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Heart Failure Cardiogenic Shock- The "Cooler" Shock

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Disclosures

- Education consultant for Abiomed

Outline

- Differences in HF CS vs AMI CS
- Outcomes
- Identification
- Hemodynamics
- Management

AMI CS vs HF CS

- ACUTE MI CS

- HF CS

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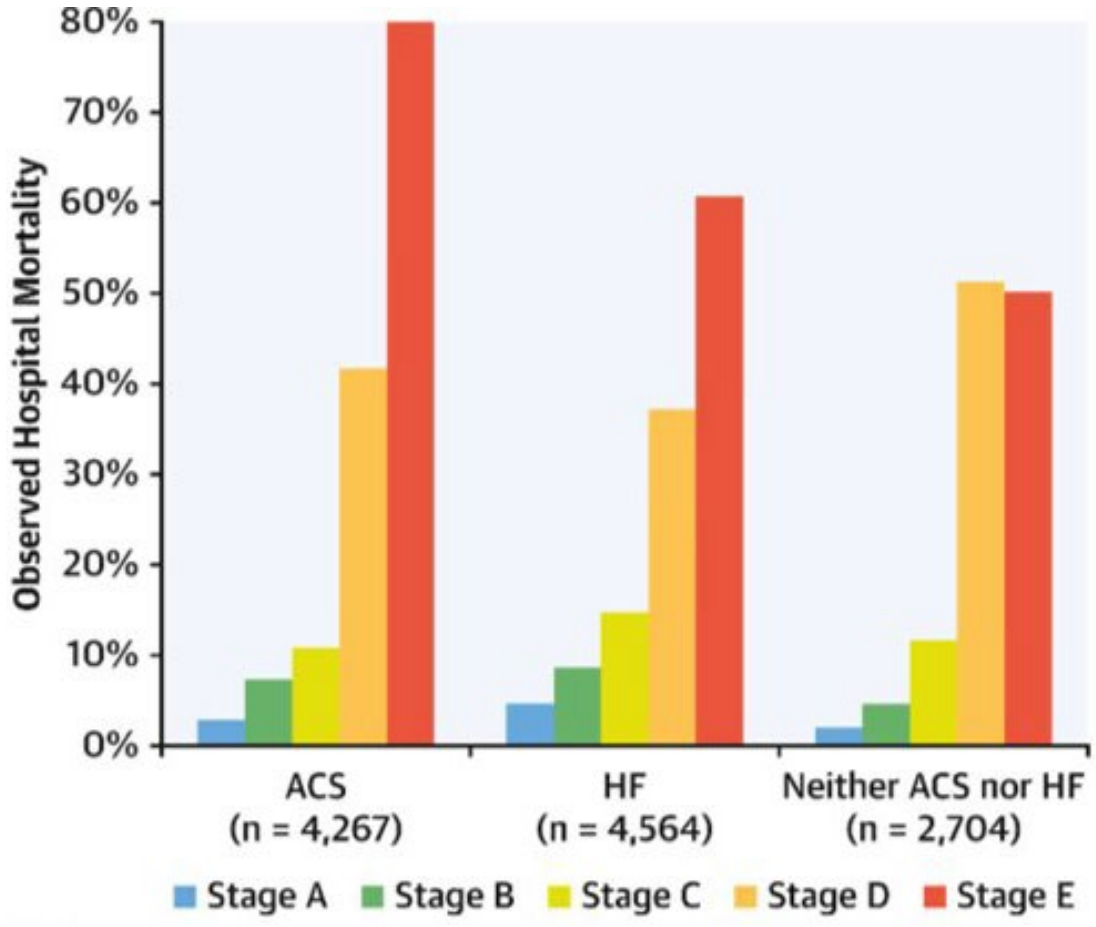
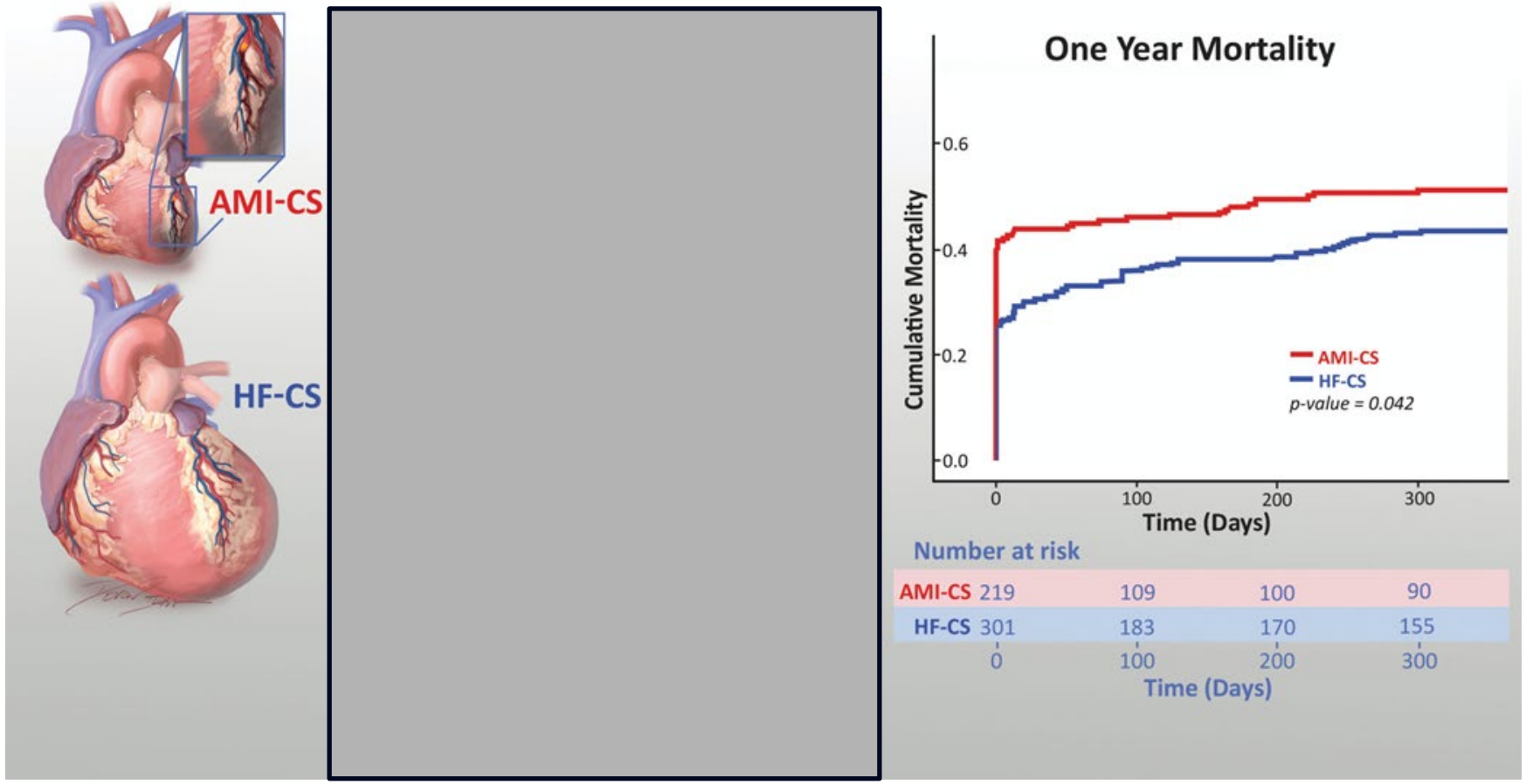
AMI CS vs HF CS- Outcomes



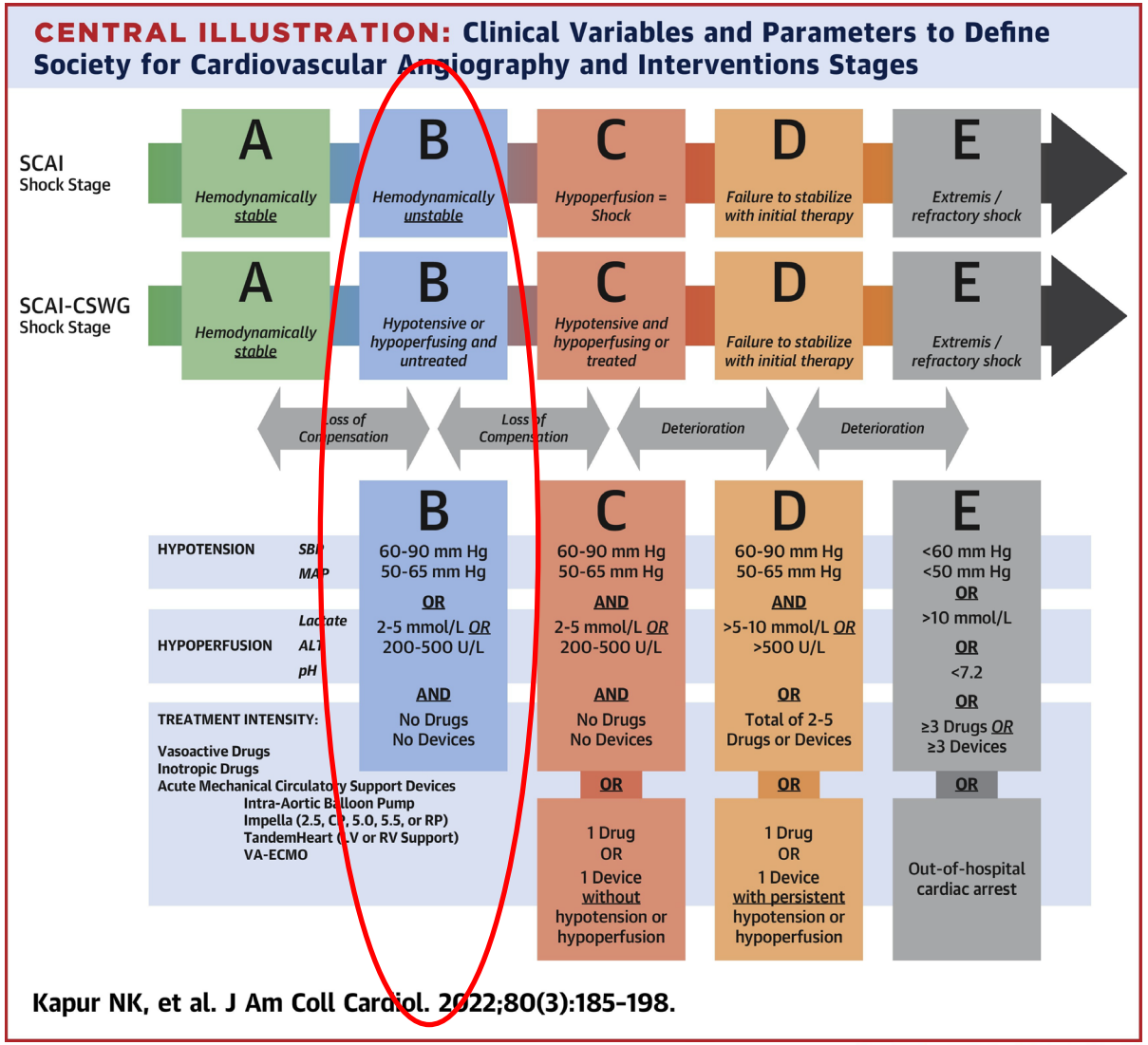
Jacob C. Jentzer, Sean van Diepen, Gregory W. Barsness, Timothy D. Henry, Venu Menon, Charanjit S. Rihal, Srihari S. Naidu, David A. Baran,
Cardiogenic Shock Classification to Predict Mortality in the Cardiac Intensive Care Unit,
Journal of the American College of Cardiology,
Volume 74, Issue 17,2019; 2117-2128.

AMI vs HF CS- Outcomes



Shashank S. Sinha. Circulation: Heart Failure. Cardiogenic Shock From Heart Failure Versus Acute Myocardial Infarction: Clinical Characteristics, Hospital Course, and 1-Year Outcomes, Volume: 15, Issue: 6, Pages: e009279,

New SCAI staging



Kapur NK, et al. J Am Coll Cardiol. 2022;80(3):185-198.

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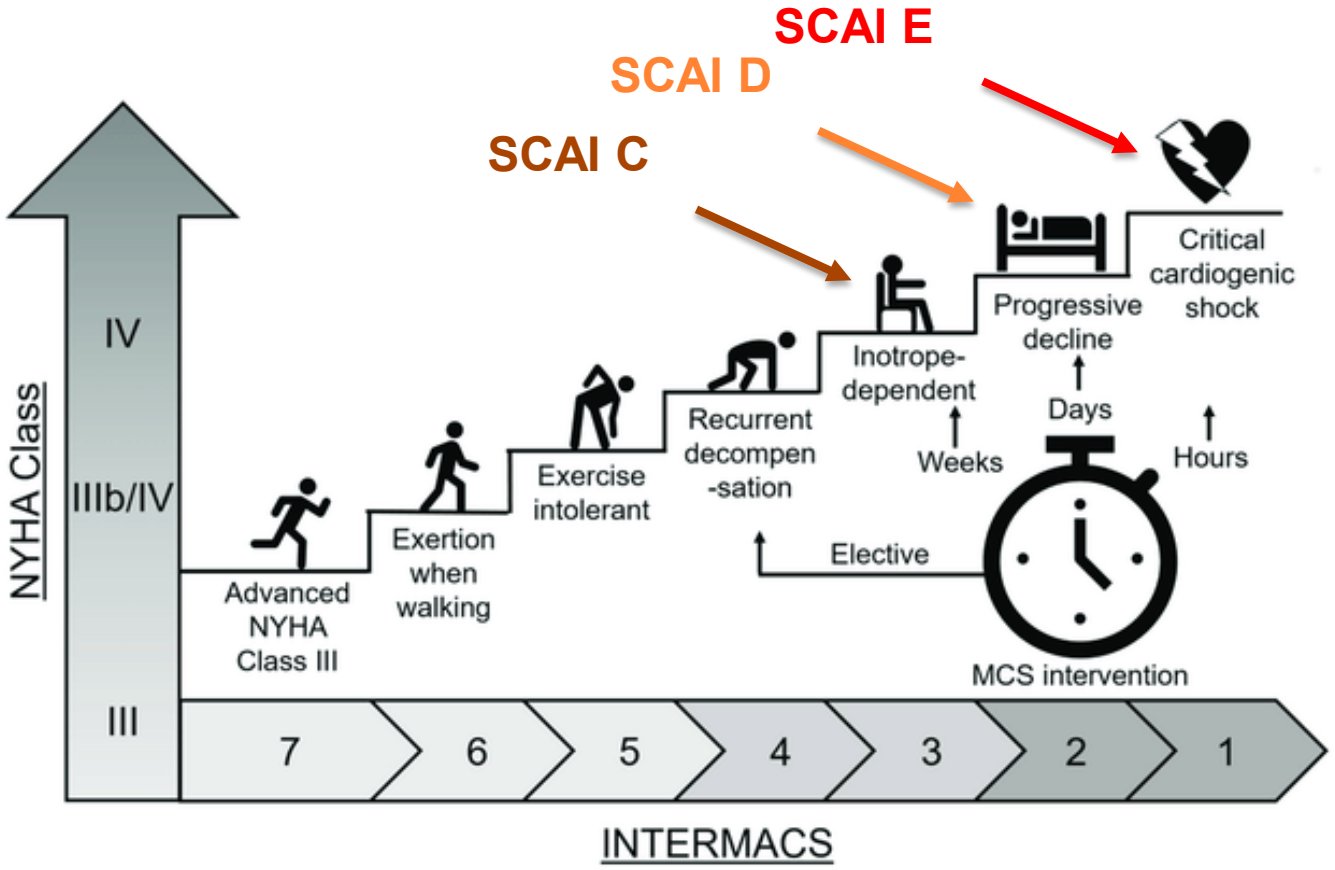
HF CS- Identification

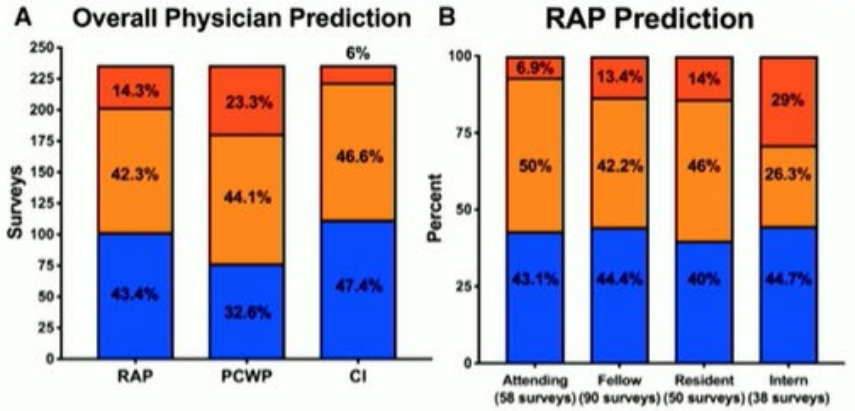


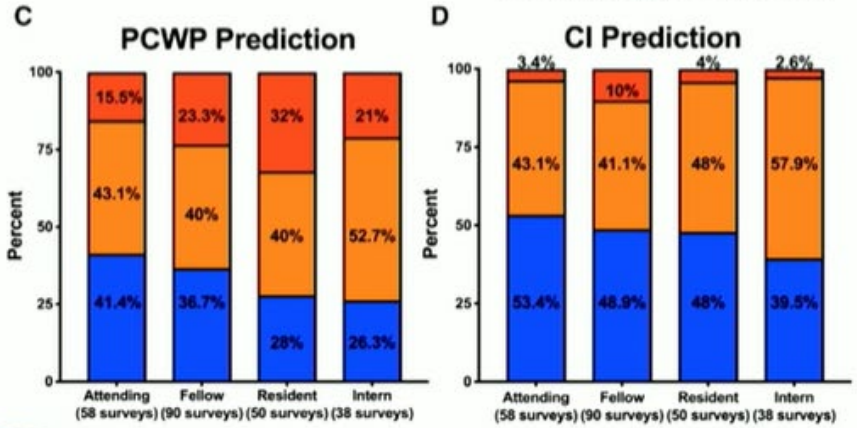
HF CS- Identification

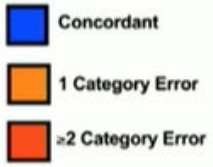
Diagnosis and classifying cardiogenic shock: The Forrester classification		Dry	Wet
		Pulmonary cardiac wedge pressure < 18	Pulmonary cardiac wedge pressure > 18
Warm	Cardiac index > 2.2	Class I Physical exam: • Clear lungs, Normotensive, warm extremities Treatment: • Supportive **Hospital mortality: 3%**	Class II Physical exam: • Pulmonary congestion, elevated JVP, Normotensive, warm extremities Treatment: • Diuresis **Hospital mortality: 9%**
Cold	Cardiac index < 2.2	Class III Physical exam: • Clear lungs, JVP normal, Hypotensive, cool extremities Treatment: • Volume **Hospital mortality: 23%**	Class IV Physical exam: • Pulmonary congestion, Hypotensive Treatment: • Intra-aortic balloon pump • Pressors • Revascularization **Hospital mortality: 51%**

HF CS- Identification

Benefits of Invasive Hemodynamic Assessment







Conclusions: Clinical assessment of patients with advanced heart failure presenting with ADHF has low accuracy across all training levels, with exaggerated rates of misrecognition of the most high-risk patients. (*J Cardiac Fail 2020;26:128–135*)

Narang, et al. J Card Fail, 2020.

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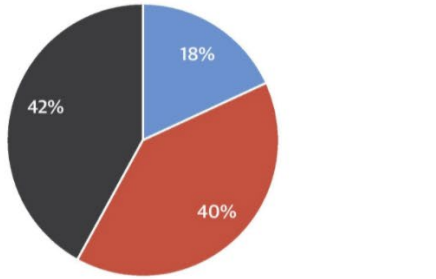
PA catheter monitoring in cardiogenic shock

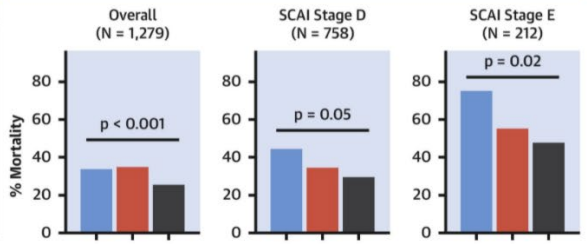
CENTRAL ILLUSTRATION: Frequency of Mortality Among PAC Use Overall and by SCAI Stage

PAC Utilization	Study Definition
None	Presence of **NONE** of the following invasive hemodynamics: • Pulmonary Artery Systolic Pressure • Pulmonary Artery Diastolic Pressure • Pulmonary Capillary Wedge Pressure • Pulmonary Artery Saturation • Right Atrial Pressure
Incomplete Assessment	Presence of **1-4** of the following invasive hemodynamics: • Pulmonary Artery Systolic Pressure • Pulmonary Artery Diastolic Pressure • Pulmonary Capillary Wedge Pressure • Pulmonary Artery Saturation
Complete Assessment	Presence of **ALL** of the following invasive hemodynamics: • Pulmonary Artery Systolic Pressure • Pulmonary Artery Diastolic Pressure • Pulmonary Capillary Wedge Pressure • Pulmonary Artery Saturation **AND** presence of Right Atrial Pressure

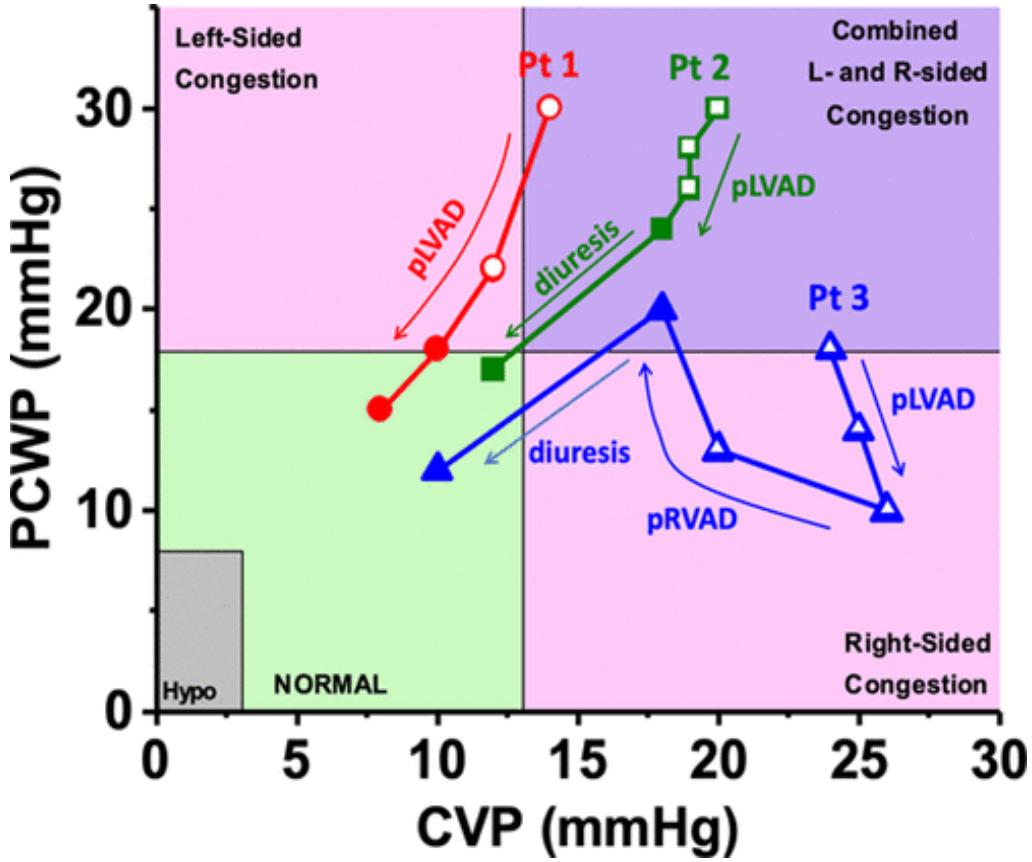
PAC Utilization Among Study Cohort



Association with Mortality Among Advanced Stage Patients



Garan, A.R. et al. J Am Coll Cardiol HF. 2020;8(11):903-13.



Abhinav Saxena. Circulation. Value of Hemodynamic Monitoring in Patients With Cardiogenic Shock Undergoing Mechanical Circulatory Support, Volume: 141, Issue: 14, Pages: 1184-1197.

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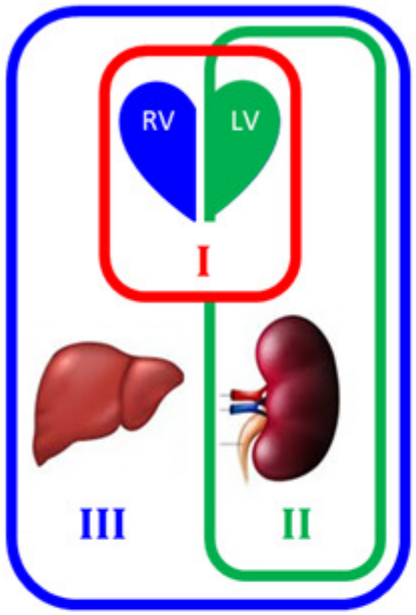
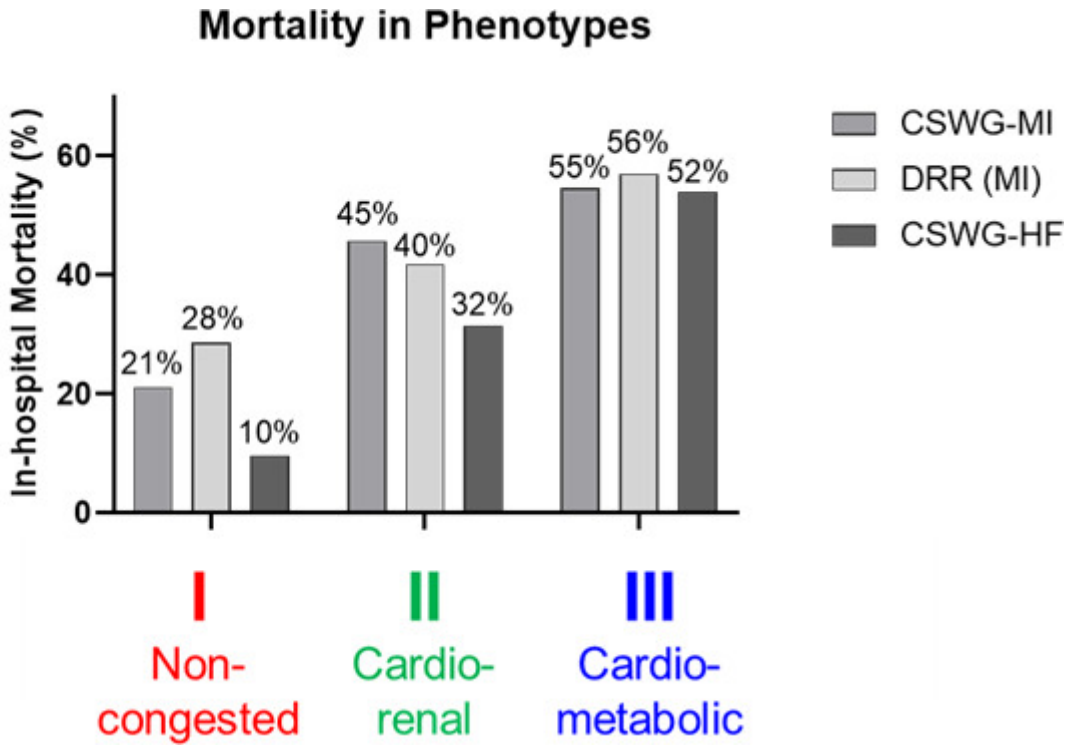
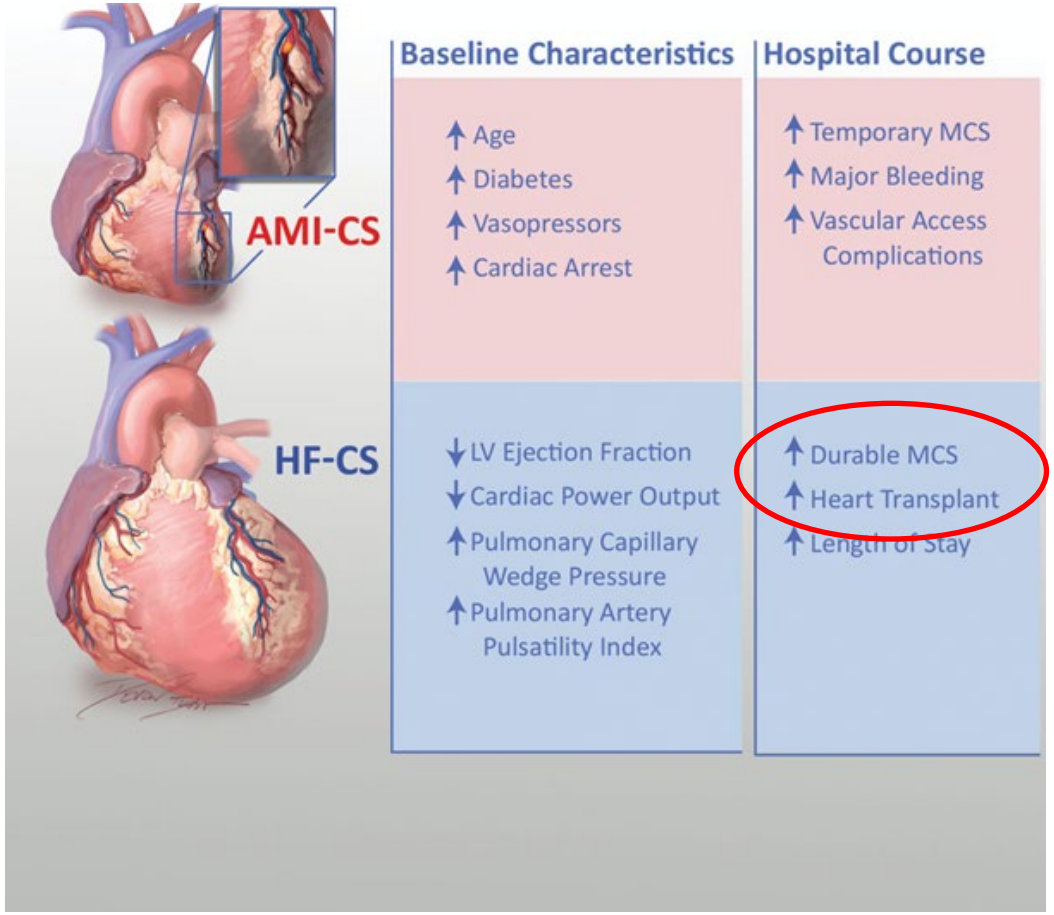
HF CS- Identification and Outcomes





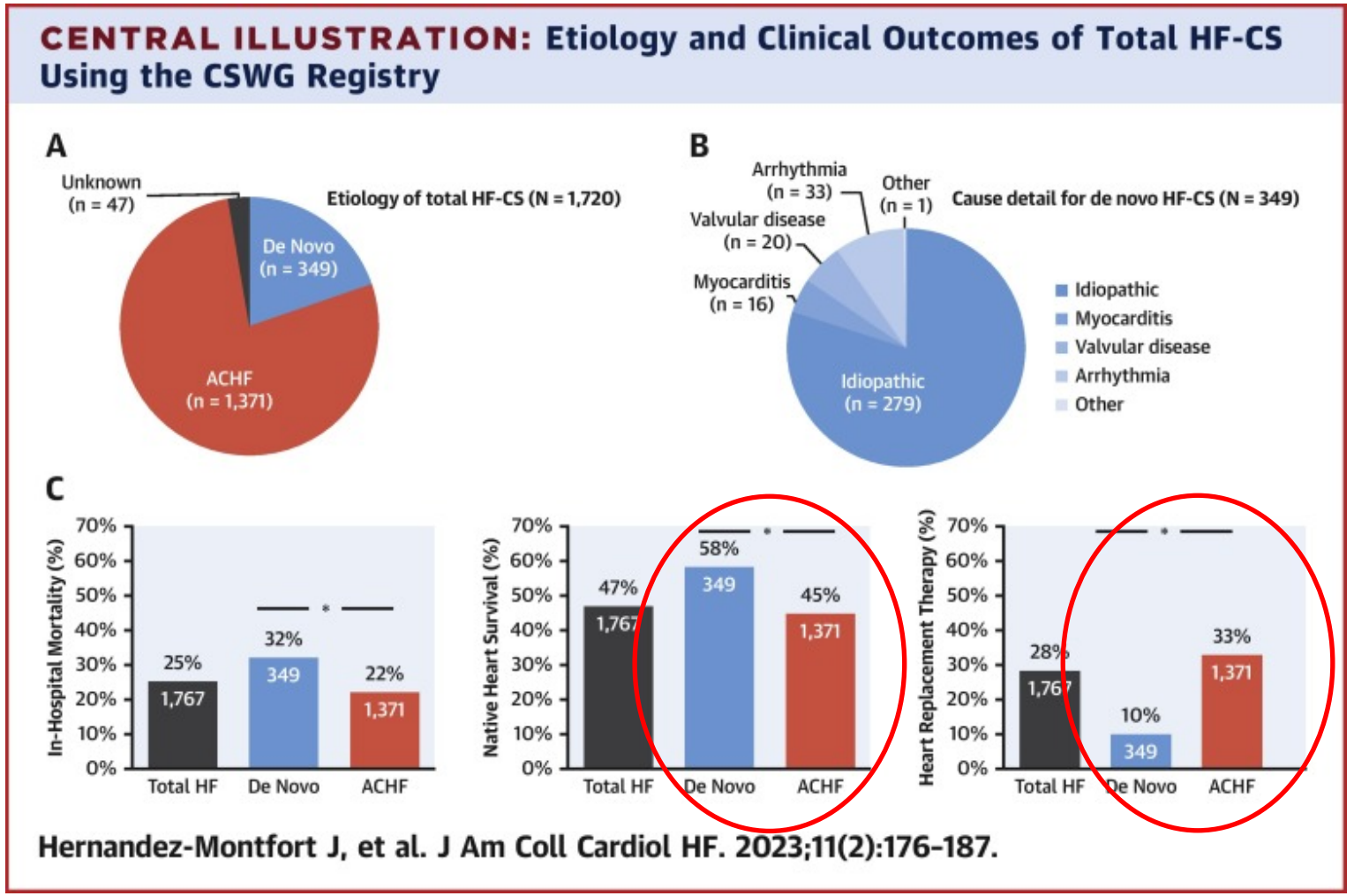
Zweck E, Thayer KL, Helgestad OKL, Kanwar M, Ayouty M, Garan AR, Hernandez-Montfort J, Mahr C, Wencker D, Sinha SS, Vorovich E, Abraham J, O'Neill W, Li S, Hickey GW, Josiassen J, Hassager C, Jensen LO, Holmvang L, Schmidt H, Ravn HB, Møller JE, Burkhoff D, Kapur NK. Phenotyping Cardiogenic Shock. J Am Heart Assoc. 2021

AMI CS vs HF CS- Hemodynamics



Shashank S. Sinha. Circulation: Heart Failure. Cardiogenic Shock From Heart Failure Versus Acute Myocardial Infarction: Clinical Characteristics, Hospital Course, and 1-Year Outcomes, Volume: 15, Issue: 6, Pages: e009279, DOI: (10.1161/CIRCHEARTFAILURE.121.009279)

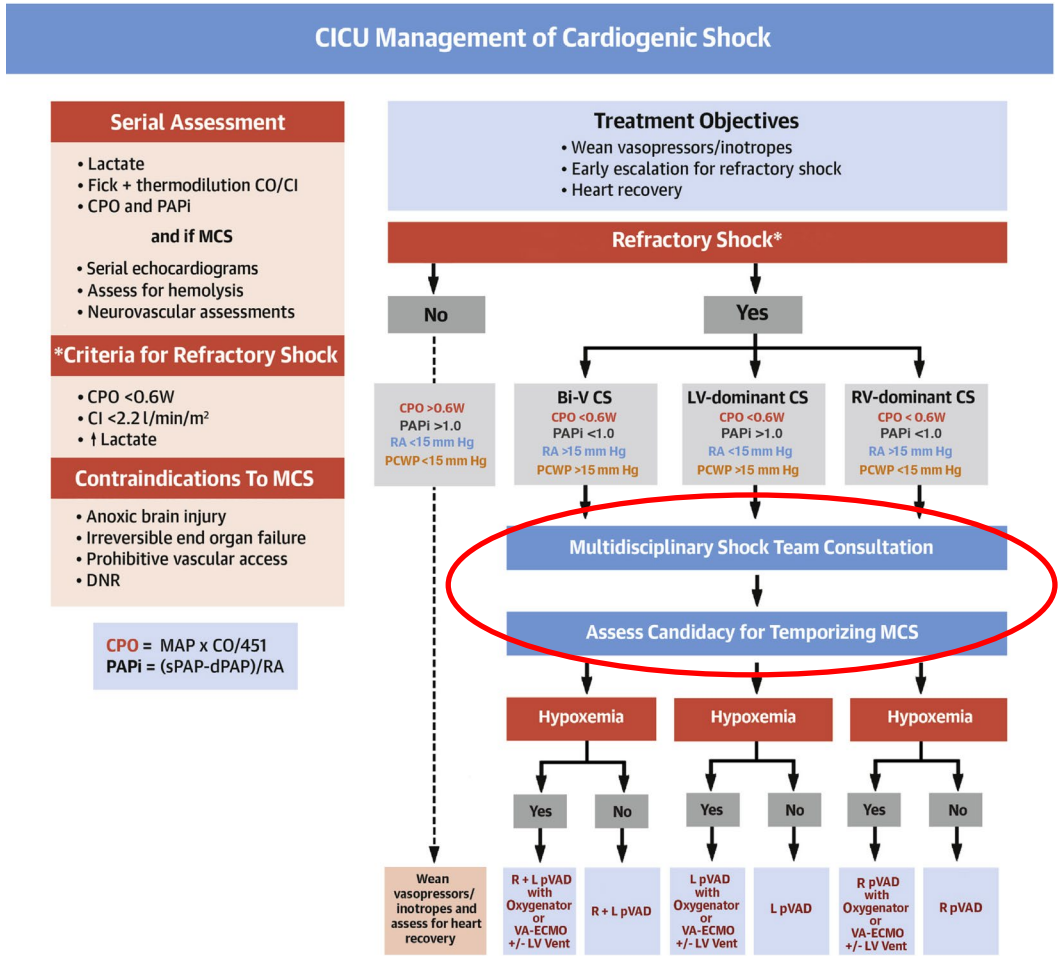
Outcomes in HF CS- End Game



Hernandez-Montfort J, et al. J Am Coll Cardiol HF. 2023;11(2):176-187.

HF CS- Management

- End-Game starts at the beginning of management!



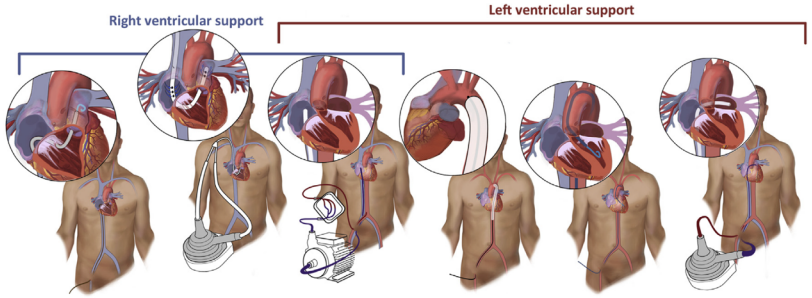
Tehrani BN, Truesdell AG, Psotka MA, Rosner C, Singh R, Sinha SS, Damluji AA, Batchelor WB. A Standardized and Comprehensive Approach to the Management of Cardiogenic Shock. JACC Heart Fail. 2020 Nov;8(11):879-891.

HF CS- Unknown End-Game

Resources

- Call your friendly neighborhood shock teams

Initial Management Options



	Impella RP	TandemHeart RA-PA	VA-ECMO	IABP	Impella (2.5, CP, 5.0, 5.5)	TandemHeart LA-FA
Flow	max 4.0 l/min	max 4.0 l/min	max 7.0 l/min	0.5 l/min	2.5 - 5.5 l/min	max 4.0 l/min
Pump Speed	33000 rpm	max 7500 rpm	max 5000 rpm	NA	max 51,000 rpm	max 7500 rpm
Mechanism	Axial flow continuous pump (RA-to-PA)	Centrifugal flow continuous pump (RA-to-PA)	Centrifugal flow continuous pump (RA-to-AO)	Balloon inflation-deflation (AO)	Axial flow continuous pump (LV-to-AO)	Centrifugal flow continuous pump (LA-to-AO)
Cannula Size	22 F venous	29 F venous	14-19 F arterial 17-21 F venous	7-8 F arterial	13-21 F arterial	12-19 F arterial 21 F venous
Insertion/Placement	Femoral vein	Internal jugular vein	Femoral vein Femoral artery	Femoral artery Axillary artery	Femoral artery Axillary artery	Femoral artery Femoral vein
LV Unloading	-	-	-	+	+to+++	++
RV Unloading	+	+	++	-	-	-
Cardiac Power	-	-	↑↑	↑	↑↑	↑↑
Afterload	-	-	↑↑	↓	↓↓	↑
Coronary Perfusion	-	-	-	↑	↑	-
Considerations	• *RECOVER RIGHT: 73% survival-to-30 days in RVF post LVAD, AMI or cardiotomy* • *May 2019 - FDA post-approval study: 33% survival-to-30 days*	• *IJ access may facilitate early ambulation*	• *Bi-V + oxygenation support for CS following:* *- AMI, ADHF or cardiac arrest* *- Cardiotomy* *- Myocarditis* *- Allograft rejection*	• *Requires stable cardiac rhythm and native heart function* • *May consider in select cases of post-AMI mechanical complications*	• *June 2008 – FDA 510(k) approval for HR-PCI* • *April 2016: Expanded Indication for CS* • *Contraindicated with mechanical aortic valve, LV thrombus*	• *Requires transseptal access* • *Oxygenator may be added to the circuit*

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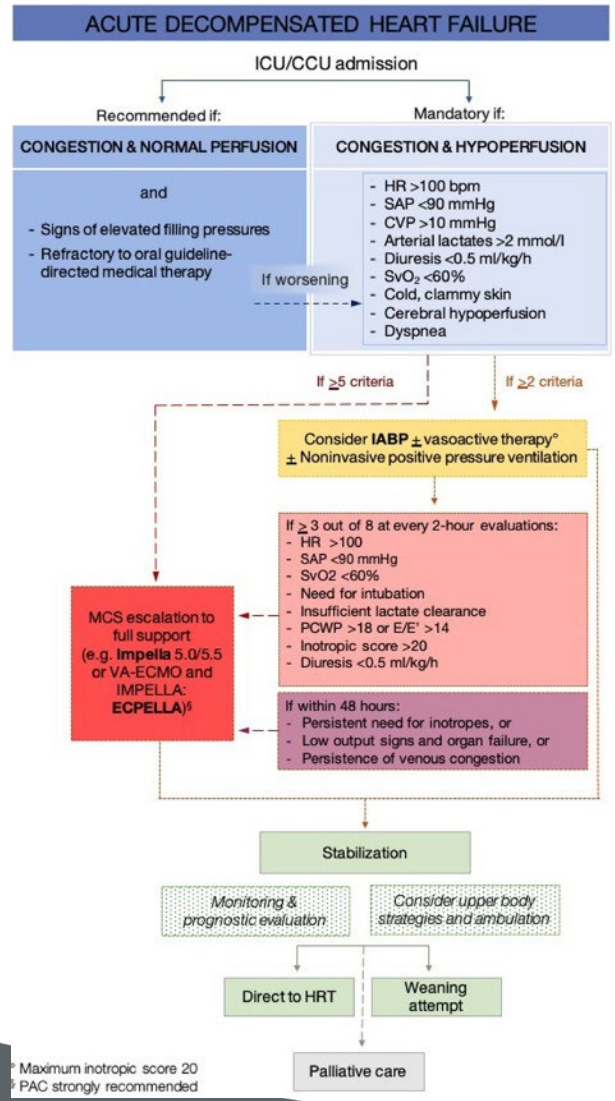
HF CS Management- IABP revival?



IABP superior to Inotropes

- (den Uil et. al, Eurointervention 2019)

IABP responders:

- High SVR
- Elevated mPAP

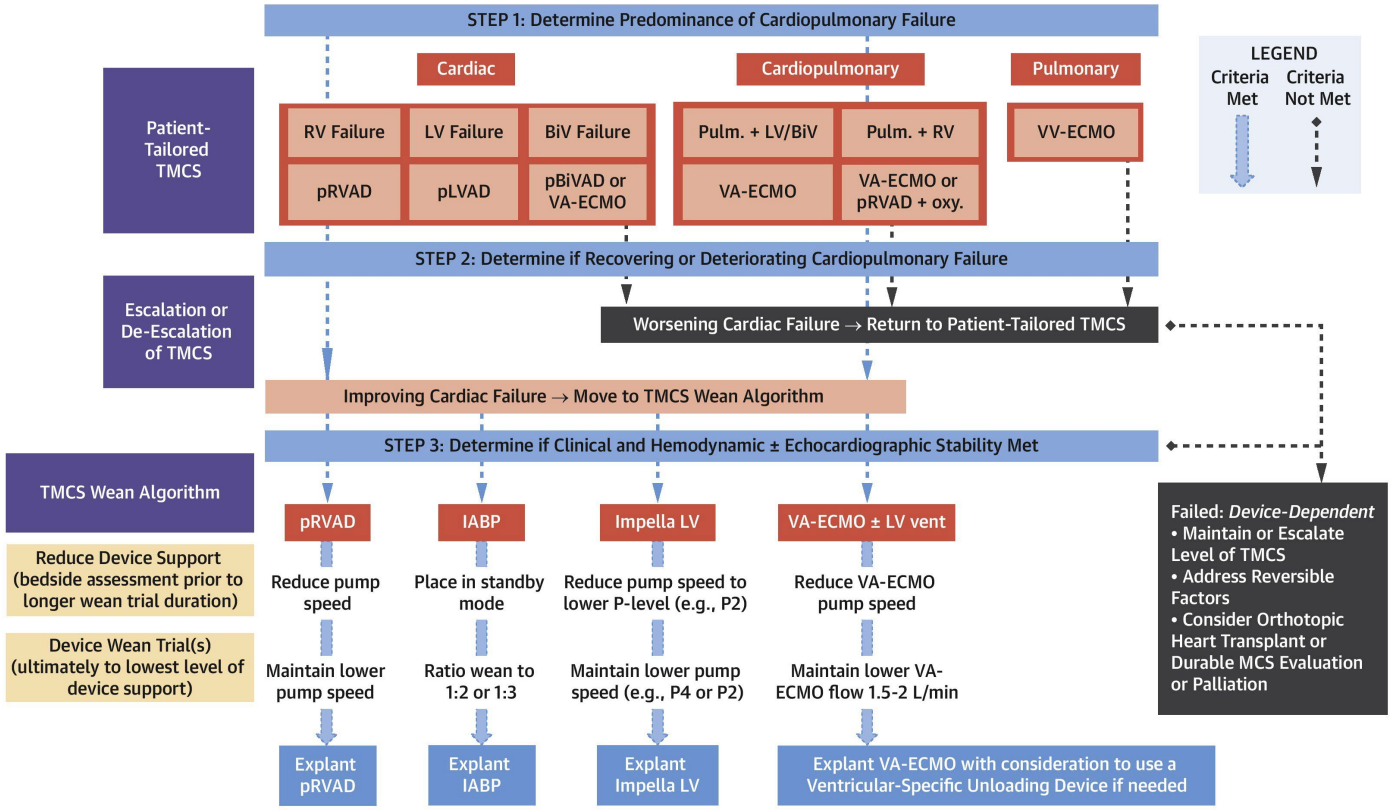
IABP non-responders:

- Ischemic cardiomyopathy
- PAPi <2

Nuccia Morici, Claudia Marini, Alice Sacco, Guido Tavazzi, Francesco Saia, Matteo Palazzini, Fabrizio Oliva, Gaetano Maria De Ferrari, Paolo C Colombo, Navin K. Kapur, Arthur Reshad Garan, Federico Pappalardo.
Intra-aortic Balloon Pump for Acute-on-Chronic Heart Failure Complicated by Cardiogenic Shock, Journal of Cardiac Failure, Volume 28, Issue 7, 2022. Pages 1202-1216.

HF CS- Management

CENTRAL ILLUSTRATION: Device-Tailoring Algorithm for Temporary Mechanical Circulatory Support



Randhawa, V.K. et al. J Am Coll Cardiol HF. 2021;9(9):664-73.

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Summary

AMI CS vs HF CS

- Different entities

HF CS

- Higher baseline wedge
- Hemodynamic profiling
- End-game
  - Shock Team Discussion
- Management
  - Unload and Perfuse
  - MAP/CPO/Lactate clearance
  - Escalation/Weaning