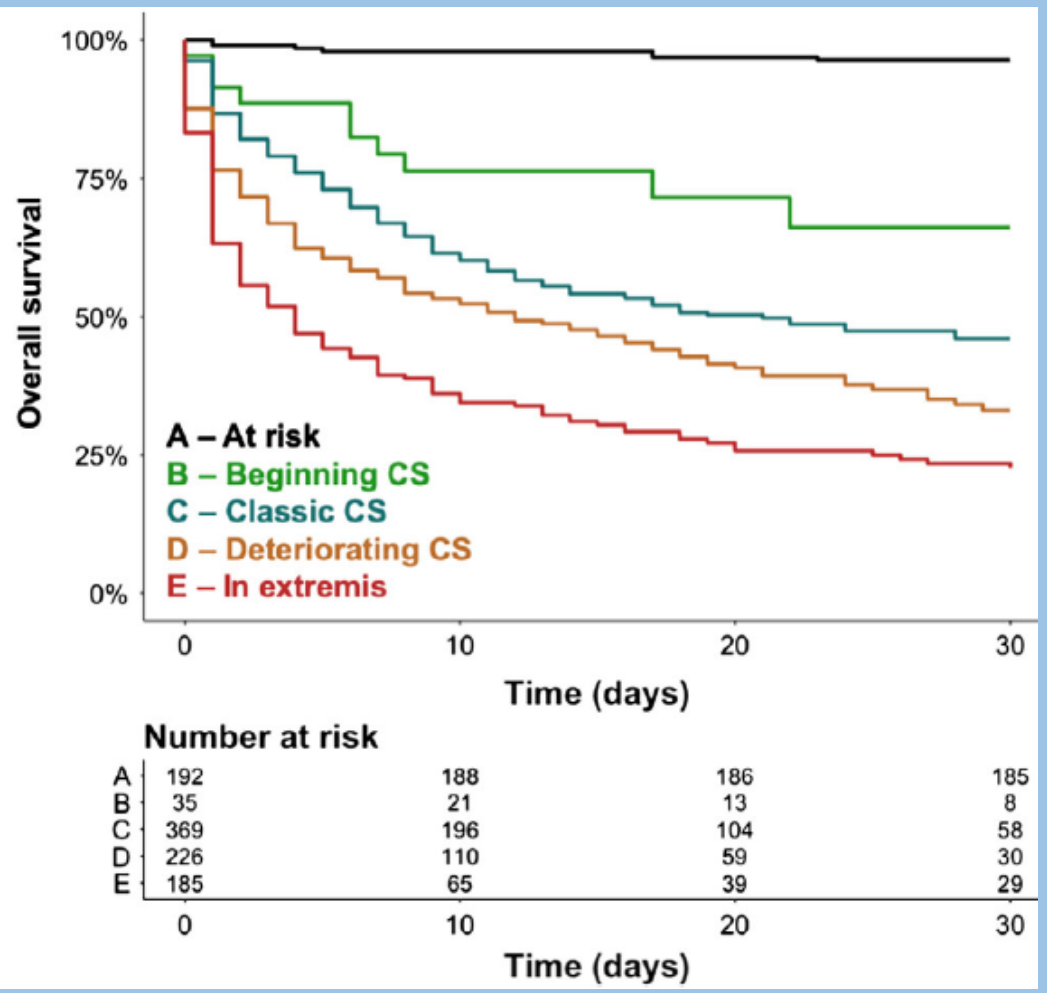


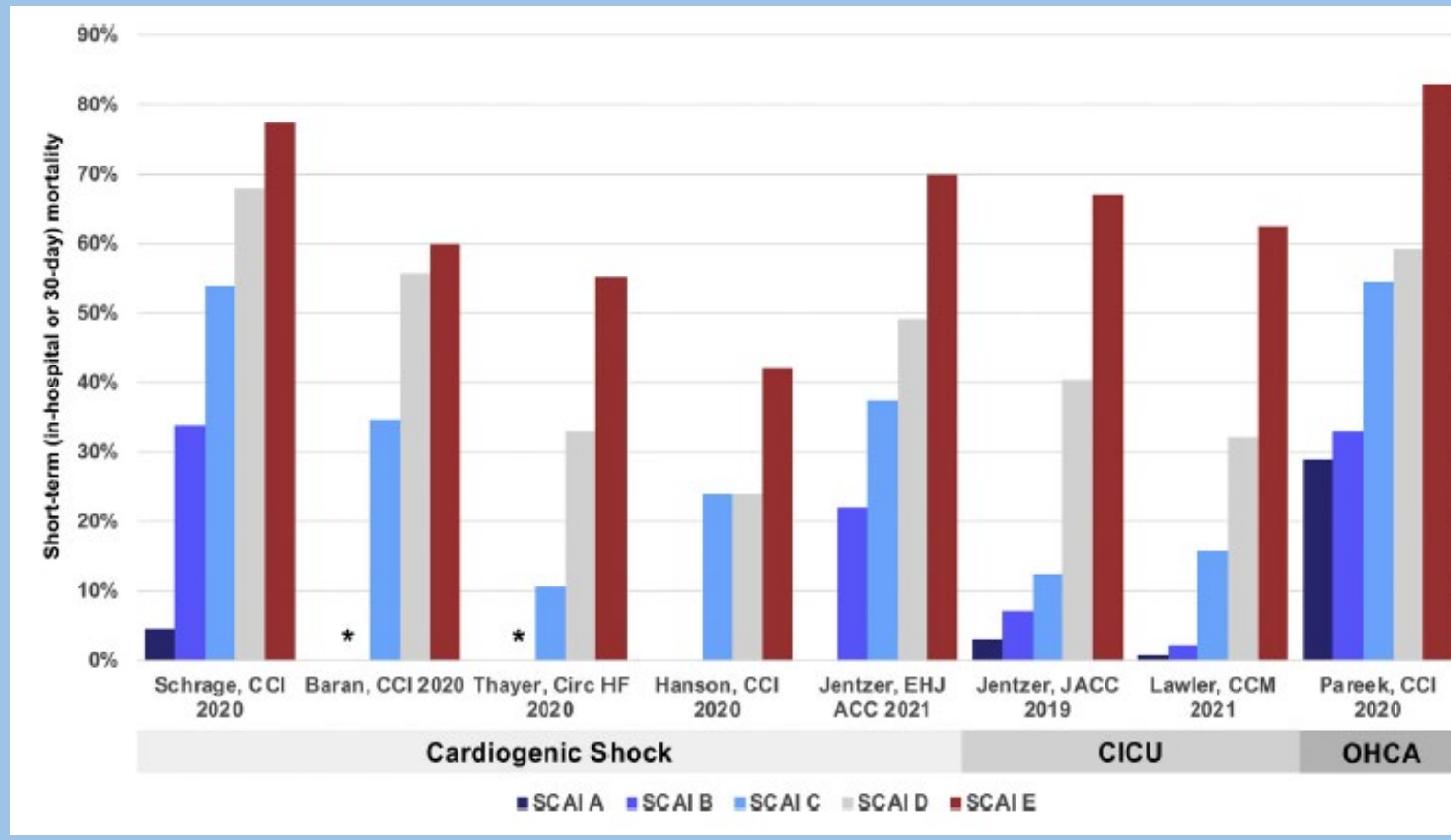
Polyzogopoulou J Clinical Medicine 2023

Risk stratify. SCAI stages



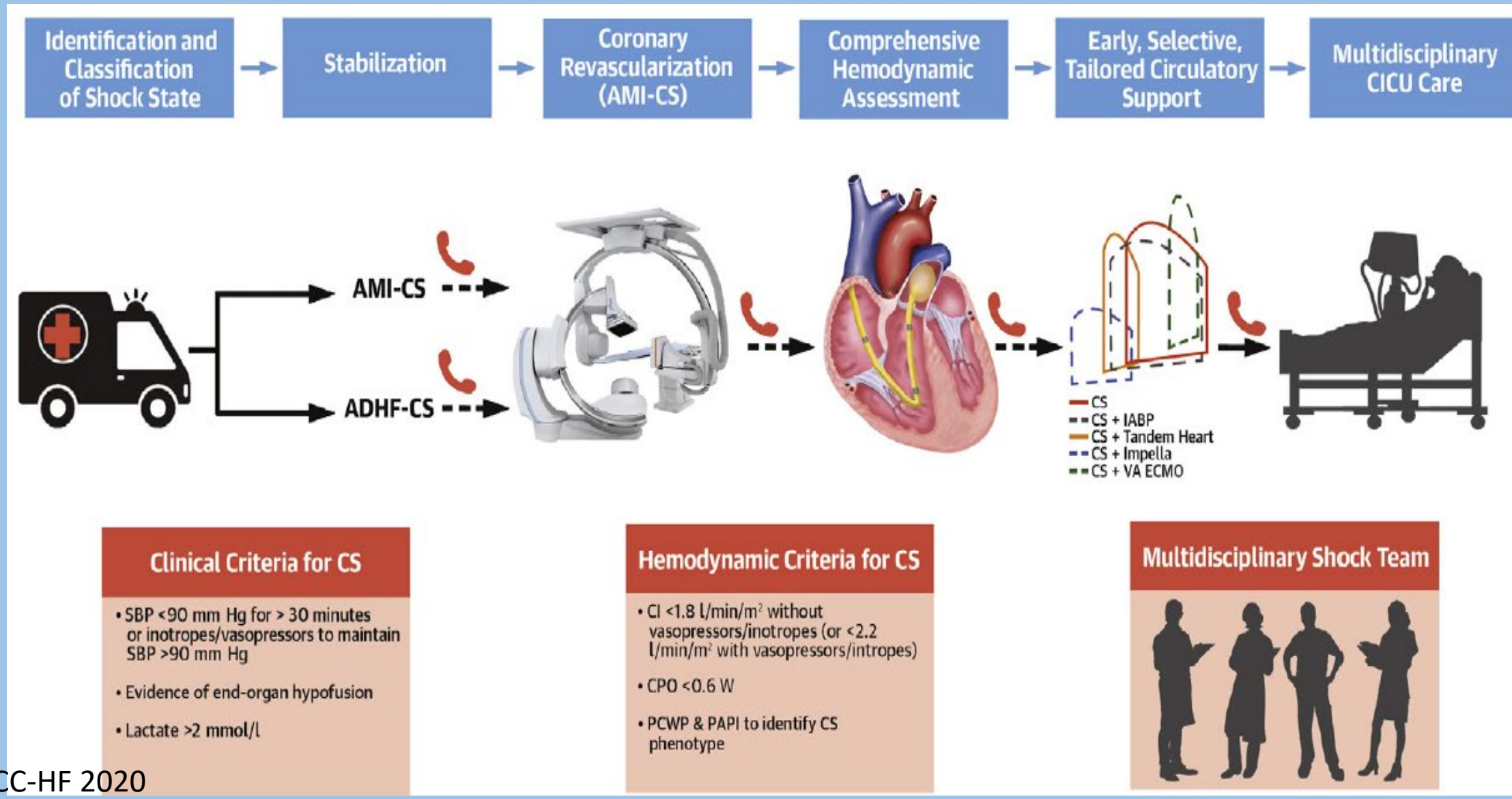
Validation SCAI Shock Stages





Schrage B CCI 2019

CARDIOGENIC SHOCK PROTOCOLS- INOVA



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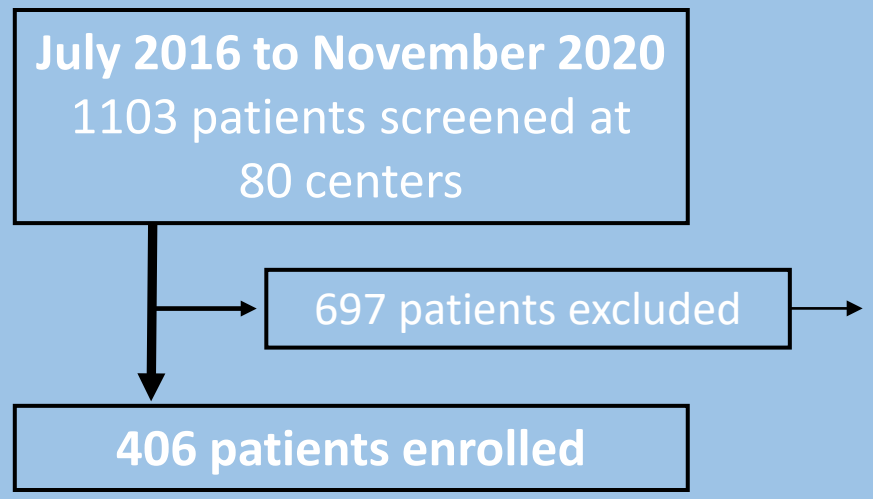
National Cardiogenic Shock Initiative

Study Design

- DESIGN: Prospective, non-randomized, single-arm, multi-center study
- OBJECTIVE: To assess the impact of early MCS, guided by invasive hemodynamics, on outcomes in AMICS, using the NCSI protocol.
- NCT03677180



*more than one exclusion criteria can apply

Inclusion Criteria Not Met*	
No PCI performed	231
No evidence of hypotension	36
No evidence of hypoperfusion (clinically or by invasive hemodynamics)	36
No evidence of AMI	24

Exclusion Criteria Met*	
IABP prior to Impella	195
Unwitnessed Arrest or ROSC >30 min	108
Other Shock	57
Active Bleeding	43
Mechanical Complication of AMI	29
Recent Major Surgery	21
LV Thrombus	10
Mechanical Aortic Valve	4

NATIONAL CSI ALGORITHM

RAPID Identification of Cardiogenic Shock

↓

Cath Lab Activation

↓

Femoral Access

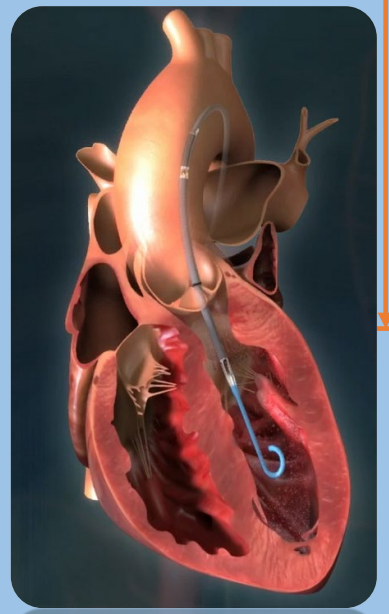
↓

AMI/CS Confirmed

↓

MCS

AMI/CS Unconfirmed
LHC*
RHC*
Echo*
*As needed to confirm diagnosis



Door To Support Time

Target < 90 minutes

CARDIAC POWER OUTPUT
(CPO)
CPO = MAP x CO / 451

PULMONARY ARTERY
PULSATILITY INDEX
(PAPI)
PAPI = sPA – dPA / RA

MCS

↓

PCI

↓

Right Heart Cath

CPO < 0.6

↓

Calculate PAPI

↓

PAPI < 0.9, RA >12, DSA*

↓

Possible RV Failure

↓

Consider
RV Support

↓

PAPI > 0.9

↓

RV Normal

↓

Consider ↑
LV Support

CPO ≥ 0.6 and
PAPI > 0.9

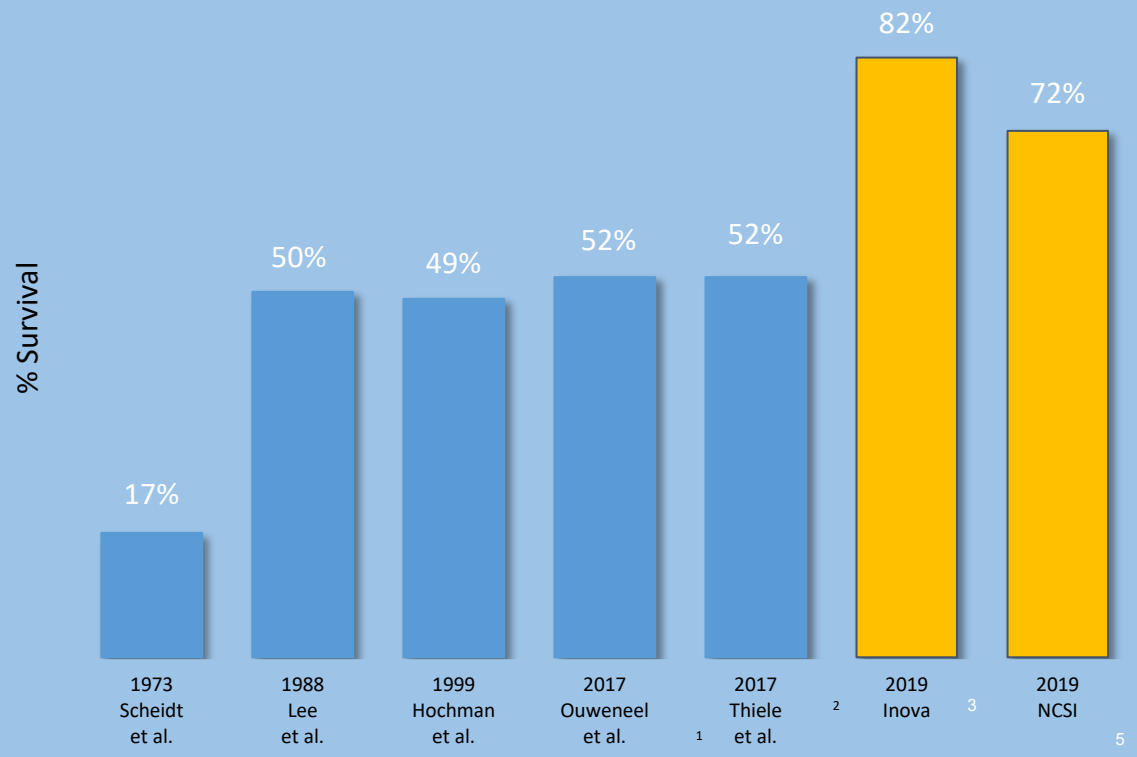
↓

Continue to Titrate
↓ Pressors/Inotropes

* Diastolic Suction Alarms

Improved Survival and Native Heart Recovery

Investigator-Led AMI Cardiogenic Shock Studies



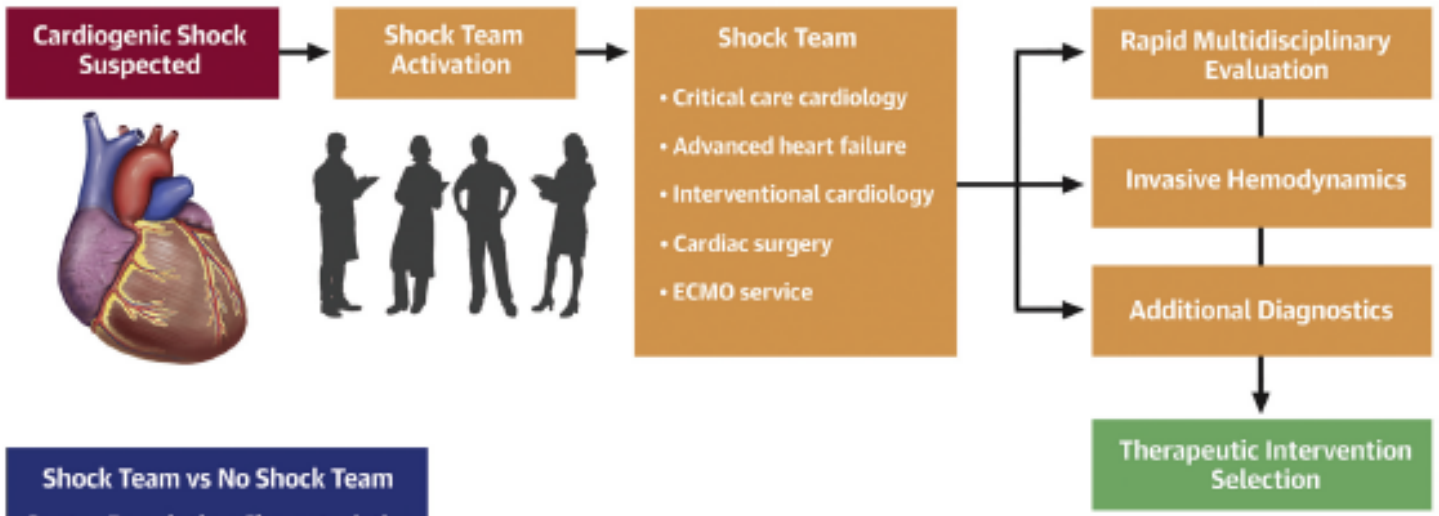
Best Practice Protocols Include[2,3,4]

- Identify and support cardiogenic shock early
- Aggressive down-titration of inotropes
- Identify inadequate LV support and escalate
- Identify RV dysfunction early and support
- Systematic use of RHC to guide therapy

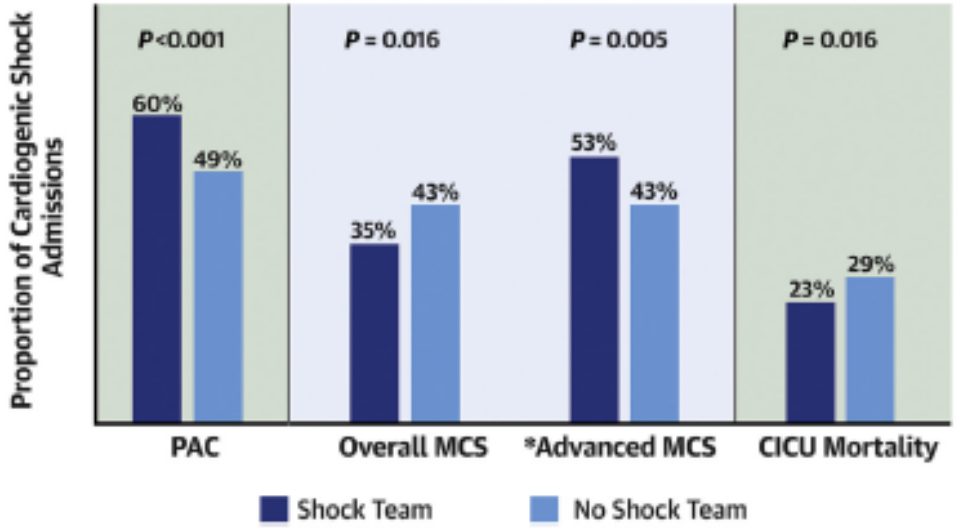
1. *Thiele et al. N Engl J of Med. 2017;377:2419-2432*
2. *Tehrani et al. JACC. 2019;73:1659-1669*
3. *Basir et al. Catheter Cardiovasc Interv. 2019;93:1173-1183*
4. *O'Neill. TCT 2020*
5. *Sawa. Annual Scientific Meeting, Japanese Circulation Society 2020*

Why have SHOCK TEAMS

CENTRAL ILLUSTRATION Prototypical Shock Team Workflow and Associated Outcomes



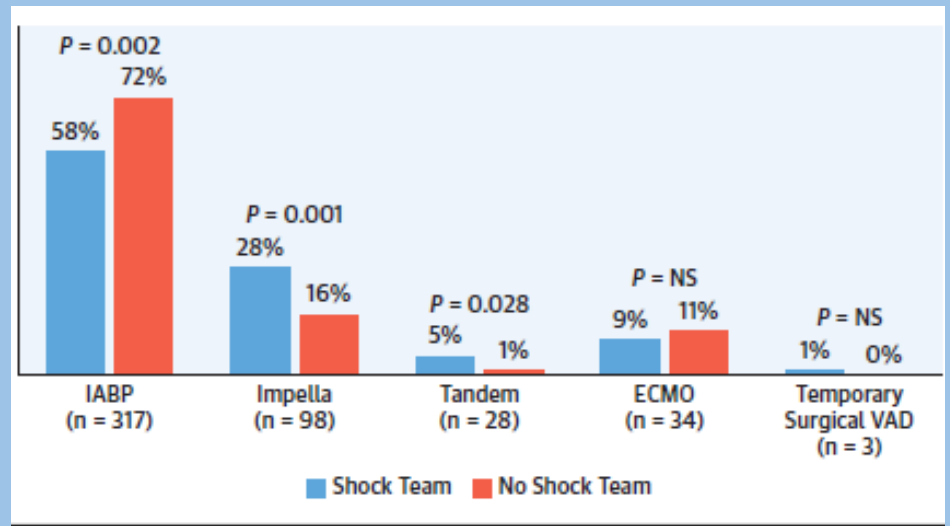
Shock Team vs No Shock Team Center Population Characteristics	
Cardiogenic shock admissions (n)	546 vs 696
AMI-CS (%)	27 vs 28
Admission lactate (mmol/L)	2.3 vs 2.3
PCWP (mm Hg)	25 vs 22
CI (L/min/m²)	1.9 vs 2.0
CPO (W)	0.62 vs 0.64



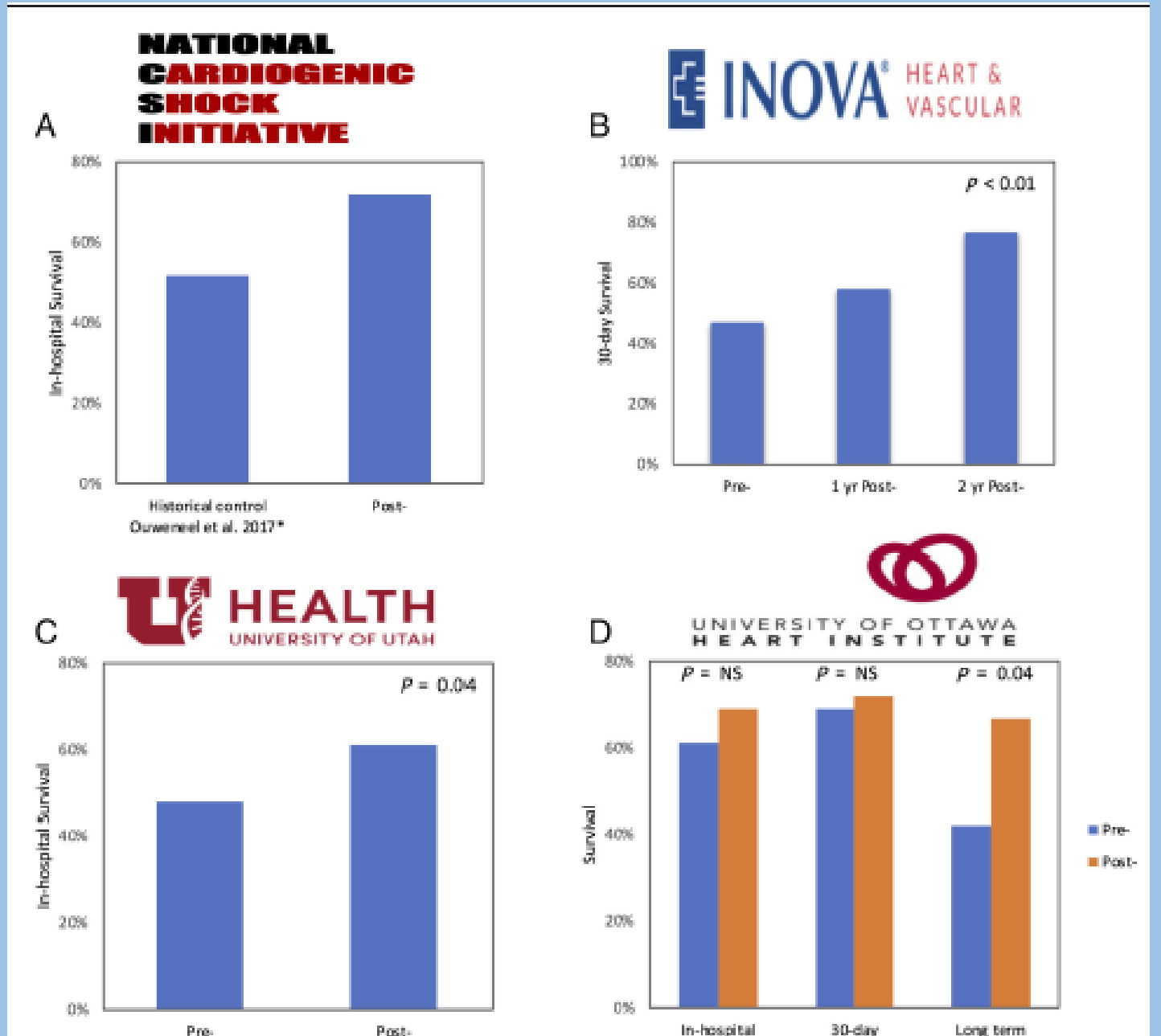
Papolos, A.I. et al. J Am Coll Cardiol. 2021;78(13):1309-1317.

Papolos JACC 2012 CRITCAL CARE CARDIOLOGY TRIAL NETWORK N24 (10 SHOCK TEAM

TRUESDELL A CSWG SUMMIT 2023

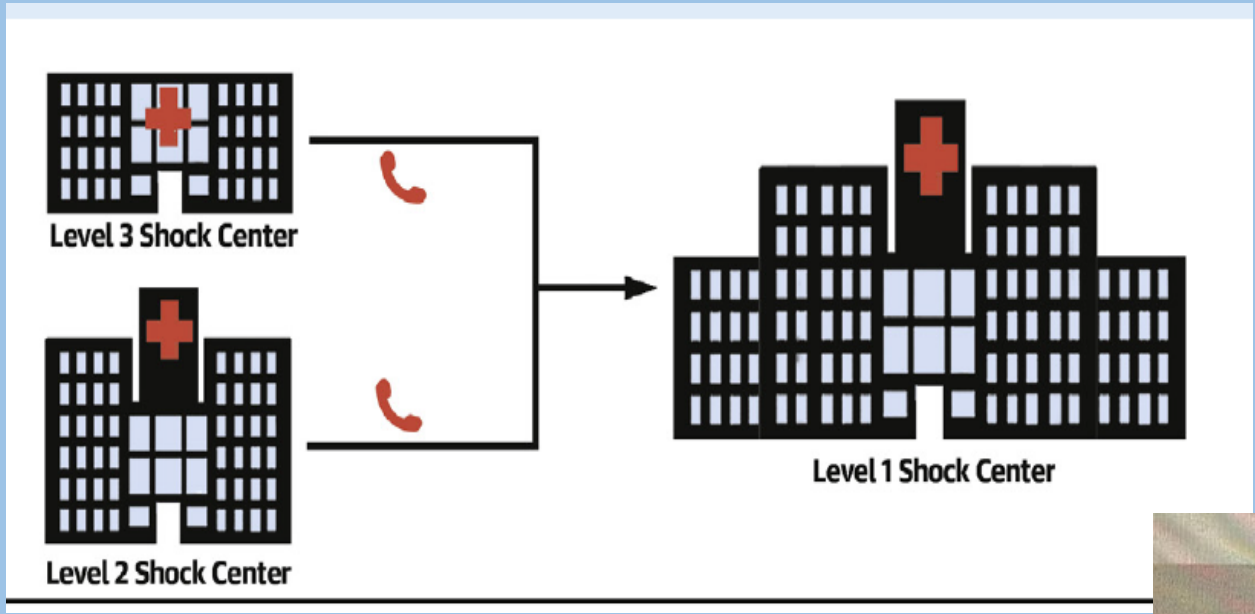


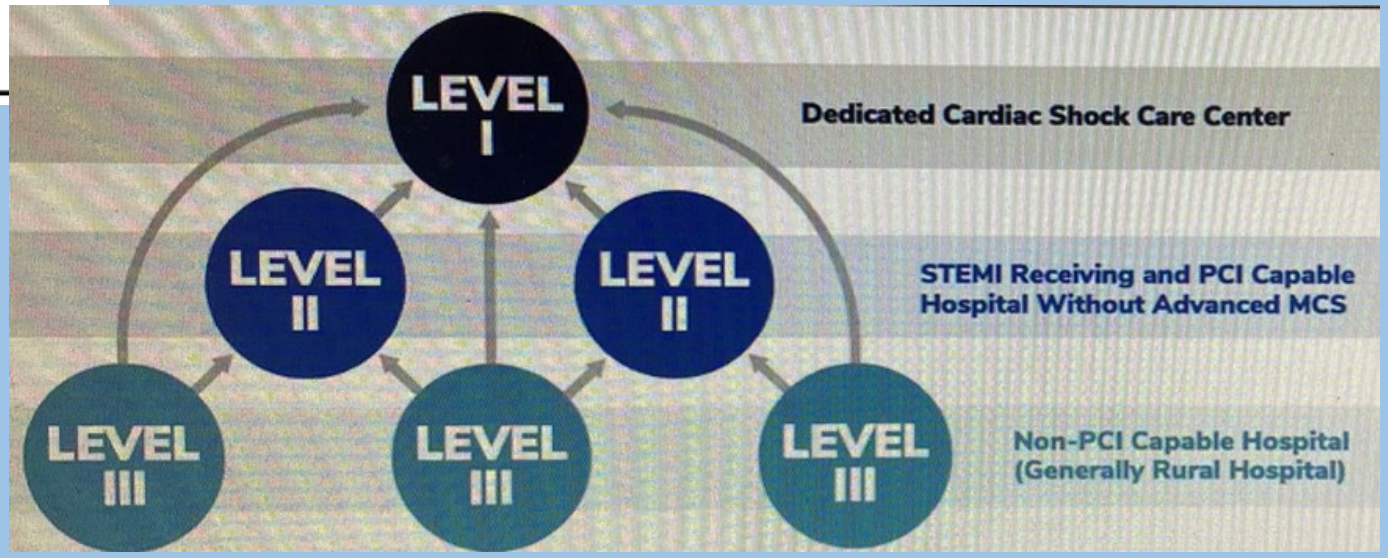
Shock teams proof of concept



Moghaddam N ECS HF 2021

Regional Systems of care for treatment of cardiogenic shock (right care , right place, right time)





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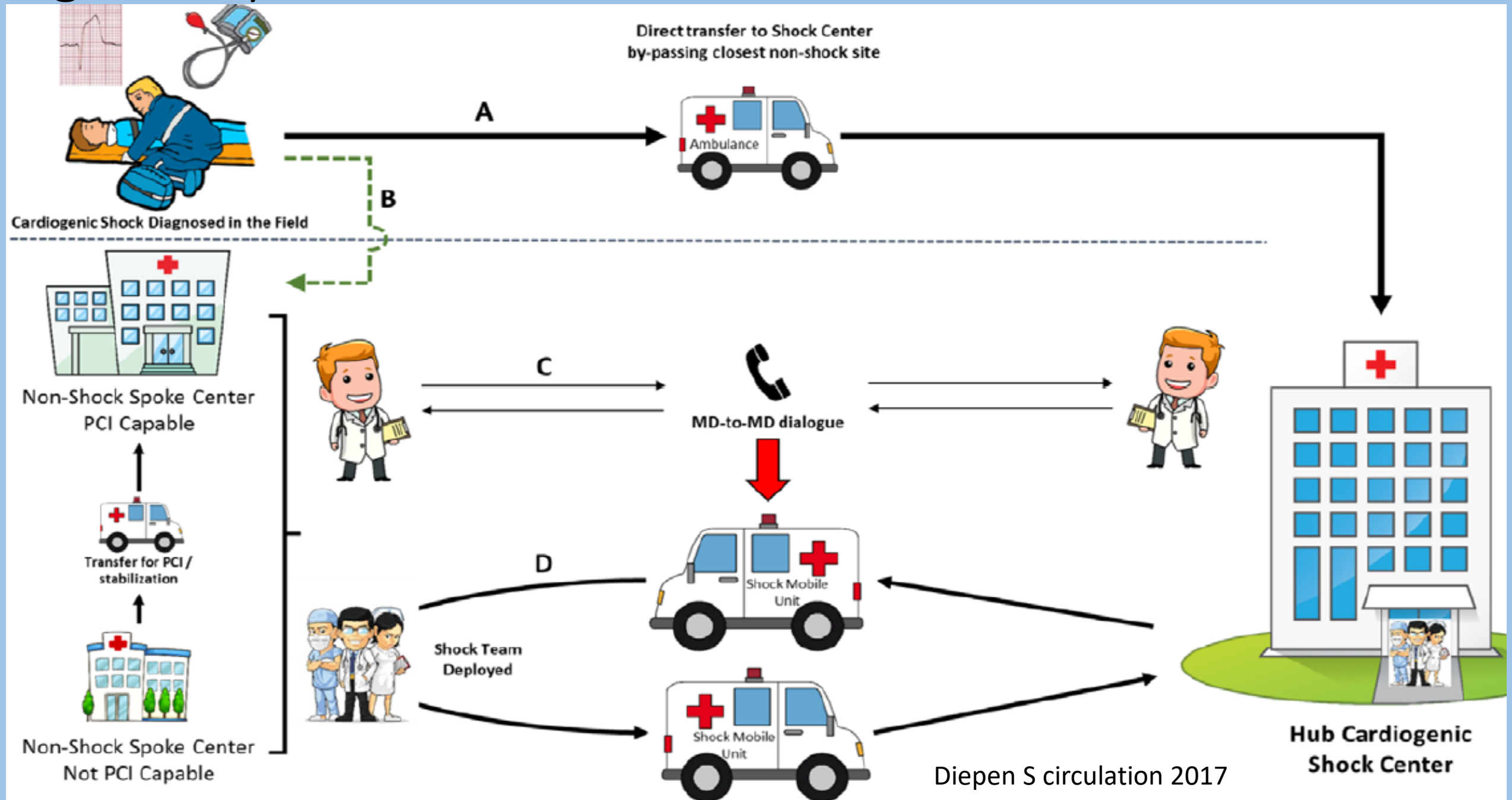
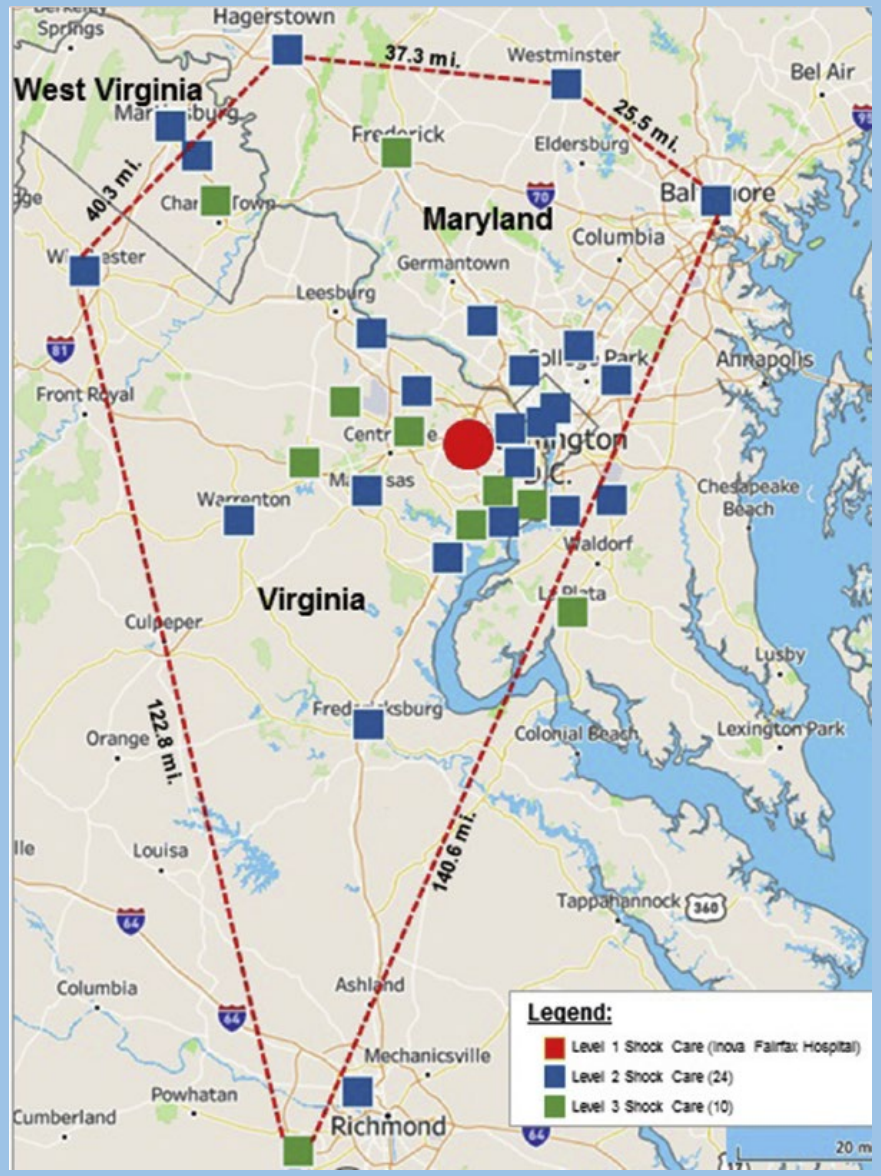
Regional systems of care



Diepen S circulation 2017

STANDARIZED AND REGIONAL NETWORK OF CARE FOR CARDIOGENIC SHOCK



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520 Consecutive Patients Treated for Cardiogenic Shock via a Regionalized Shock Network

Criteria for Diagnosis of Cardiogenic Shock
- AMI or Heart Failure
- SBP <90 mm Hg for 30 min or use of vasopressors
- Evidence of end-organ hypoperfusion
- Cardiac Index <1.8 L/min/m²
- PCWP ≥15 mm Hg

234 patients Initially Triaged at Level 1 ("Hub") Shock Center

286 patients Initially Triaged at Level 2/3 ("Spoke") Shock Centers prior to Transfer to Hub

75 AMI-CS patients

159 HF-CS patients

144 AMI-CS patients

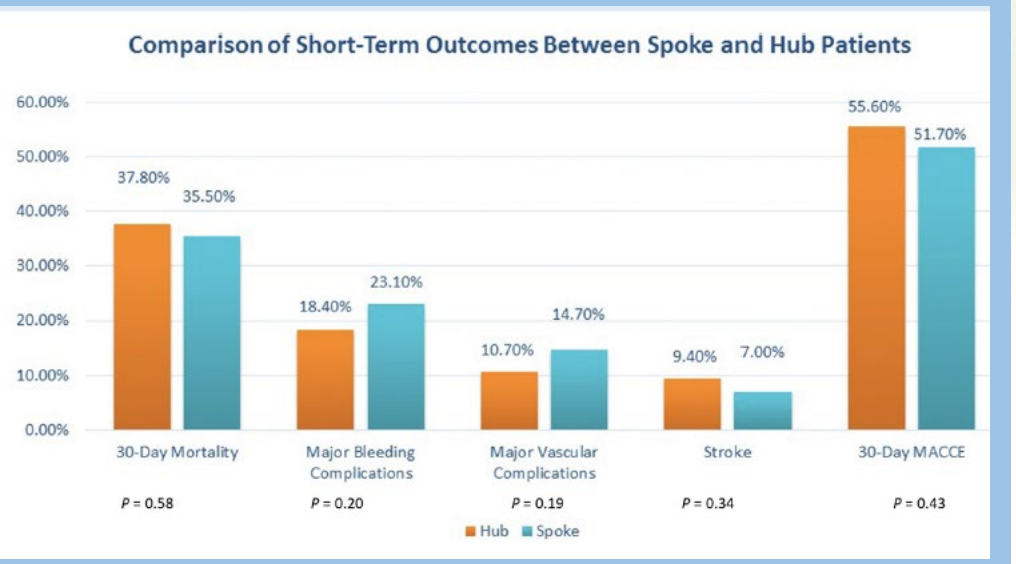
142 HF-CS patients

Unable to confirm status of 4 patients at 30 days post-hospital discharge

Unable to confirm status of 4 patients at 30 days post-hospital discharge

512 patients (98.5%) followed through 30 days post hospital discharge

Cardiogenic Shock transfers. SYSTEMS OF CARE.



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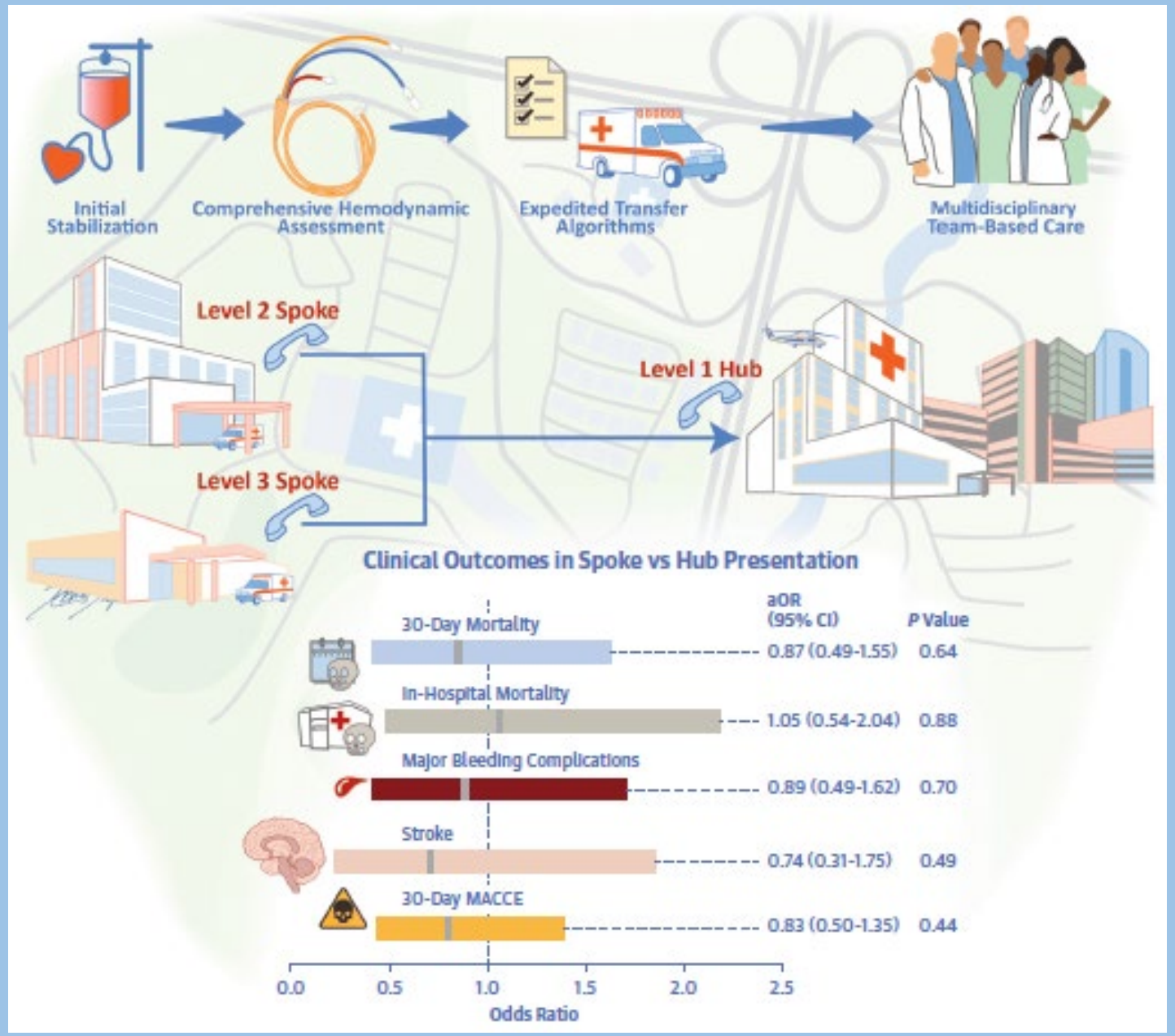
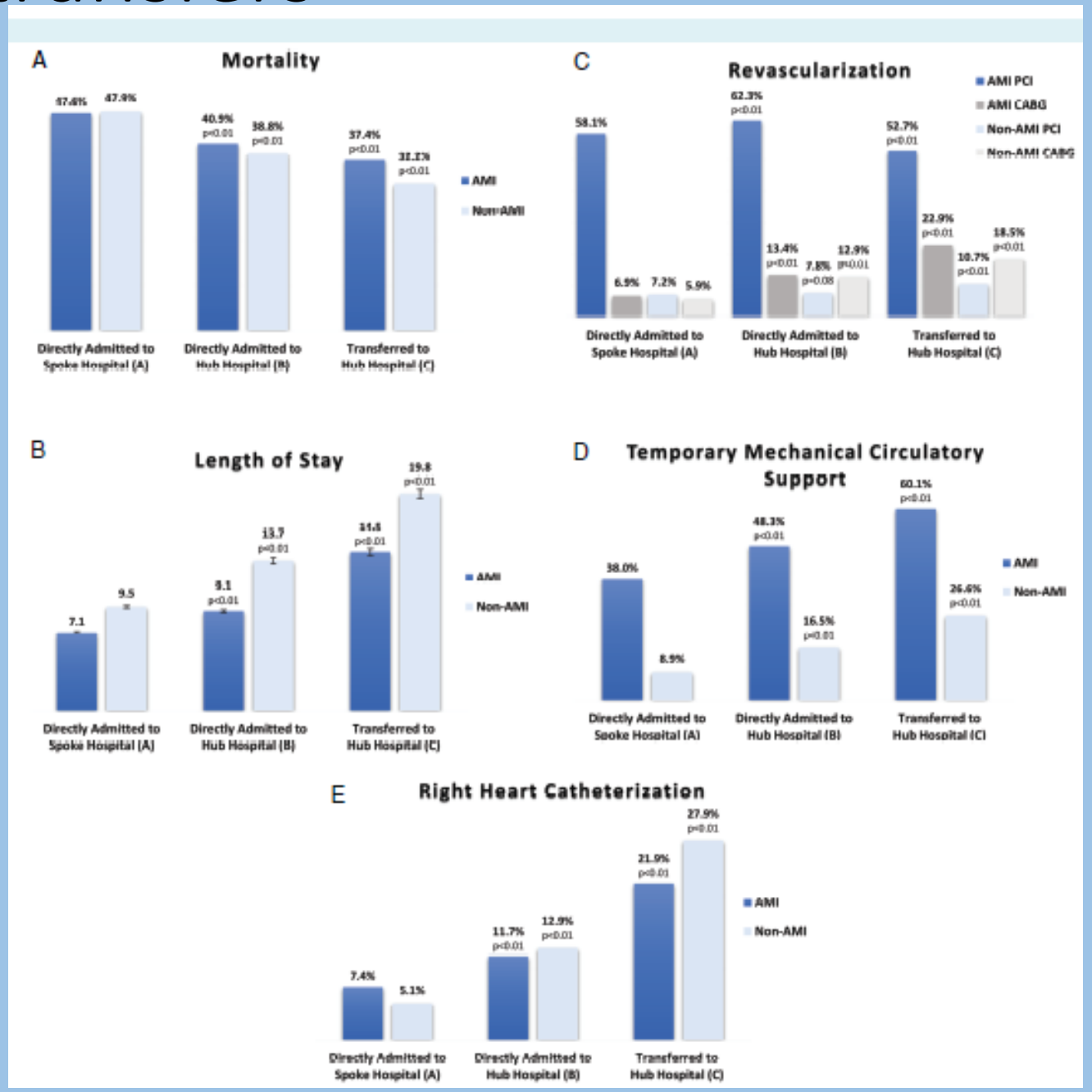


Cardiogenic shock transfers



Lu D Euro J of HF 2021

NATIONWIDE READMISSIONS DATABASE

TRANSFER AMICS TO A LEVEL 1 SHOCK CENTER

Shock Team

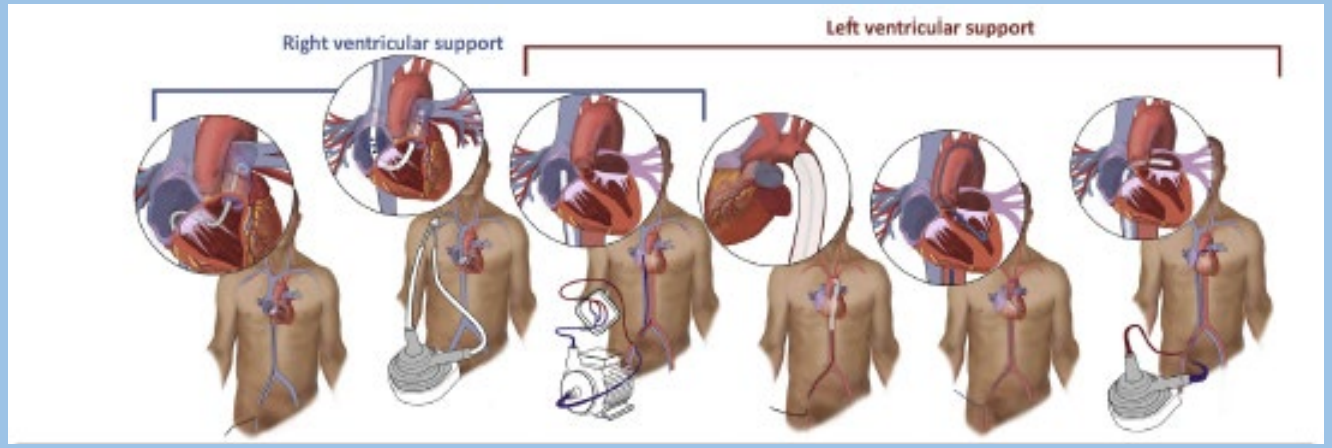
CRITICAL CARE

ADVANCED HEART FAILURE

CARDIAC SURGERY

INTERVENTIONAL CARDIOLOGY

ADVANCED MCS SUPPORT



CS SHOCK/ AMICS PROTOCALS

IMPROVE OUTCOME

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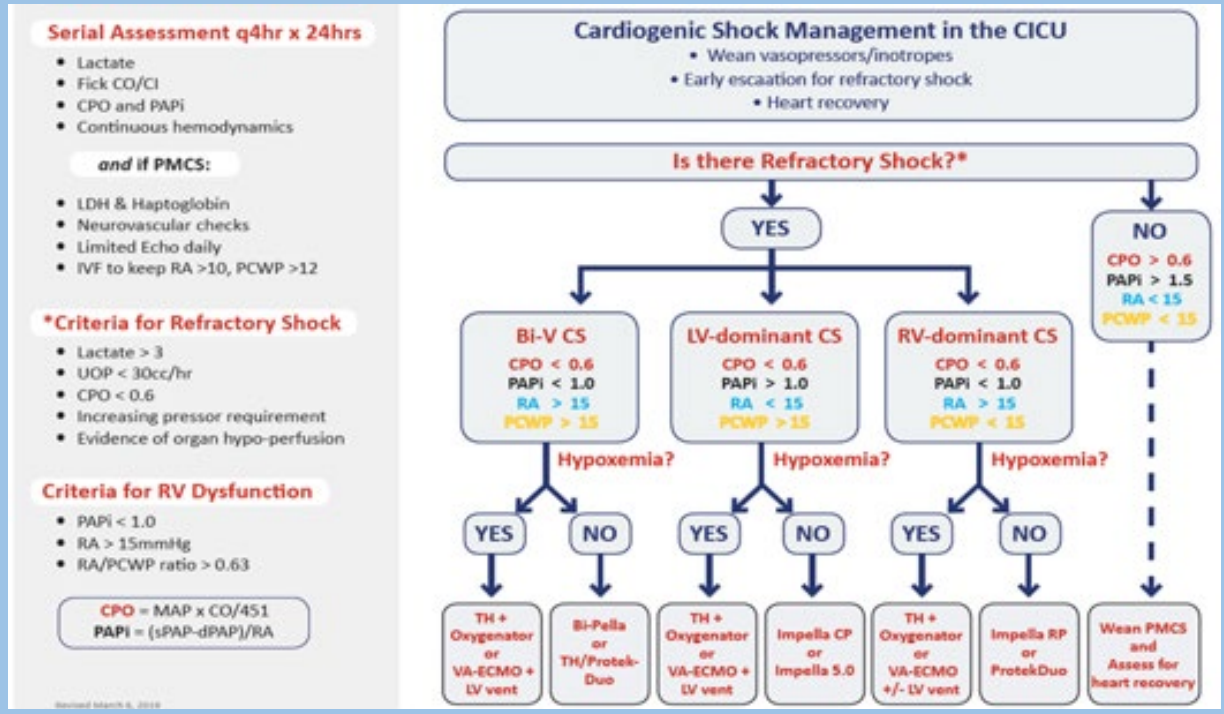

OPTIMAL COMMUNICATION Guide

Cardiogenic Shock Call Discussion Guide

- Brief HPI
- Pertinent PMH (with focus on chronic end organ dysfunction)
- Baseline Functional Status
- Vital Signs (within last 1 hour)
  - Hemodynamics via PA Catheter (if available): CVP, PAP, PCWP, CI, SVO2
  - Current Vasoactive Medication Doses
  - Current Ventilator or Oxygen Settings
- Objective Data
  - ABG and Lactate within last 2 hours
  - Creatinine and Liver Function Tests within last 12 hours
  - Other significantly abnormal laboratory findings (INR, CBC, etc.)
  - Urine Output
  - TTE with assessment of biventricular function within last 24 hours
  - Left Heart Cath Results (if available)

At conclusion of call:

1. Accepting Physician
2. Unit / Bed #
3. Transfer Modality (Air vs. Ground; Lifeflight or other Service)
4. Recommendations for Immediate Interventions

SCAI
Society for Cardiovascular Angiography & Interventions

Optimal Interdisciplinary Shock Communication

Part 1: Initial Evaluation

History and Physical
Age, primary diagnosis, comorbidities, meds, allergies
Vitals, BMI, supplemental O_2, exam, SCAI SHOCK class

Hemodynamic Support
Current lines, drips and doses
Mechanical circulatory support, settings, complications

Laboratories
CBC, BMP+LFTs, troponin, BNP, procalcitonin
Lactate, ABG, SaO2, SvO2

Social History
Frailty, baseline function, social support, adherence

Code Status / Goals of Care

Part 2: Advanced Evaluation

Echocardiogram
BiV size/function, valvular and structural abnormalities, effusion, CO/CI, LVOT VTI, other pertinent details

Right Heart Cath
RA, RV, PA (systolic, diastolic, mean), PCW pressures
Calculated CO, CI, CPO, PAPi, PVR

Coronary Angiogram
Anatomy ± PCI, complications, antiplatelet therapy

Mechanical Circulatory Support
Settings, anticoagulation, limb perfusion, LV venting

Advanced Therapies Candidacy

CONCLUSION

- EARLY DIAGNOSIS
- EARLY TREATMENT

} PARAMOUNT "GOLDEN HOUR"

- SHOCK TEAM ACTIVATION EARLY. TRANSFER PATIENTS FOR APPROPRIATE LEVEL OF CARE
  (RIGHT CARE, RIGHT PLACE, RIGHT TIME)
  - SHOCK TEAM
  - SHOCK PROTOCOLS
  - RESOURSES

- WORK WITH HOSPITALS IN THE REGION TO HAVE A REGIONAL NETWORK SYSTEM OF CARE.
  - EDUCATION
  - PROTOCALS
  - COMMUNICATION

- PARTICIATE IN REGISTRIES AND TRIALS (ADVANCE KNOWLEDGE)
  - CSWG REGISTRY
  - CERAMIC REGISTRY- AMICS
  - RECOVER IV-AMICS
  - ISO- SHOCK-AMICS

THANK YOU