



**ROPER ST. FRANCIS**  
HEALTHCARE

# ***CURRENT DIAGNOSIS AND MANAGEMENT OF HEART FAILURE***

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Roper St. Francis HealthCare

# Definition of Heart Failure

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**Heart failure is a clinical syndrome** characterized by symptoms (dyspnea, fatigue, orthopnea) and/or signs (peripheral edema, jugular venous distention, pulmonary congestion) caused by structural and/or functional cardiac abnormalities, corroborated by elevated natriuretic peptides and/or objective evidence of congestion.

The syndrome results from impaired ventricular filling or ejection of blood, leading to decreased stroke volume and cardiac output.

HF Type	LVEF Criteria	Additional Diagnostic Requirements	References
<b>HFrEF</b> (HF with reduced EF)	≤40%	Symptoms/signs of HF, elevated natriuretic peptides	[1-2]
<b>HFmrEF</b> (HF with mildly reduced EF)	41-49%	Evidence of increased LV filling pressures (elevated natriuretic peptides, E/e' ≥15, or invasive hemodynamics)	[1, 3]
<b>HFpEF</b> (HF with preserved EF)	≥50%	Evidence of increased LV filling pressures; structural heart disease (increased LA volume, LV mass)	[1, 3]
<b>HFimpEF</b> (HF with improved EF)	Previous LVEF ≤40%, follow-up >40%	≥10 point increase from baseline LVEF	[1, 3]

## Classification by Left Ventricular Ejection Fraction

Asymptomatic systolic or diastolic dysfunction is not heart failure

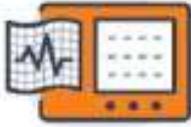


## Stages in the development and progression of heart failure



### Stage A: At-risk for heart failure

Patients at risk for HF but without current or prior symptoms or signs of HF and without structural or biomarkers evidence of heart disease.



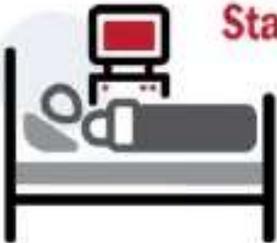
### Stage B: Pre-heart failure

Patients without current or prior symptoms or signs of HF, but evidence of structural heart disease or abnormal cardiac function, or elevated natriuretic peptide levels.



### Stage C: Heart failure

Patients with current or prior symptoms and/or signs of HF caused by a structural and/or functional cardiac abnormality.

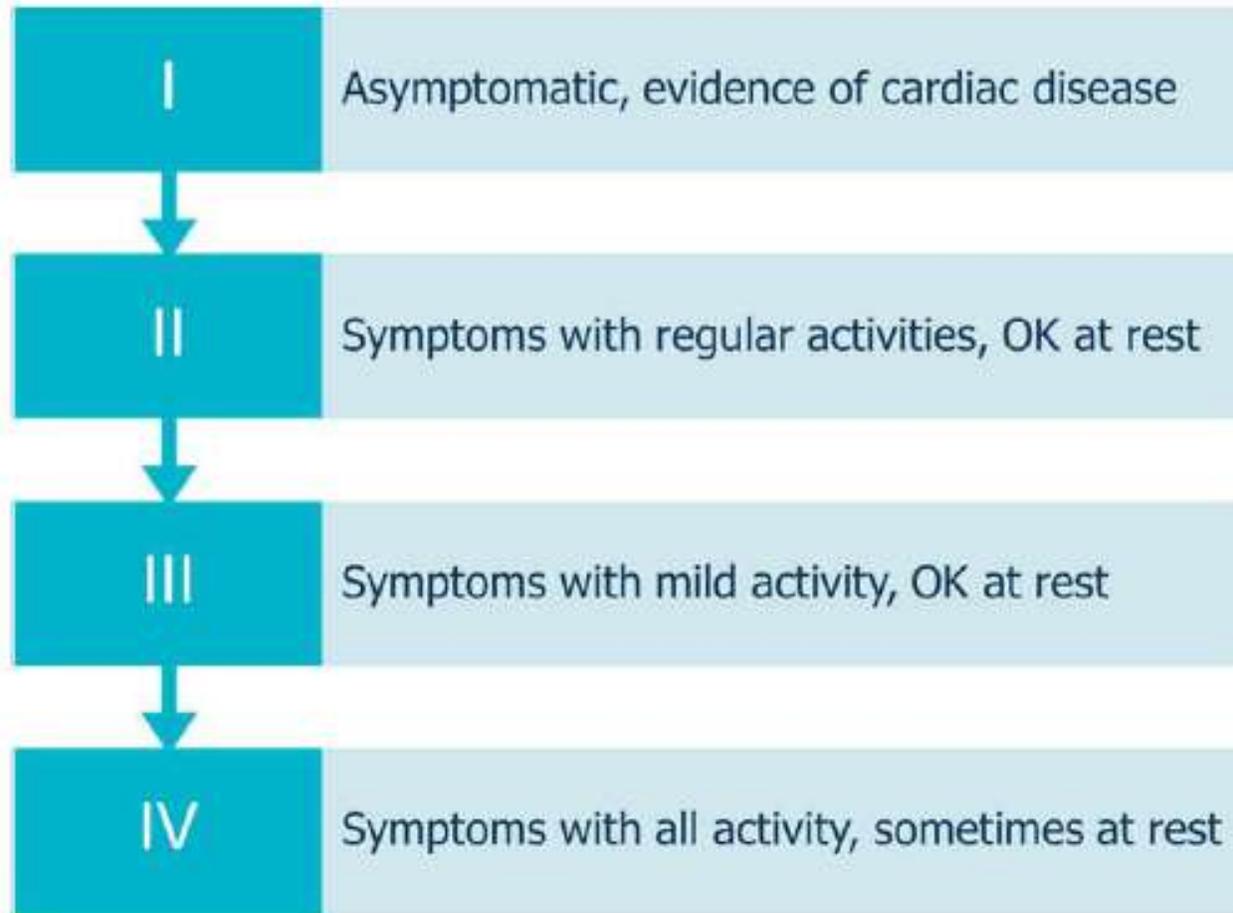


### Stage D: Advanced heart failure

Patients with severe symptoms and/or signs of HF at rest, recurrent hospitalizations despite guideline-directed management and therapy (GDMT), refractory or intolerant to GDMT, requiring advanced therapies such as consideration for transplant, mechanical circulatory support, or palliative care.

SOURCE: J Card Fail. 2021 Mar 1; doi:10.1016/j.cardfail.2021.01.022

# NYHA Heart Failure Classification



# Diagnostic Approach

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## INITIAL EVALUATION:

Medical history and physical examination focusing on signs of congestion

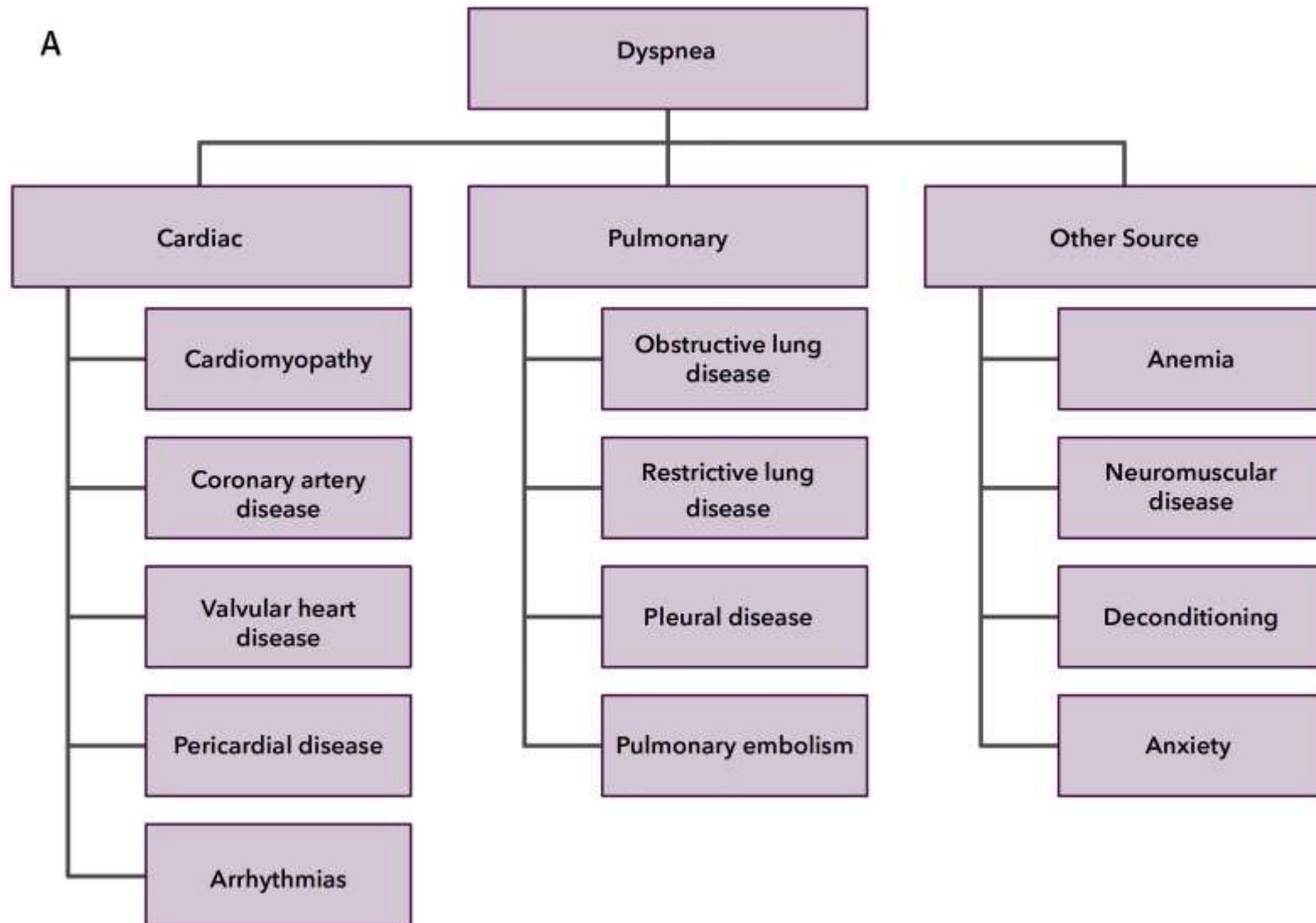
Natriuretic peptide measurement (BNP or NT-proBNP above age-specific thresholds)

Echocardiography to assess LVEF and cardiac structure

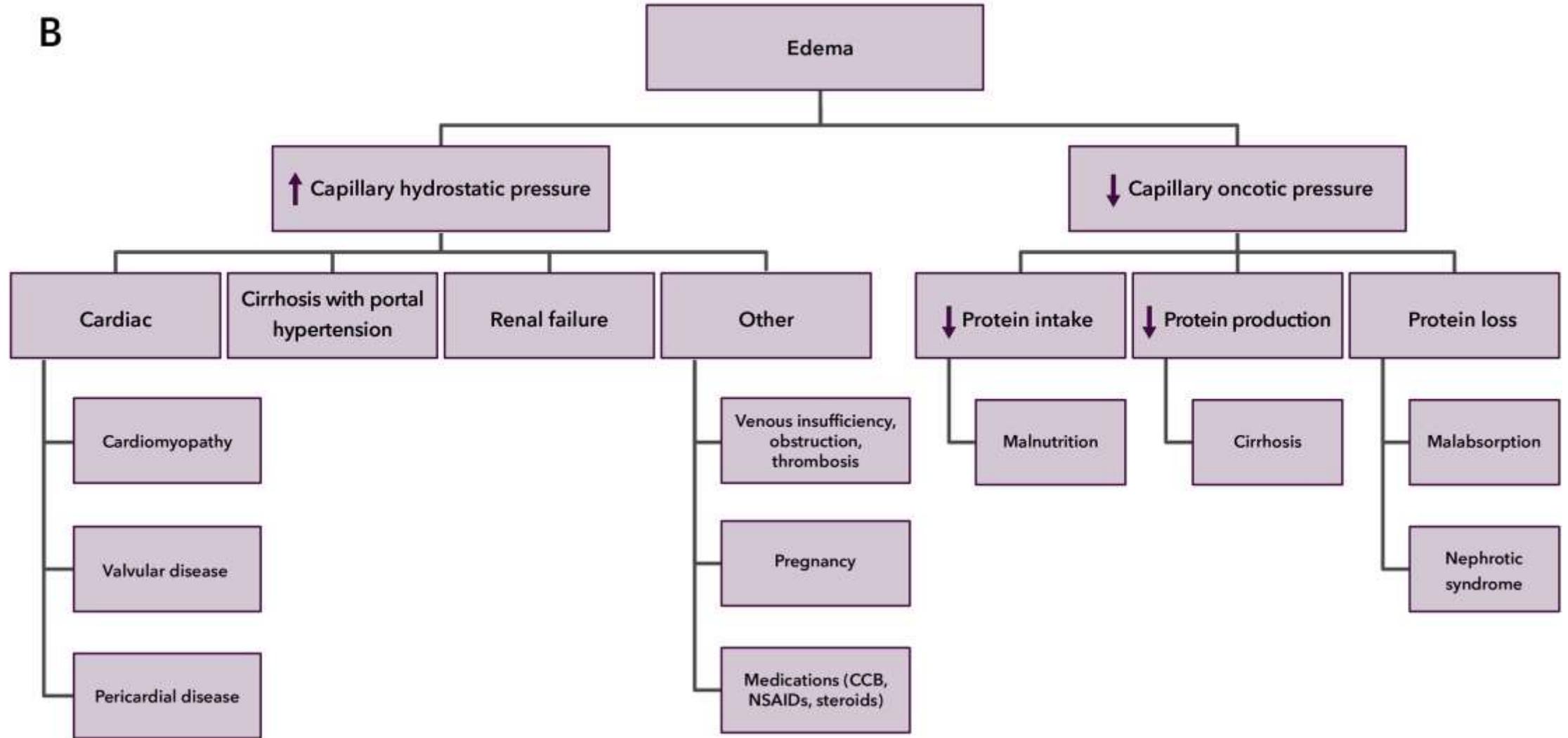
Electrocardiogram

**For HFmrEF and HFpEF specifically**, diagnosis requires evidence of:

--> elevated LV filling pressures through natriuretic peptides, echocardiographic parameters ( $E/e' \geq 15$ ), or invasive hemodynamic testing (***Diastolic dysfunction alone on Echo is insufficient for diagnosis***)



**B**



# Diagnostic Scoring Systems for HFpEF

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**H2FPEF Score** integrates six variables (obesity, atrial fibrillation, age >60 years,  $\geq 2$  antihypertensive medications,  $E/e' > 9$ , PA systolic pressure >35 mm Hg) with scores ranging 0-9.<sup>1</sup>

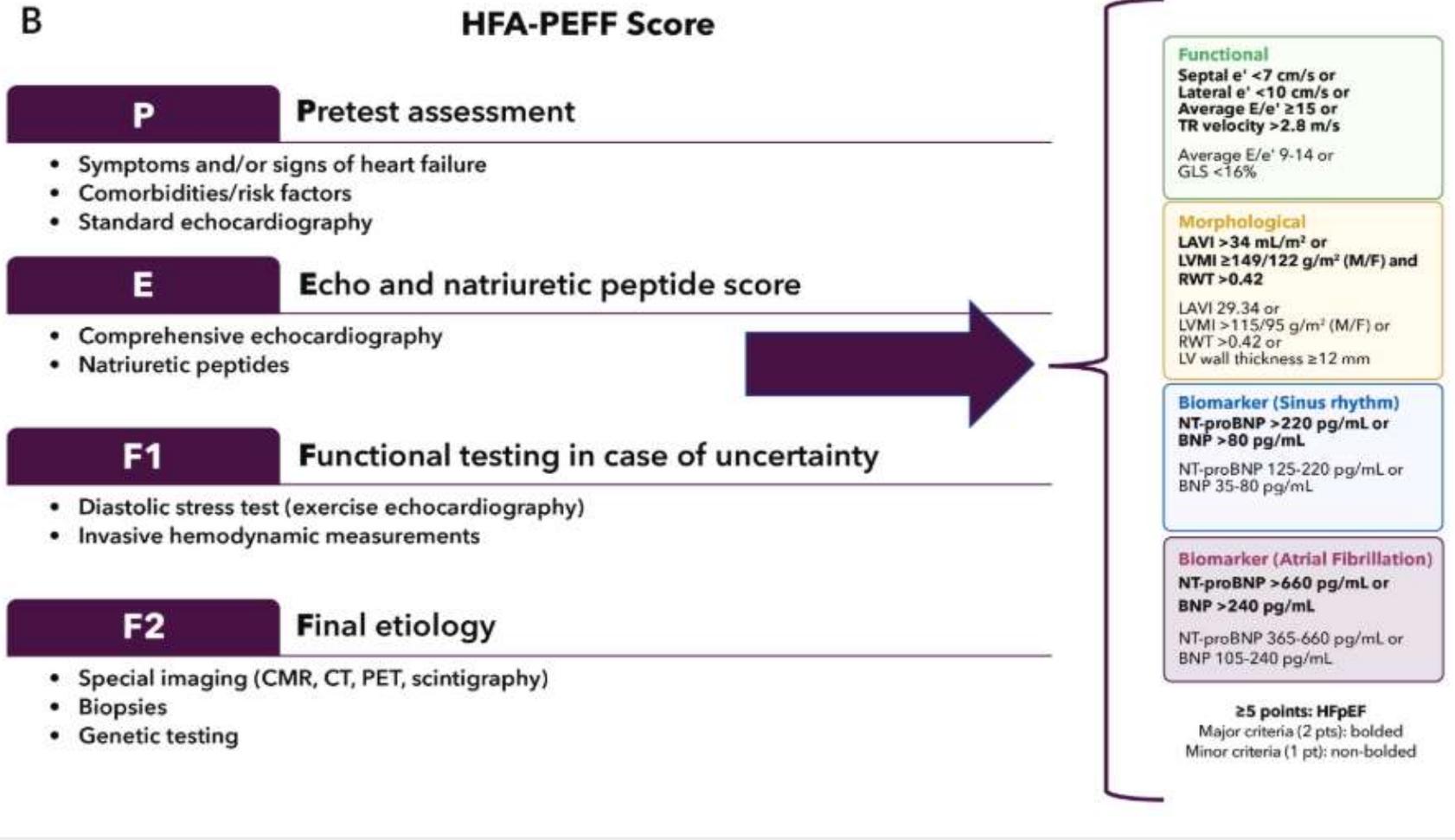
**HFA-PEFF algorithm** provides a more comprehensive stepwise approach including pretest assessment, echocardiographic scoring, functional testing, and etiology assessment.<sup>2</sup>

A

## H<sub>2</sub>FPEF

<b>H<sub>2</sub></b>	<b>H</b> heavy (BMI >30 kg/m <sup>2</sup> )	2
	On ≥2 anti <b>H</b> ypertensives	1
<b>F</b>	Atrial <b>F</b> ibrillation	3
<b>P</b>	<b>P</b> ulmonary hypertension (PASP >35 mm Hg on Doppler echocardiography)	1
<b>E</b>	<b>E</b> lder (age >60 years)	1
<b>F</b>	<b>F</b> illing pressure (E/e' >9 on Doppler echocardiography)	1

≥6 points: highly diagnostic of HFpEF



**Figure 4** HFpEF Diagnostic Scoring Systems\*

# MANAGEMENT OF HEART FAILURE

# HEART FAILURE WITH REDUCED EJECTION FUNCTION (HFrEF)

## Foundational Therapy: 4 Pillars (Class I Indication)

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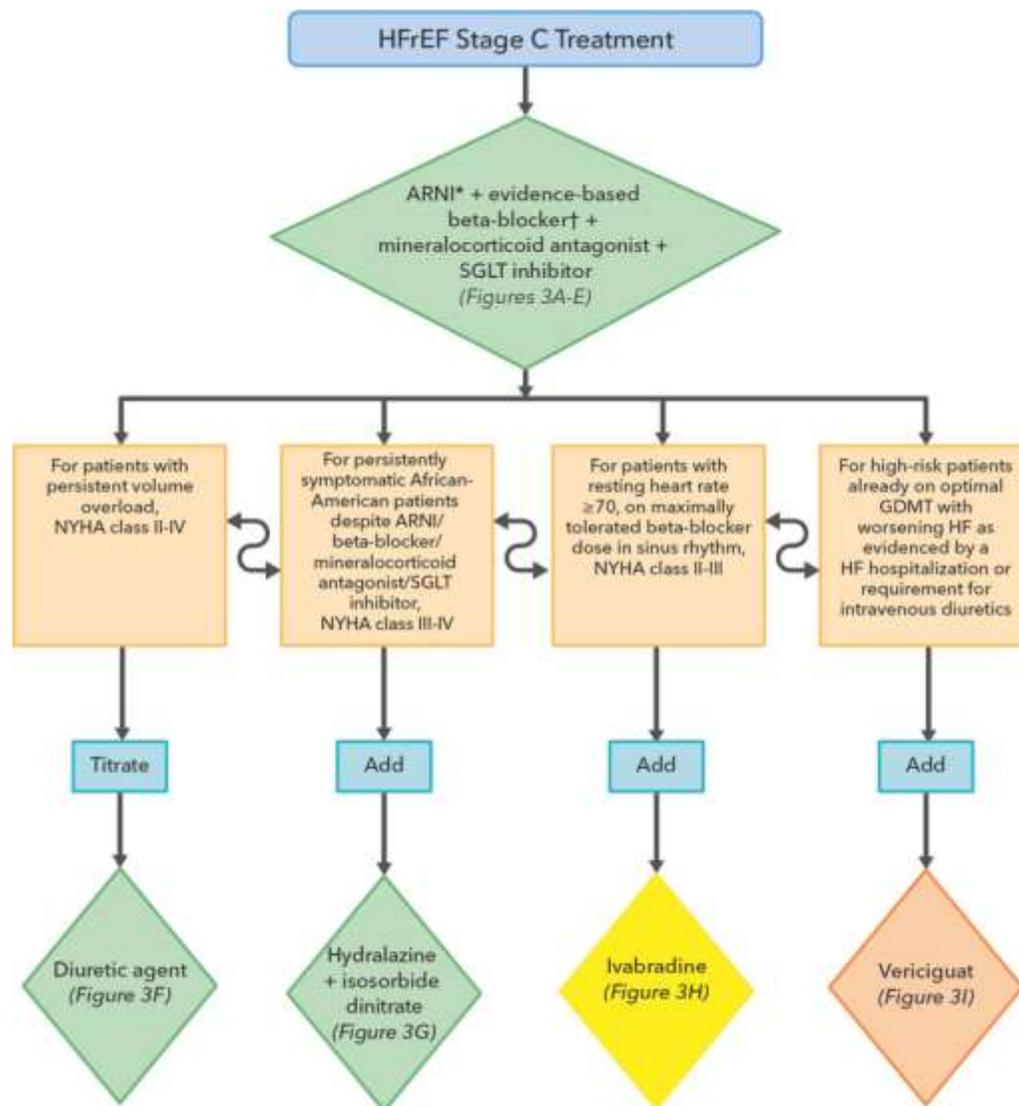
**All patients with HFrEF should receive four foundational drug classes unless contraindicated, with early initiation and rapid uptitration:**

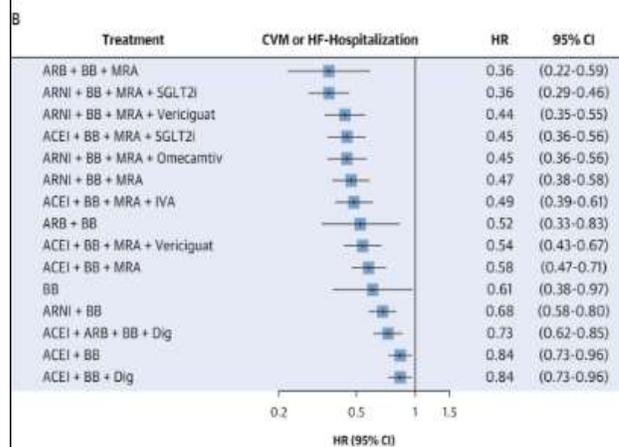
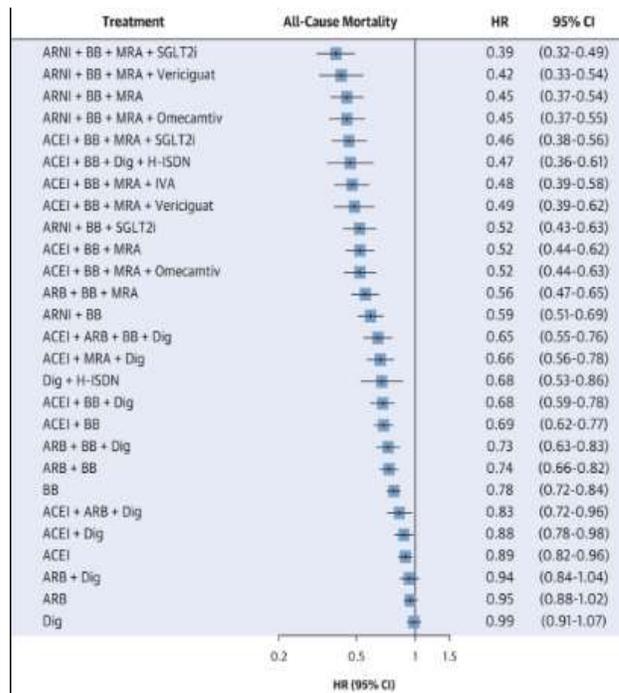
- 1. RAAS inhibition:** ARNI (angiotensin receptor-neprilysin inhibitor) over ACE inhibitor, ARB
- 2. Beta-blockers** (carvedilol, metoprolol succinate, bisoprolol)
- 3. Mineralocorticoid receptor antagonists** (MRAs: spironolactone and eplerenone)
- 4. SGLT2 inhibitors** (sodium-glucose cotransporter-2 inhibitors)

**Diuretics** for symptom relief and decongestion (Class 1 recommendation)

Bumetanide/Torsemide better than furosemide

Subcutaneous furosemide: FUROSIX™





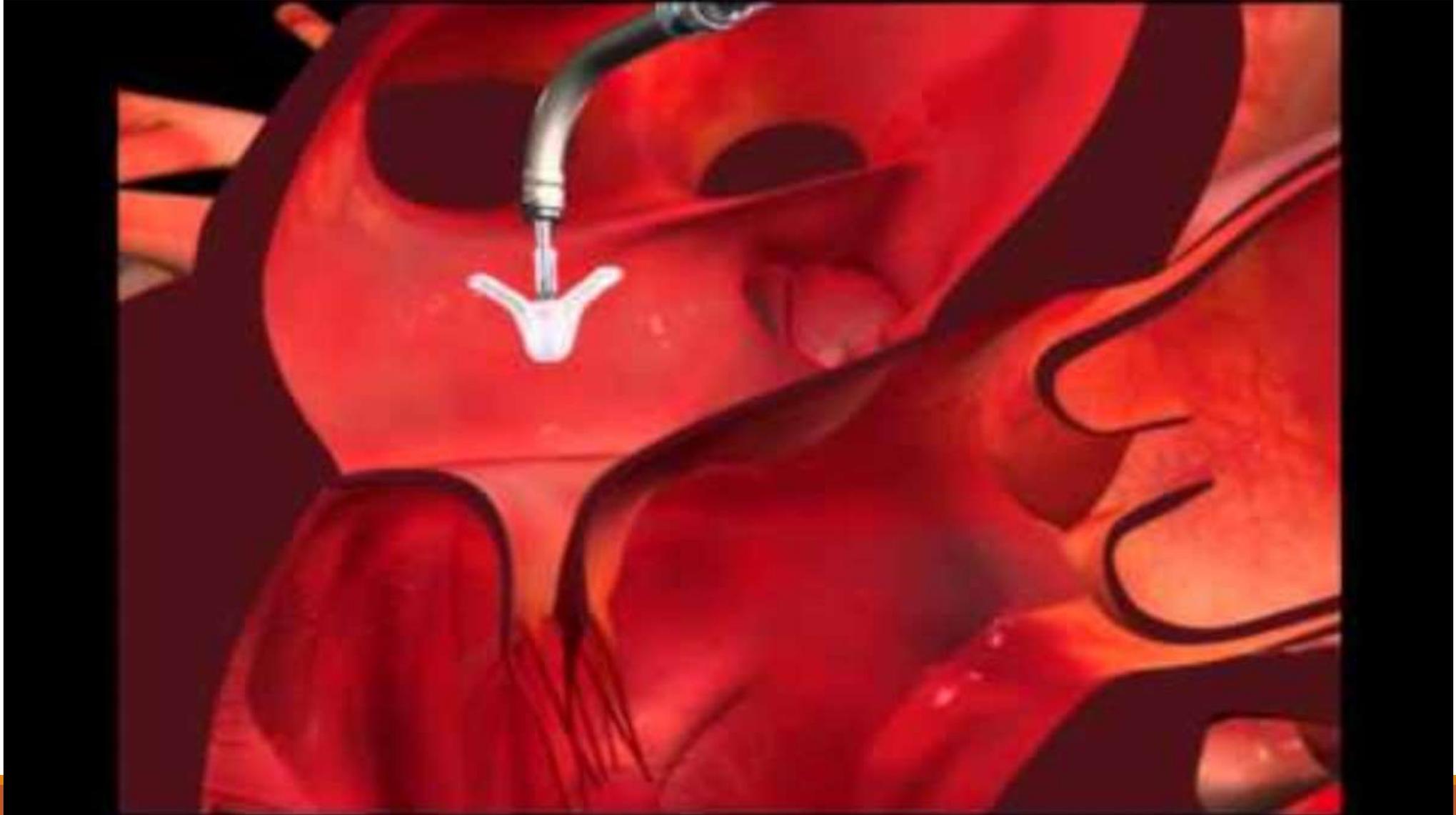
SOURCE: JACC Journals: Vol. 86 No.24: Meta-Analysis 29 August 2025: Pharmacologic Treatment of Heart Failure With Reduced Ejection Fraction: An Updated Systematic Review and Network Meta-Analysis

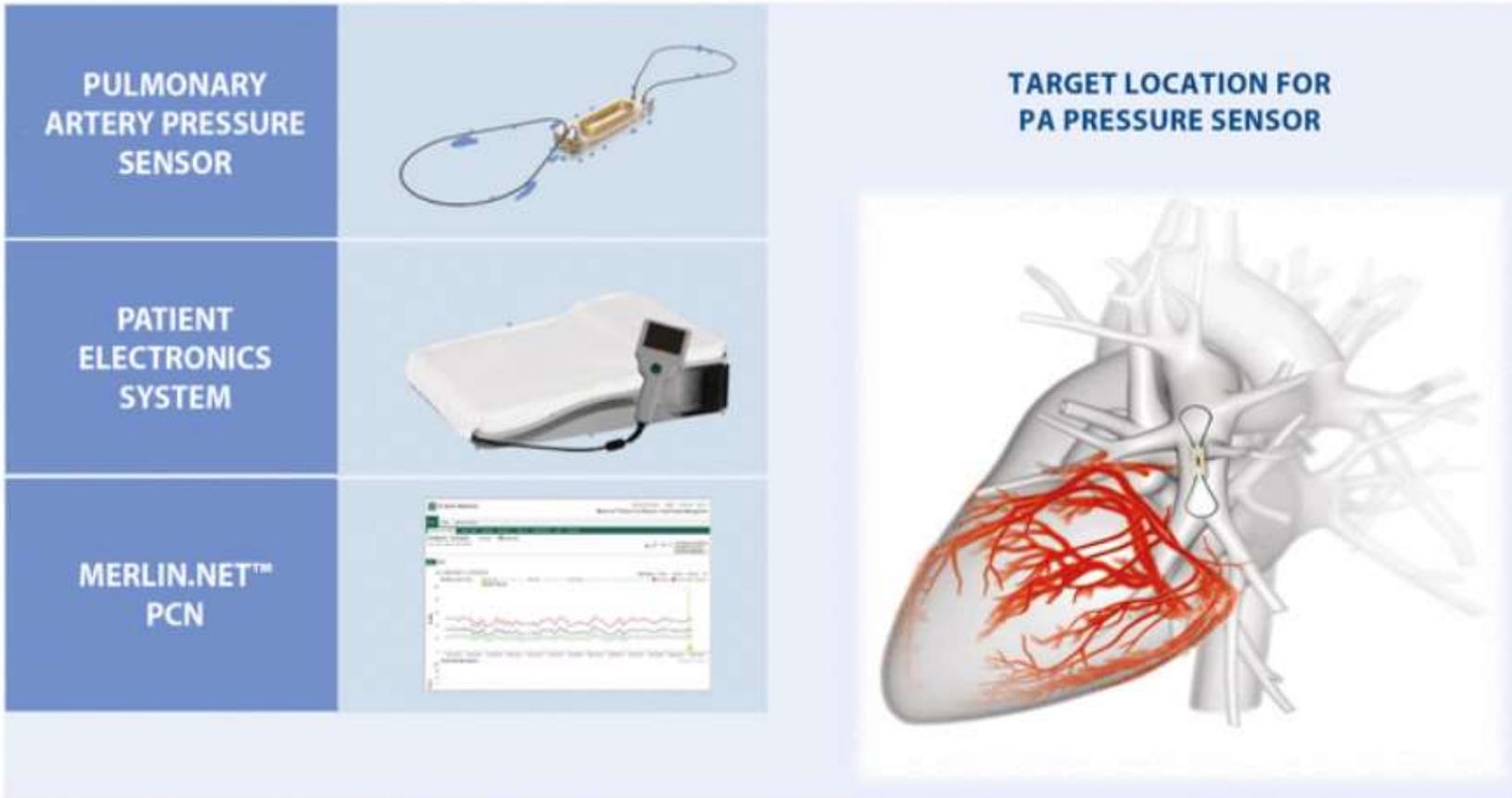
# DEVICE THERAPIES IN HFrEF

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- Cardiac resynchronization therapy for interventricular dyssynchrony
  - LBBB, QRS>150 msec and LVEF <35%
- Implantable cardiac defibrillators for severe LV dysfunction, especially ischemic etiology
- Transcatheter mitral valve repair (TEER) for severe secondary mitral regurgitation and LV dysfunction
- CardioMEMS™ HF System : continuous PA pressure monitoring system for tailoring of diuretic therapy

# Transcatheter MitraClip TEER System



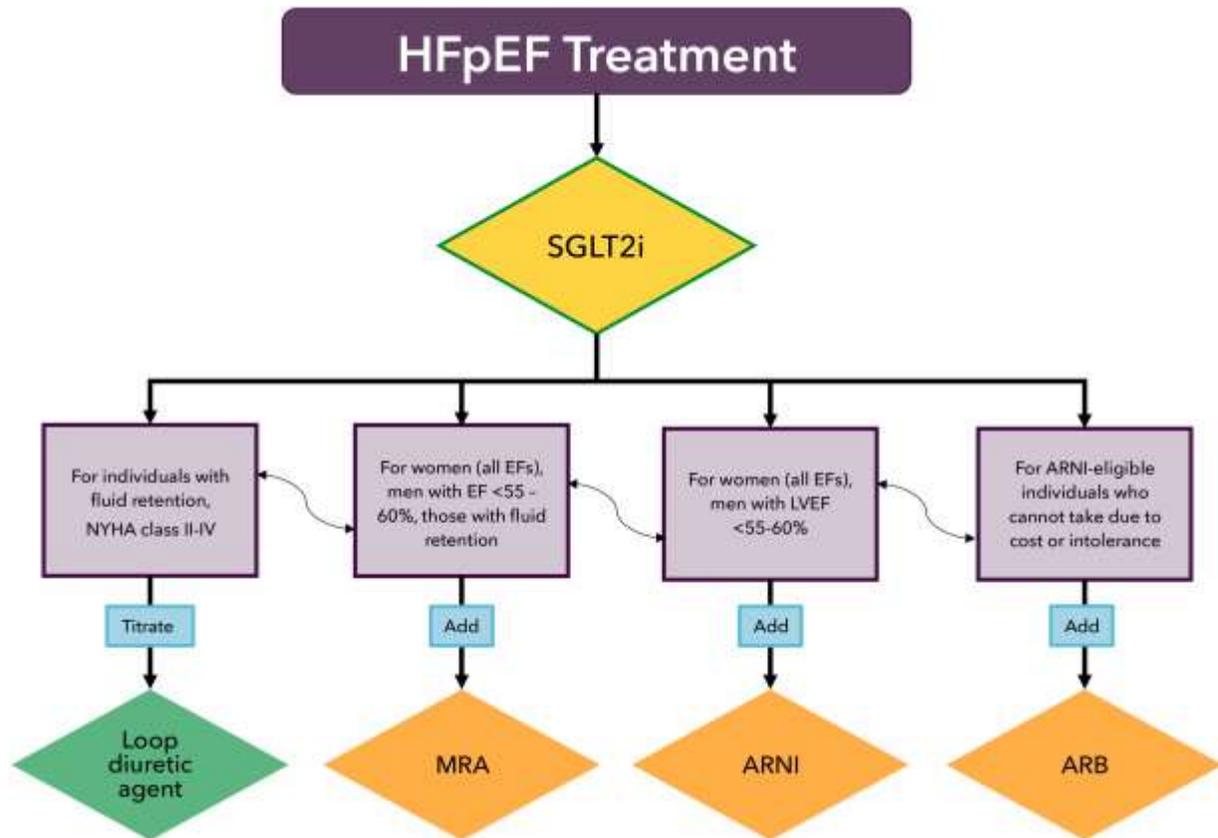


## CardioMEMS™ HF System

Major components of the CardioMEMS™ HF System (left) and anatomical representation of the heart and vessels showing the CardioMEMS™ sensor implanted in the left pulmonary artery (right). PA pulmonary artery

Angermann, Christiane & Assmus, Birgit & Anker, Stefan & Brachmann, Johannes & Ertl, Georg & Koehler, Friedrich & Rosenkranz, Stephan & Tschöpe, Carsten & Adamson, Philip & Böhm, Michael. (2018). Safety and feasibility of pulmonary artery pressure-guided heart failure therapy: rationale and design of the prospective CardioMEMS Monitoring Study for Heart Failure (MEMS-HF). *Clinical Research in Cardiology*. 107. 10.1007/s00392-018-1281-8.

# Management of HFpEF: Drug Therapy



Treatment Algorithm for Guideline-Directed Medical Therapy in HFpEF\*  
Green color identifies a Class 1 therapy from clinical practice guidelines  
Yellow color indicates a Class 2a therapy  
Orange color denotes a Class 2b therapy

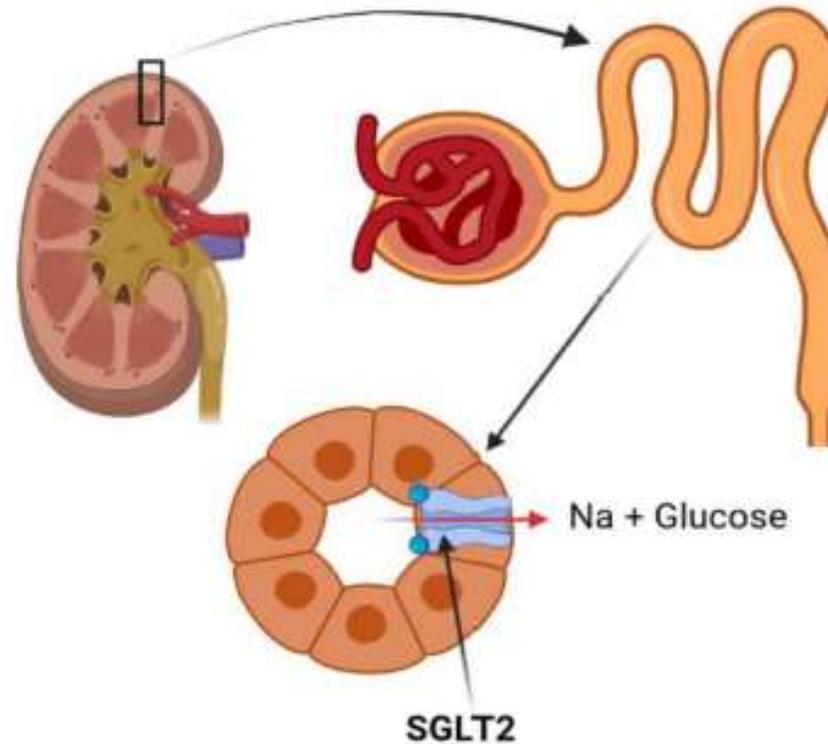
SGLT2is receive a Class 2a indication in the 2022 AHA/ACC/HFSA HF Guidelines, but the benefit, now confirmed in 2 randomized trials, suggests that SGLT2is may receive a stronger class of recommendation in future guidelines, and thus the box is shaded yellow with a green border.

JACC Journals: Vol. 83. No. 15: 2023 ACC Expert Consensus Decision Pathway on Management of Heart Failure With Preserved Ejection Fraction: A Report of the American College of Cardiology Solution Set Oversight Committee

# SGLT2 inhibitors

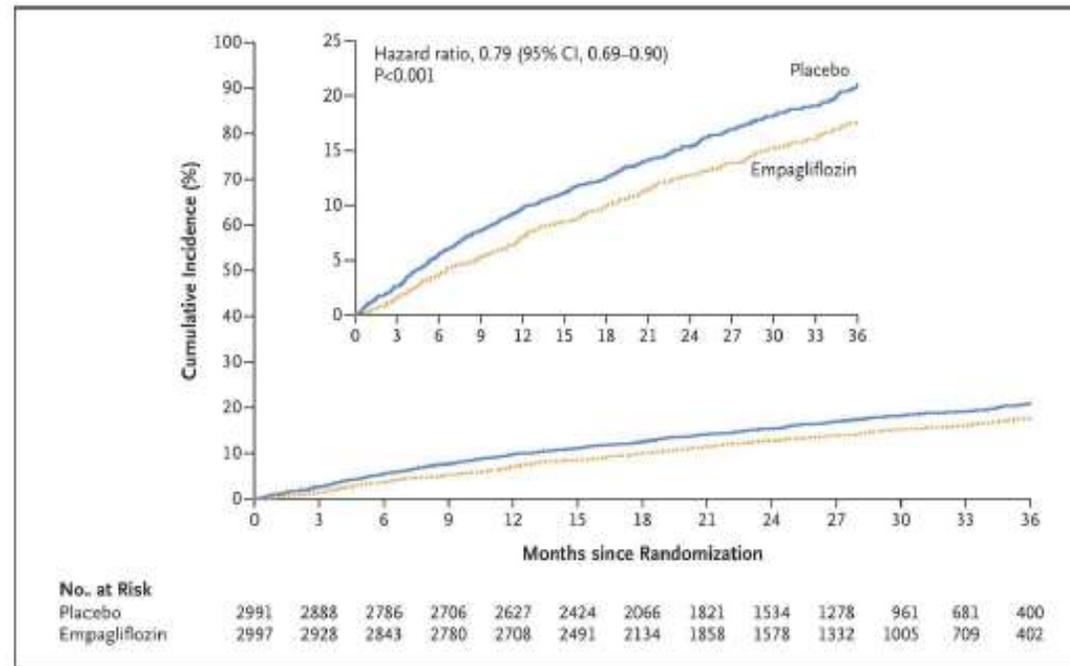
- Mainly **Empagliflozin** (EMPEROR-Reduced and EMP-Preserved) and **Dapagliflozin** (DAPA-HF and DELIVER) in heart failure
- Osmotic diuresis and natriuresis (Na<sup>+</sup> excretion), less loop diuretic needed
- Reduced hyperkalemia (esp. with MRA)
- Less clinical gout (loop, thiazide)

\* eGFR cutoff 25 mL/min/1.73 m<sup>2</sup> for dapagliflozin, no lower cutoff for empagliflozin



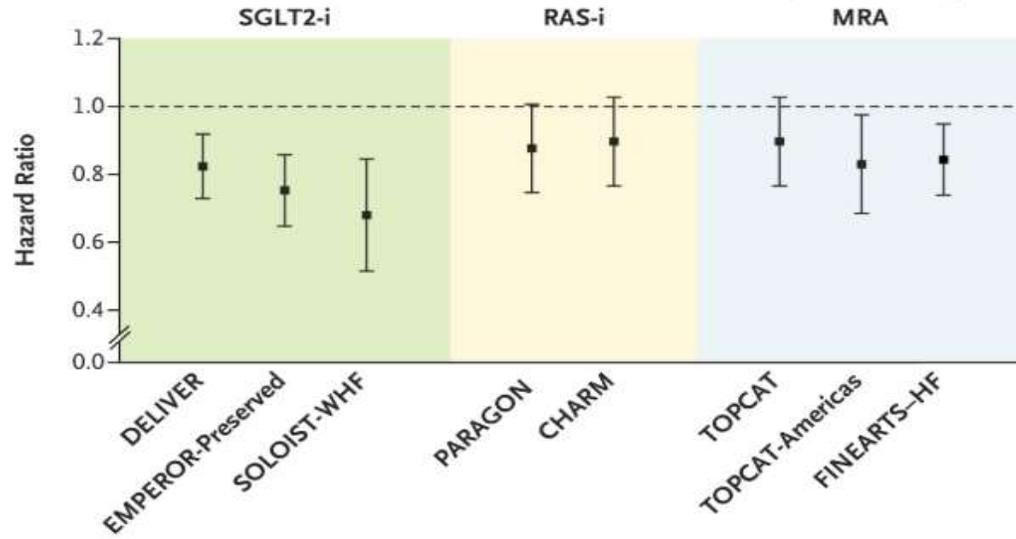
## 21% lower relative risk in cardiovascular death or hospitalization (regardless of DM or not)

EMPEROR-Preserved study included 5988 patients with class II–IV HF and an EF > 40%

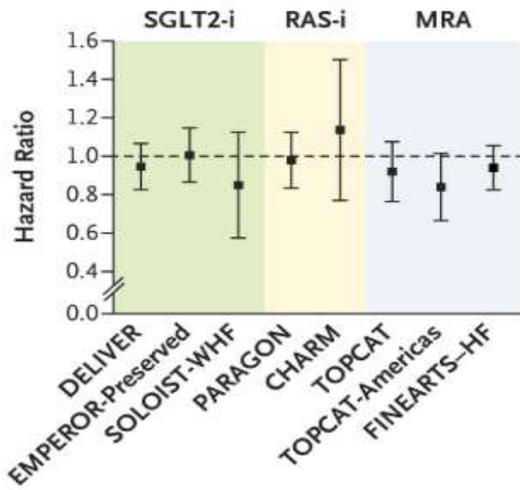


Anker SD et al. N Engl J Med 2021;385:1451-1461

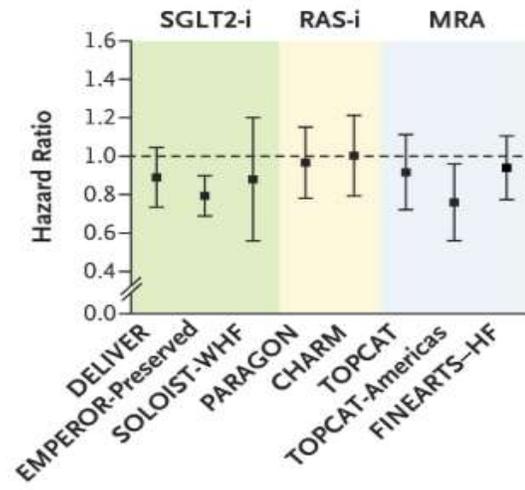
**A Primary End Point (death from cardiovascular causes, hospitalization for heart failure, or worsening heart failure)**



**B Death from Any Cause**



**C Death from Cardiovascular Causes**



**D Hospitalization or Urgent Visits for Heart Failure**

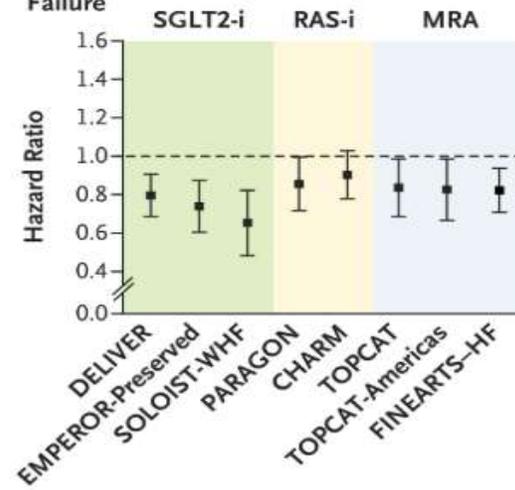
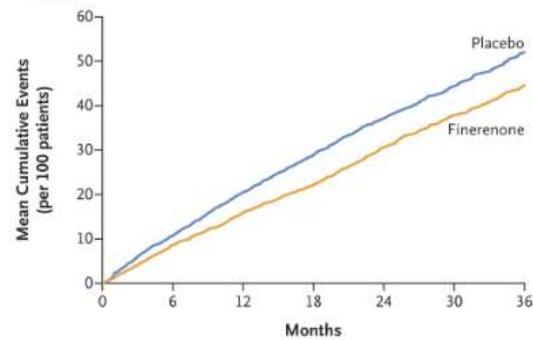


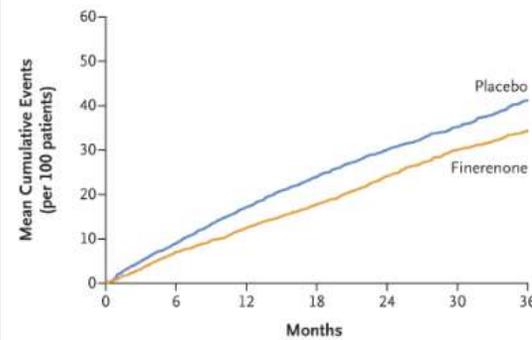
Figure 2. Treatment Effect Shown in Trials of Recommended Drug Therapies in Heart Failure with Preserved Ejection Fraction. Heart Failure with Preserved Ejection Fraction: N Engl J Med. January 8, 2025.

# NEWEST ADDITION: Finerenone (Kerendia) mid and preserved EF

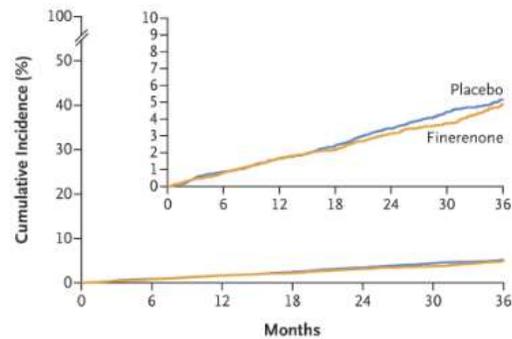
**A** Total Worsening Heart Failure Events and Death from Cardiovascular Causes



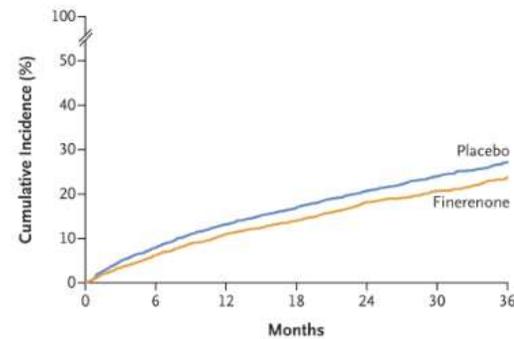
**B** Total Worsening Heart Failure Events



**C** Death from Cardiovascular Causes



**D** First Worsening Heart Failure Event or Death from Cardiovascular Causes



ORIGINAL ARTICLE



## Finerenone in Heart Failure with Mildly Reduced or Preserved Ejection Fraction

**Authors:** Scott D. Solomon, M.D., John J.V. McMurray, M.D., Muthiah Vaduganathan, M.D., M.P.H., Brian Claggett, Ph.D., Pardeep S. Jhund, M.B., Ch.B., Ph.D., Akshay S. Desai, M.D., M.P.H., Alasdair D. Henderson, Ph.D., for the FINEARTS-HF Committees and Investigators\* [Author Info & Affiliations](#)

Published September 1, 2024 | N Engl J Med 2024;391:1475-1485 | DOI: 10.1056/NEJMoa2407107

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The FINEARTS-HF trial recently demonstrated that finerenone, a non-steroidal mineralocorticoid receptor antagonist, reduces the risk of cardiovascular death, hospitalization for heart failure, and urgent heart failure visits in adults with heart failure and LVEF  $\geq 40\%$ . This represents the newest addition to the evidence base and led to FDA approval in 2025 for this indication.

# Devices in HFpEF ?

CardioMems™ only approved (IIb)

--> have experienced  $\geq 1$  hospitalization for heart failure and continue to have NYHA functional class III symptoms despite optimal guideline-directed medical therapy

--> experience significant lability in volume status despite close ambulatory monitoring

--> have cardiorenal syndrome; or have comorbidities such as obesity or chronic lung disease where differentiating heart failure from other causes of dyspnea is difficult

# WHAT ABOUT GLP-1 RECEPTOR AGONISTS?



ORIGINAL ARTICLE



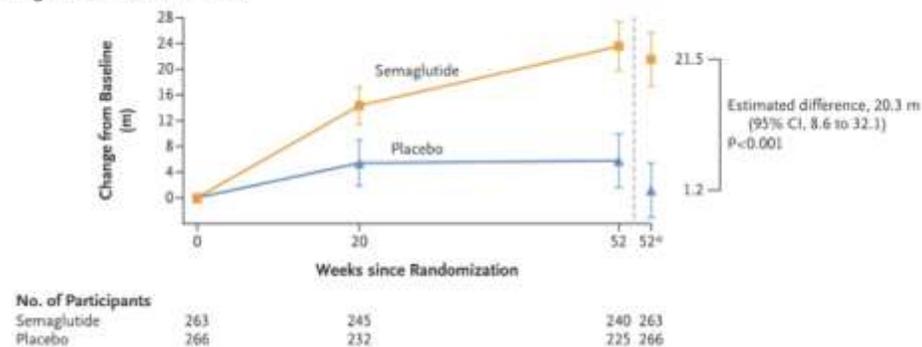
# Semaglutide in Patients with Heart Failure with Preserved Ejection Fraction and Obesity

Authors: Mikhail N. Kosiborod, M.D., Steen Z. Abildstrøm, Ph.D., Barry A. Borlaug, M.D., Javed Butler, M.D., Søren Rasmussen, Ph.D., Melanie Davies, M.D., G. Kees Hovingh, M.D., Ph.D., [et al.](#), for the STEP-HFpEF Trial Committees and Investigators<sup>\*</sup> [Author Info & Affiliations](#)

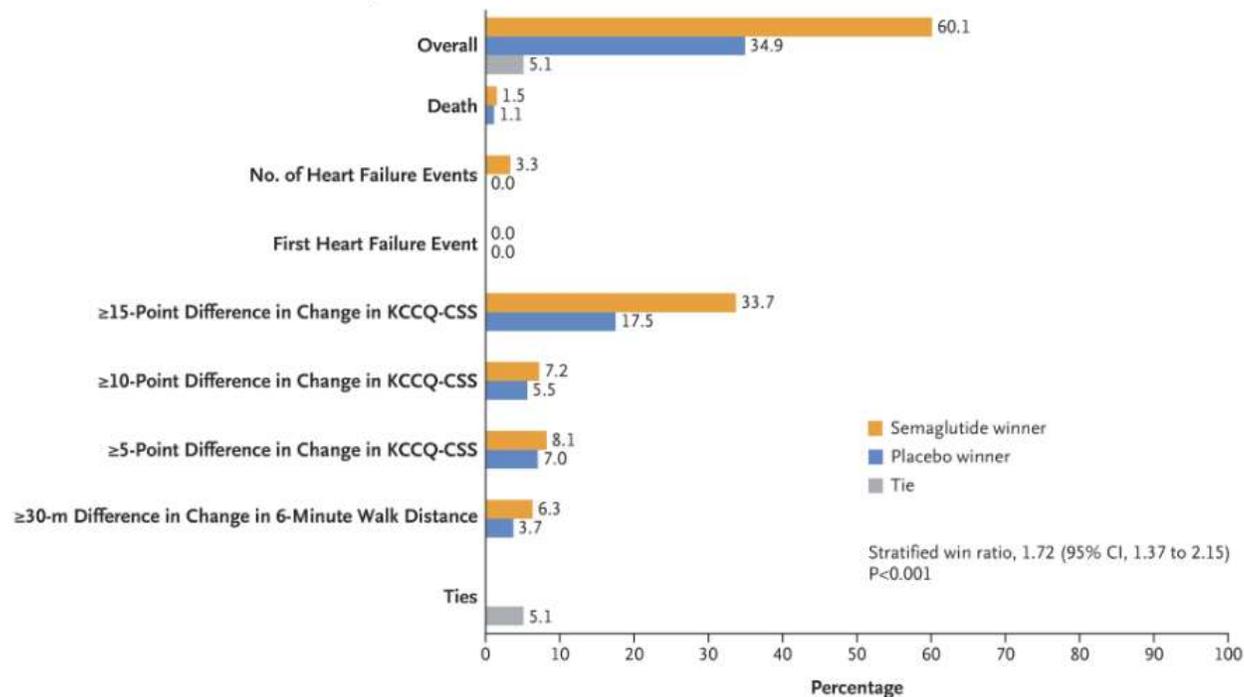
Published August 25, 2023 | N Engl J Med 2023;389:1069-1084 | DOI: 10.1056/NEJMoa2306963

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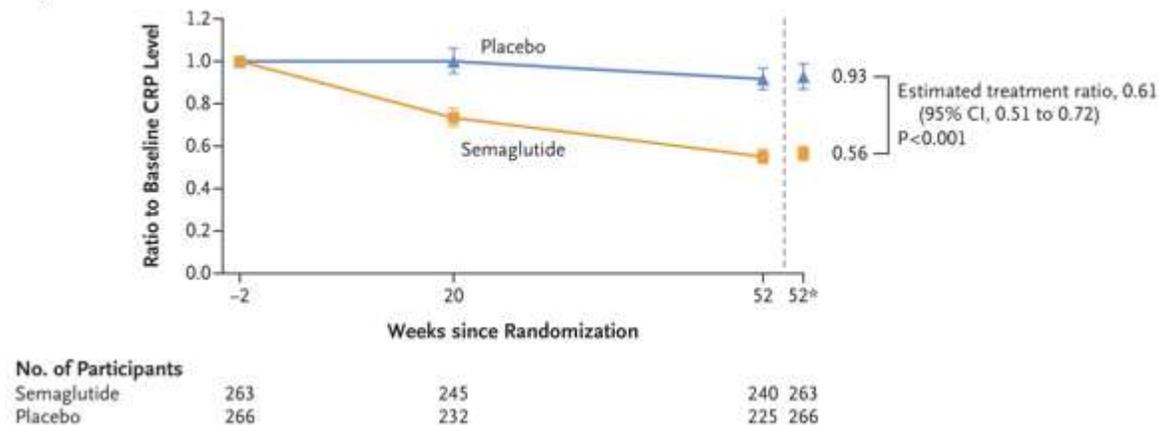
A Change in 6-Minute Walk Distance



B Stratified Win Ratio for Hierarchical Composite End Point

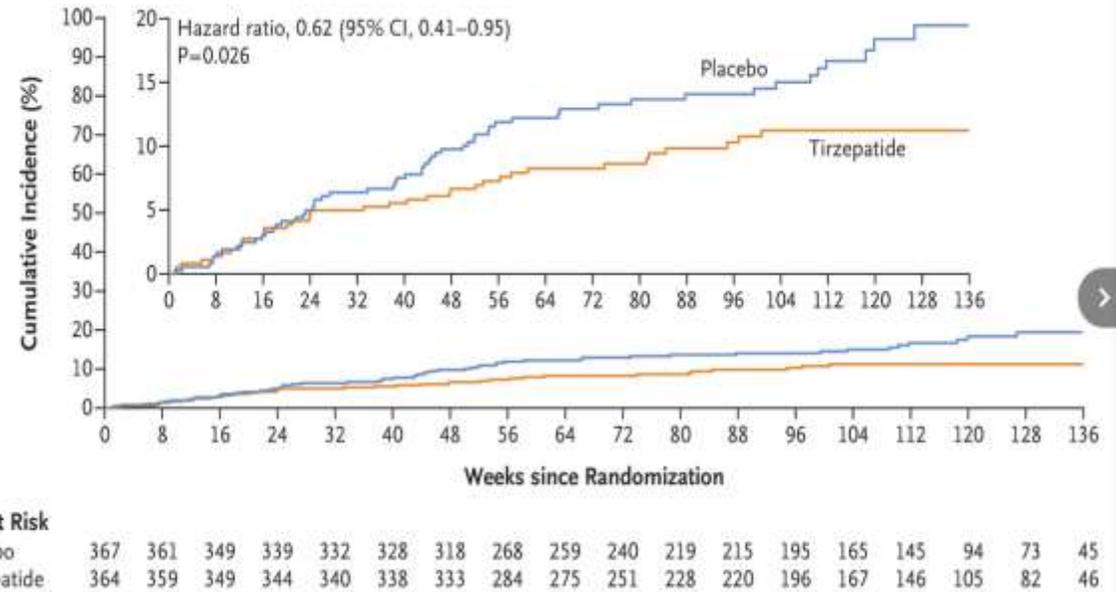


C Change in C-Reactive Protein Level



## Composite of Death from Cardiovascular Causes or a Worsening Heart-Failure Event.

Shown is the cumulative incidence of death from cardiovascular causes or a worsening heart-failure event (the composite primary end point), assessed in a time-to-first-event analysis, among 364 patients who received tirzepatide and 367 patients who received placebo. The inset shows the same data on an expanded y axis.



## Tirzepatide for Heart Failure with Preserved Ejection Fraction and Obesity

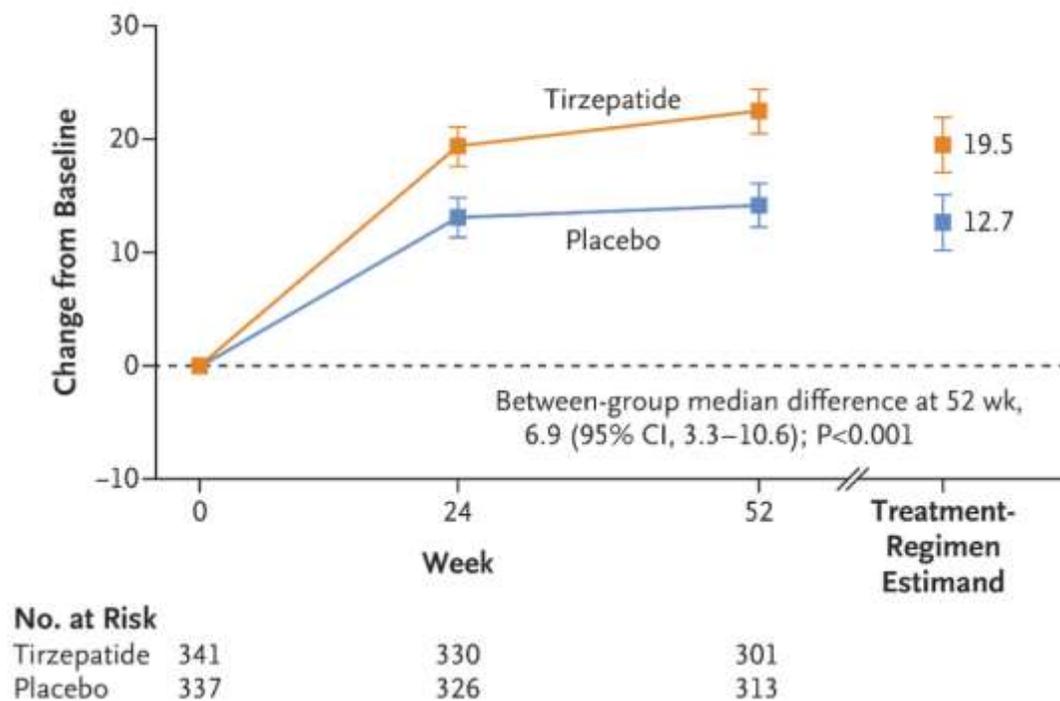
Authors: Milton Packer, M.D., Michael R. Zile, M.D., Christopher M. Kramer, M.D., Seth J. Baum, M.D., Sheldon E. Litwin, M.D., Venu Menon, M.D., Junbo Ge, M.D., for the SUMMIT Trial Study Group<sup>†</sup> [Author Info & Affiliations](#)

Published November 16, 2024 | N Engl J Med 2025;392:427-437 | DOI: 10.1056/NEJMoa2410027

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FIGURE 2

Change in Kansas City Cardiomyopathy Questionnaire Clinical Summary Score (KCCQ-CSS).



ORIGINAL ARTICLE



## Tirzepatide for Heart Failure with Preserved Ejection Fraction and Obesity

**Authors:** Milton Packer, M.D., , Michael R. Zile, M.D., Christopher M. Kramer, M.D., Seth J. Baum, M.D., Sheldon E. Litwin, M.D., Venu Menon, M.D., Junbo Ge, M.D., , for the SUMMIT Trial Study Group\* [Author Info & Affiliations](#)

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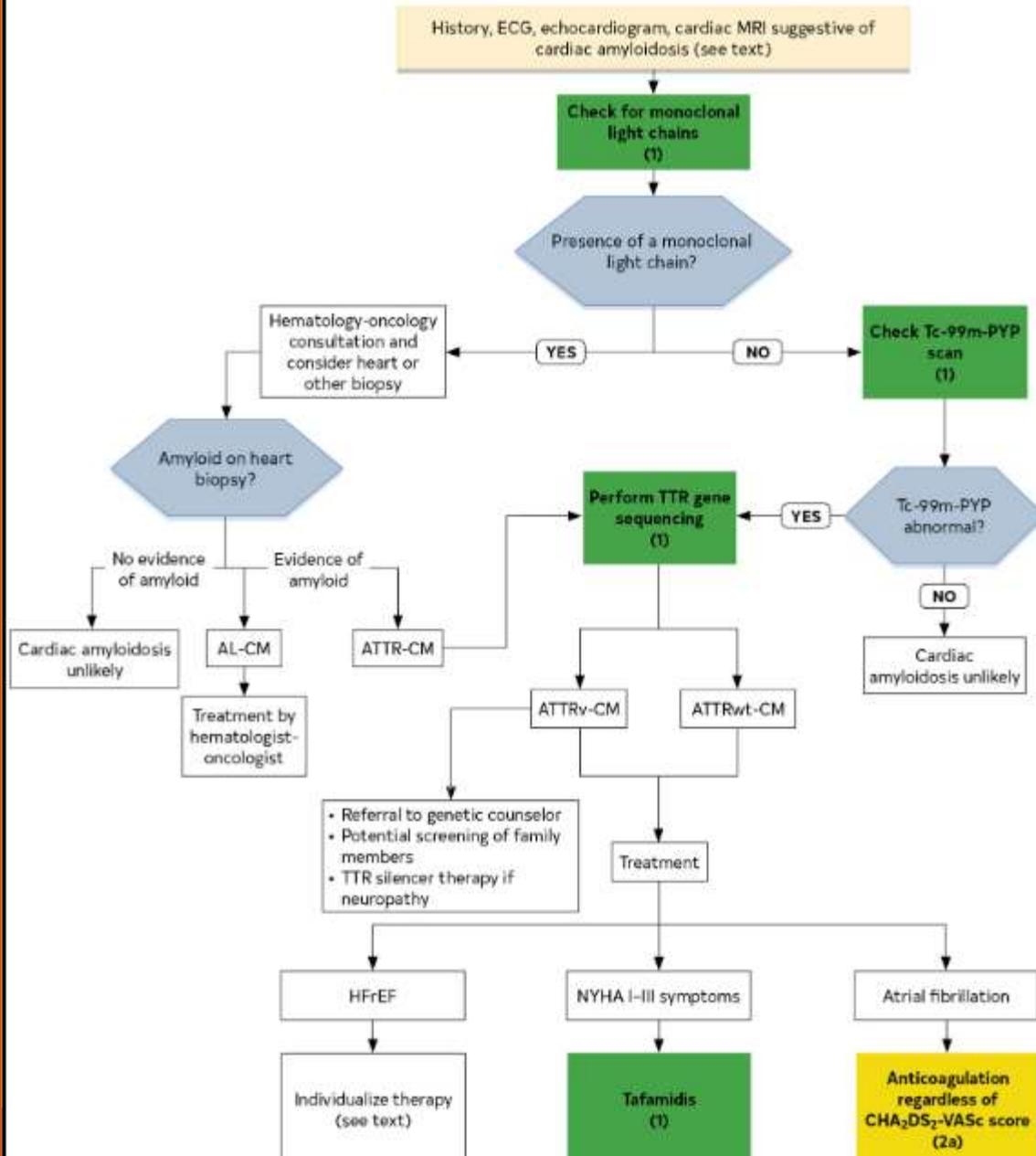
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# Summary on GLP-1 Agonists: CV indications

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- No GLP-1 is approved for heart failure with reduced or preserved EF
- Some data is promising in HFpEF more data is needed
- Semaglutide (WEGOVY): elevated BMI  $\geq 27$  kg/m<sup>2</sup> + prior CV event (MI or CVA) or PAD
- Tirzepatide (ZEPBOUND): elevated BMI + moderate to severe OSA

## Diagnostic and Treatment Algorithm of Cardiac Amyloidosis



## Cardiac Amyloidosis

--> extracellular misfolded protein deposition in the heart muscle

--> AL and ATTR Amyloidosis affect the heart

--> predominantly HFpEF but end-stage can be HFrEF

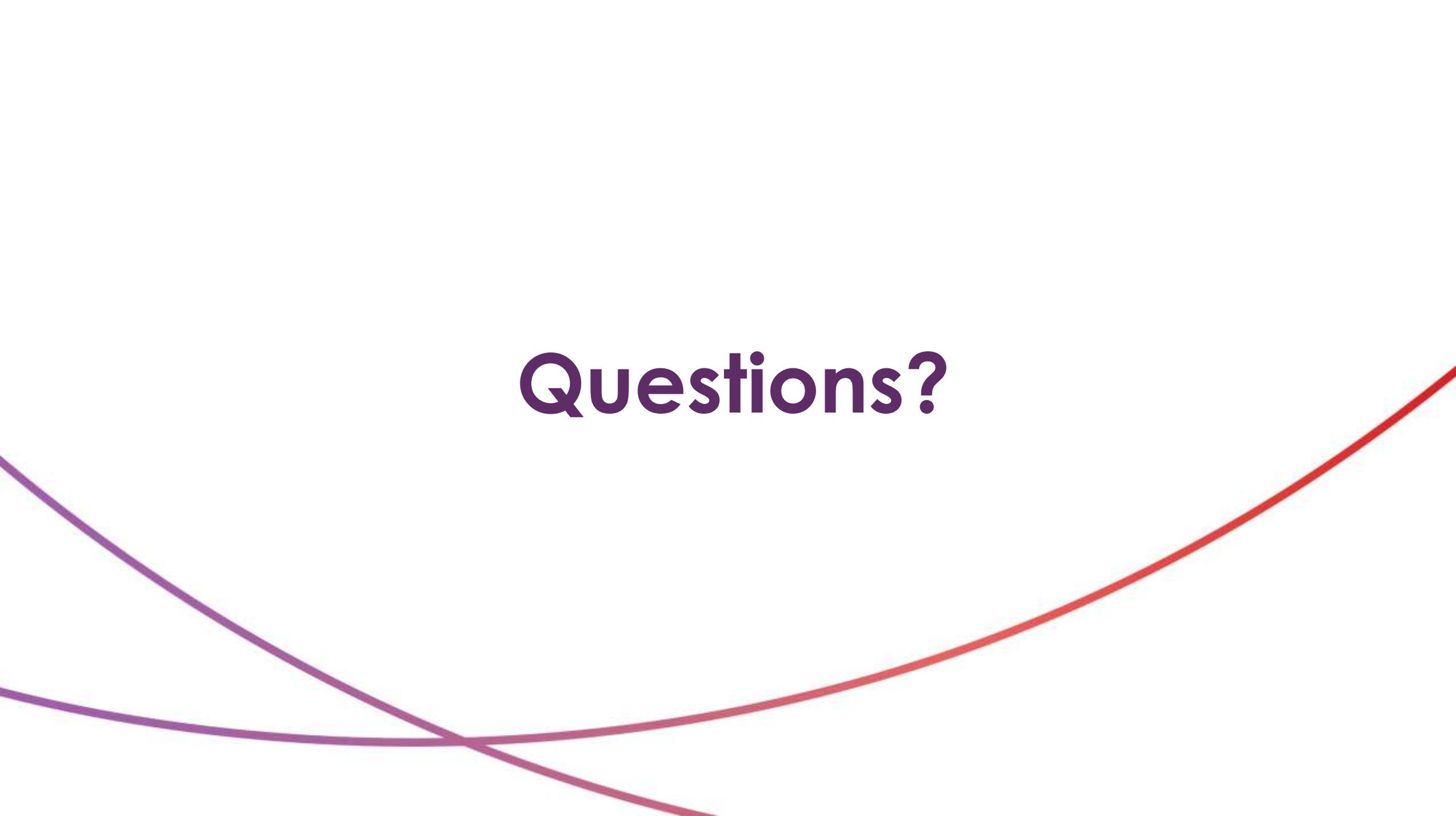
JACC Journals Vol. 83 No. 15: 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

# HFStats.org



## *HF Stats 2024: Heart Failure Epidemiology & Outcomes Statistics*

- Approximately 6.7 million Americans currently live with heart failure, projected to rise to **10.3 million by 2040**.
- The **lifetime risk of HF has increased to 24%**; approximately 1 in 4 persons will develop HF in their lifetime.
- Approximately **24-34%** of the US population has **pre-HF (Stage B)**. The risk of developing HF is increased in individuals with obesity, hypertension, and diabetes.
- **Black, American Indian, and Alaska Native** individuals continue to have the **highest all-cause** age-adjusted HF mortality rates.



**Questions?**

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12. Packer M, Zile MR, Kramer CM, Baum SJ, Litwin SE, Menon V, Ge J, Weerakkody GJ, Ou Y, Bunck MC, Hurt KC, Murakami M, Borlaug BA, for the SUMMIT Trial Study Group. Tirzepatide for Heart Failure with Preserved Ejection Fraction and Obesity. *The New England Journal of Medicine*. 2025;392(5):427-437.