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Understanding Heart Failure and Impacting it Early

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Objectives for our discussion

- Describe the continuum of heart failure (HF) and the critical need for early diagnosis
- Discuss the criteria for making the HF diagnosis, including how Vivio offers a high-quality diagnostic for primary care
- Review appropriate goal directed treatment in the primary care setting
- Create a framework for referring to cardiology/ advanced HF specialty care

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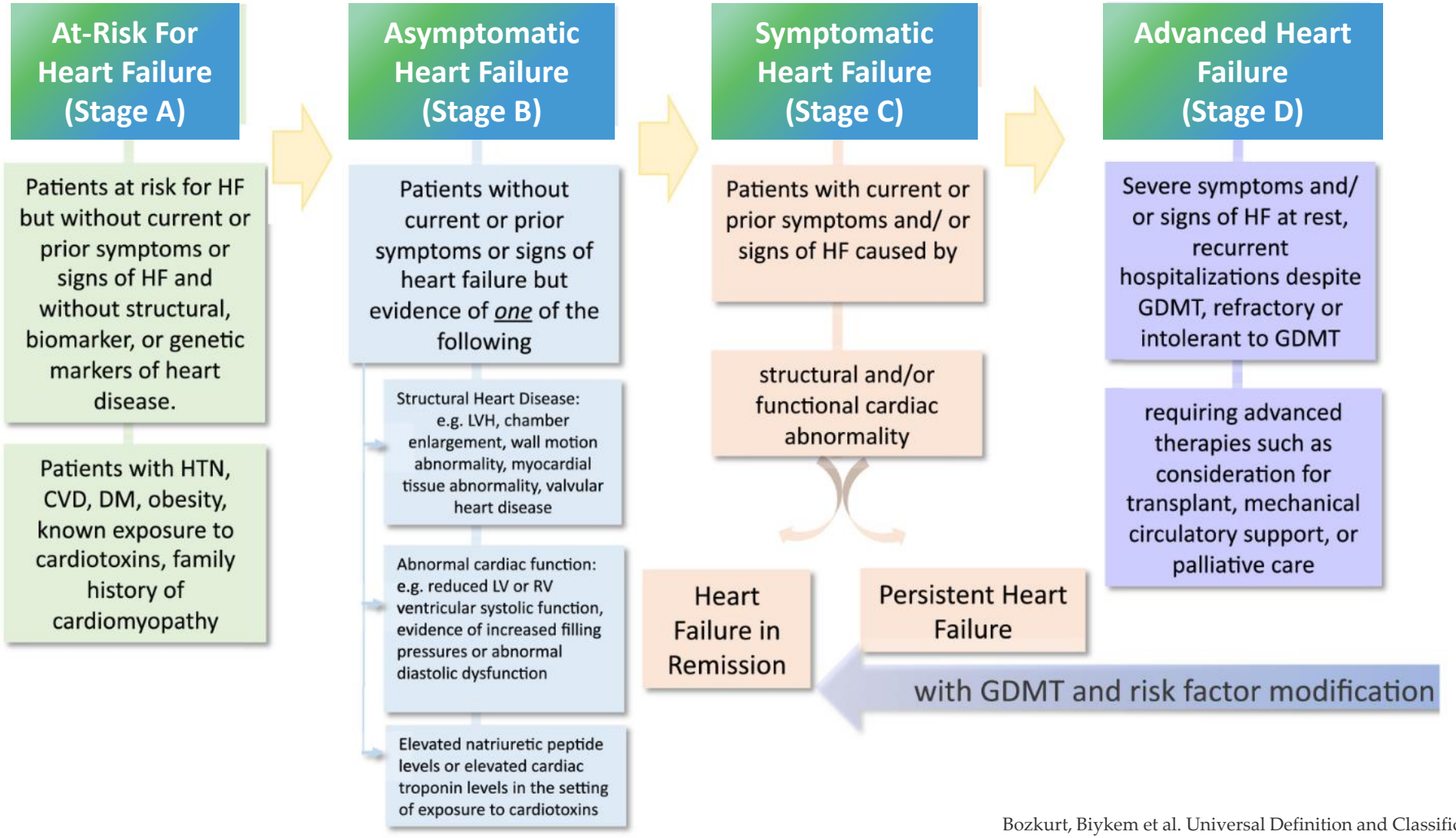
Understanding and Defining the Continuum of Heart Failure

Defining Heart Failure

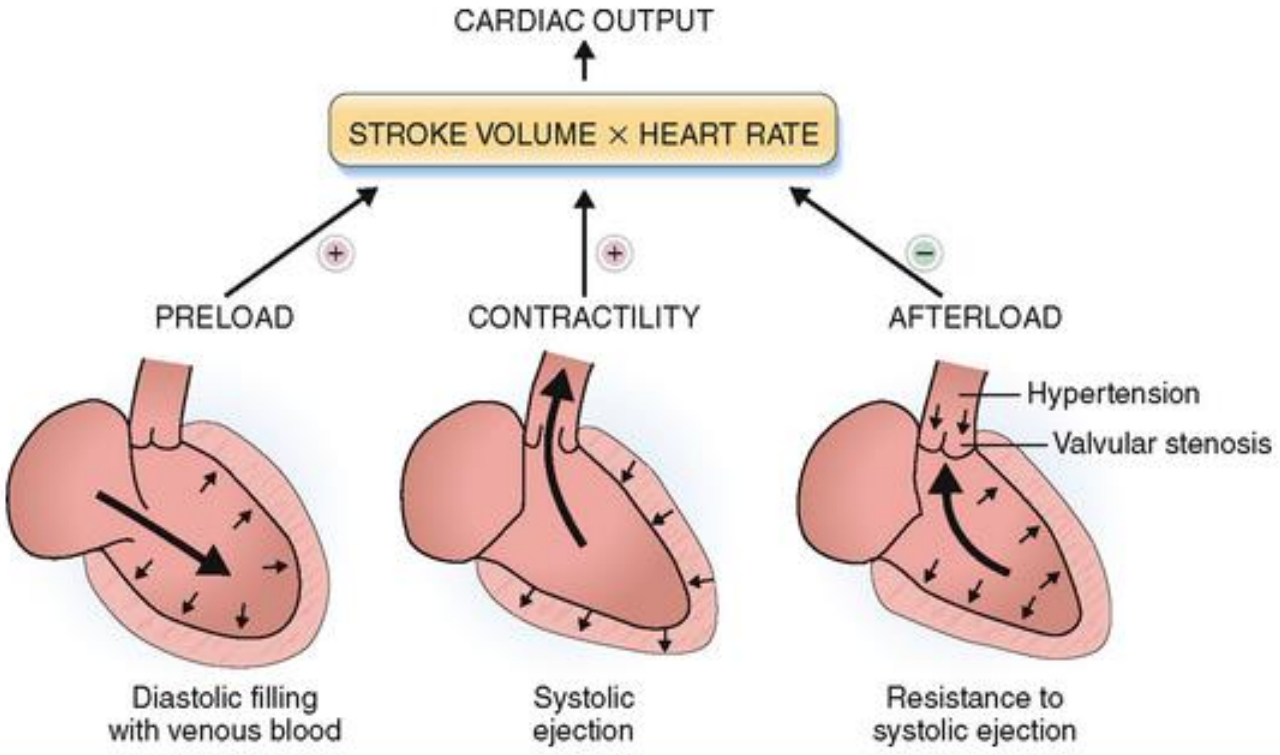
Heart failure (HF) is a **clinical syndrome** caused by **structural or functional cardiac abnormalities** that impair the heart's ability to pump blood effectively enough to meet the body's metabolic demands, or it can only do so at the expense of elevated intracardiac pressures.

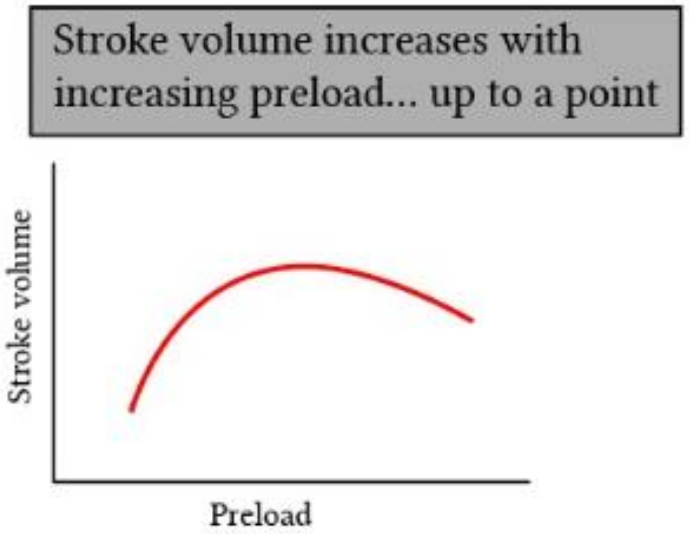
Heart Failure is a Progressive Disease



Bozkurt, Biykem et al. Universal Definition and Classification of Heart Failure, Journal of Cardiac Failure, Volume 27, Issue 4, 387 – 413.

A Trip Back to Cardiac Physiology





In a healthy individual, the heart adjusts these variables (preload, afterload, and contractility) to maintain an adequate cardiac output

In heart failure, the cardiac output is reduced due to impaired contractility and/or increased afterload (e.g., from HTN/severe AS). The heart compensates by increasing preload (via fluid retention)

Starling's Law of the Heart: "The greater the stretch of the cardiac muscle fibers (within physiological limits), the greater the force of contraction, which leads to increased cardiac output."

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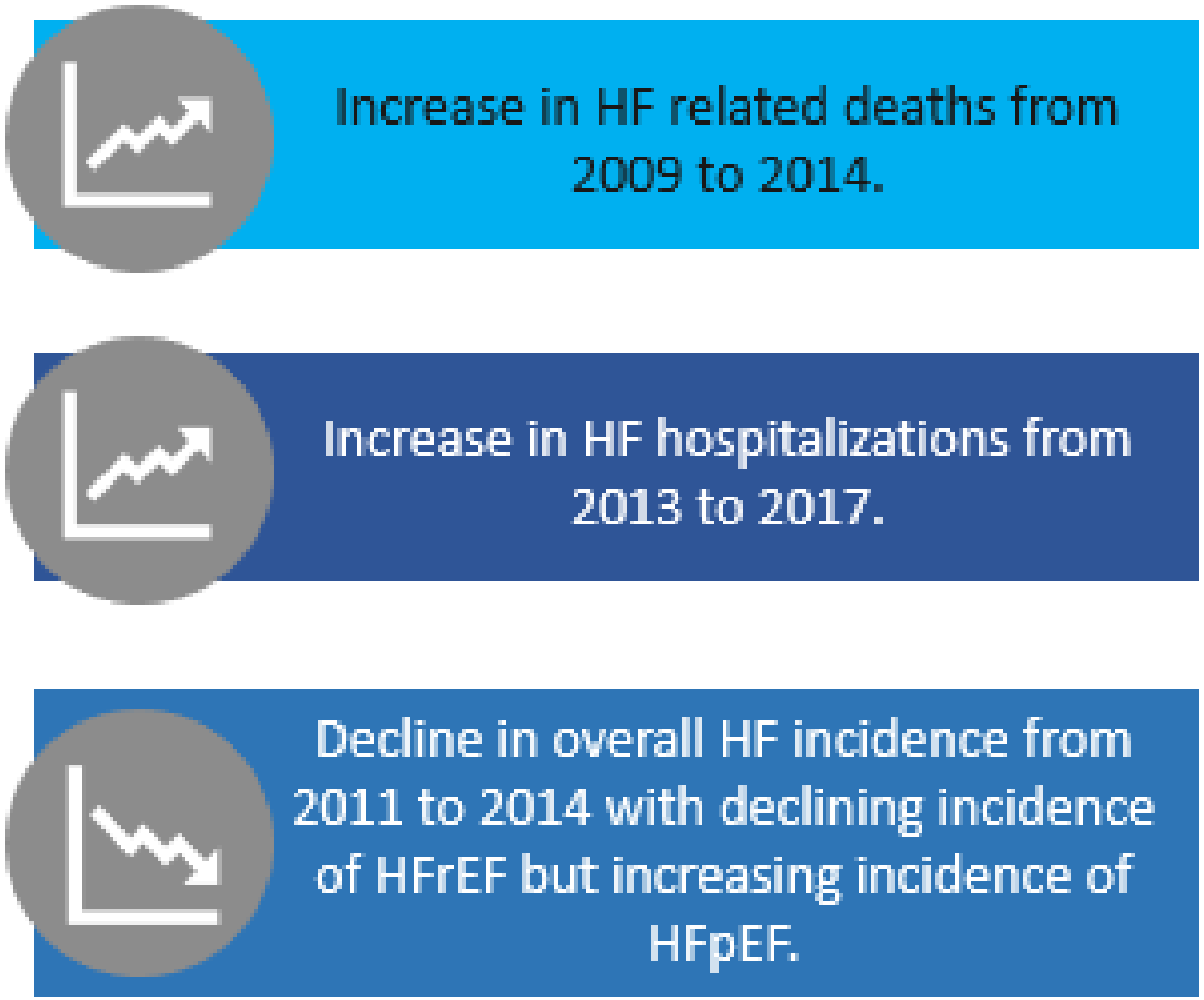
What is the Impact of Heart Failure and Why Should We Get Ahead of It?

Understanding the Potential Impact of Heart Failure

- According to the Heart Failure Society of America (HFSA.org):
  - Prevalence
    - Approximately 6.7 million Americans aged 20 and older are living with heart failure.
    - This number is projected to rise to 8.7 million by 2030 and 11.4 million by 2050.
  - Mortality Rate
    - Heart failure directly accounts for about 8.5% of all heart disease deaths in the U.S
- Economic Burden
  - Current Costs:
    - As of 2022, the annual cost of heart failure in the U.S. is estimated to be around $70 billion.
    - The economic burden of cardiovascular disease, including heart failure, is expected to increase substantially in the coming decades

Heidenreich, Paul A.Butler, Javed et al. Economic Issues in Heart Failure in the United States. Journal of Cardiac Failure, Volume 28, Issue 3, 453 – 466.

Epidemiology of Heart Failure in the United States



Heidenreich, Paul A.Butler, Javed et al. Economic Issues in Heart Failure in the United States. Journal of Cardiac Failure, Volume 28, Issue 3, 453 – 466.

The Challenge

65% of Medicare patients with a heart failure diagnosis are first diagnosed in the ER or in-patient setting[1,2,3]

1. Cuthbertson CC, Heiss G, Wright JD, et al. Socioeconomic status and access to care and the incidence of a heart failure diagnosis in the inpatient and outpatient settings. Annals of Epidemiology. 2018;28(6):350-355. doi:https://doi.org/10.1016/j.annepidem.2018.04.003
2. Curtis LH. Incidence and Prevalence of Heart Failure in Elderly Persons, 1994-2003. Archives of Internal Medicine. 2008;168(4):418. doi:https://doi.org/10.1001/archinternmed.2007.80
3. Hayhoe B, Kim D, Aylin PP, Majeed FA, Cowie MR, Bottle A. Adherence to guidelines in management of symptoms suggestive of heart failure in primary care. Heart. 2018;105(9):678-685. doi:https://doi.org/10.1136/heartjnl-2018-313971

The Challenge

65% of Medi
first di

What stage do these patients represent?

Stage C

e diagnosis are
setting[1,2,3]

1. Cuthbertson CC, Heiss G, Wright JD, et al. Socioeconomic status and access to care and the incidence of a heart failure diagnosis in the inpatient and outpatient settings. Annals of Epidemiology. 2018;28(6):350-355. doi:https://doi.org/10.1016/j.annepidem.2018.04.003
2. Curtis LH. Incidence and Prevalence of Heart Failure in Elderly Persons, 1994-2003. Archives of Internal Medicine. 2008;168(4):418. doi:https://doi.org/10.1001/archinternmed.2007.80
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Value of Shifting HF Diagnosis to Outpatient Settings

01 BETTER OUTCOMES

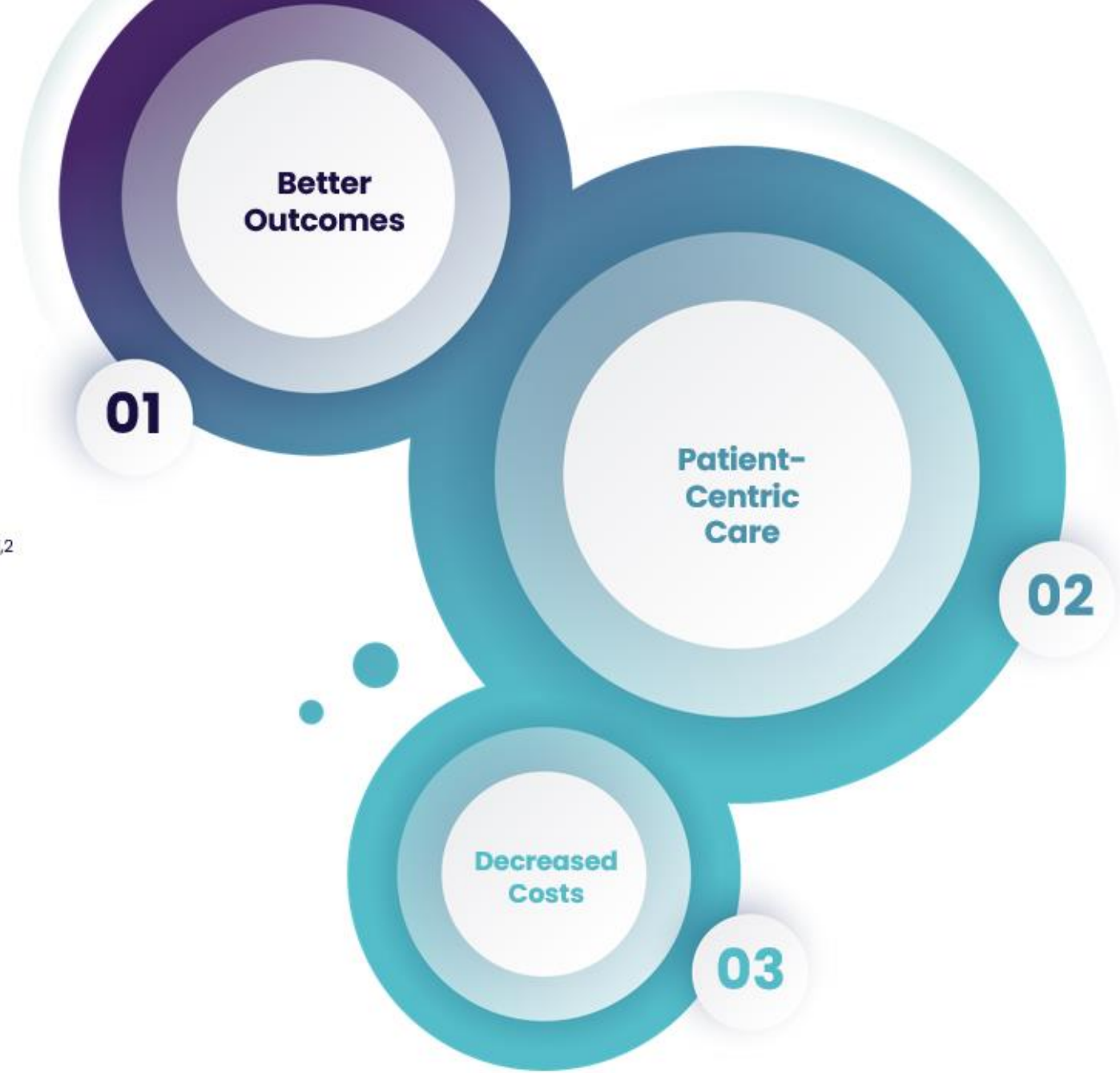
- Decreased 30-day & 1-year mortality[1,2]
- Decreased 1-year all cause hospitalization[1,2]

02 PATIENT-CENTRIC CARE

- Increased overall quality of life[3]

03 DECREASED COSTS

- $21,800 1-year cost savings per patient[1,4]
  - $17,500, cost-savings per initial diagnostic visit
  - $4,300 cost-savings per year per diagnosis from reduced 1-year all-cause hospitalization



Why Early Diagnosis in Stage B Matters

➢ Prevention of Symptomatic Heart Failure (Stage C)

•Structural heart disease (e.g., left ventricular dysfunction, LVH, or prior MI) is already present, but patients are symptom-free.
•Without treatment, progression to symptomatic heart failure is inevitable in many patients.
•Early guideline-directed medical therapy (GDMT) can halt or slow progression.

➢ Reduction in Mortality & Hospitalization

•ACE-I, ARBs, ARNIs, and beta-blockers in Stage B patients with reduced ejection fraction (HFrEF, LVEF ≤ 40%) reduce the risk of death and hospitalization by up to 30-40% in clinical trials.
•Statins and blood pressure control lower cardiovascular risk in patients with CAD and LVH.

➢ Structural Heart Changes Are Often Irreversible

•Once cardiac remodeling progresses (e.g., dilation, fibrosis), reversing damage is difficult.
•Early pharmacologic intervention can prevent or slow these structural changes.

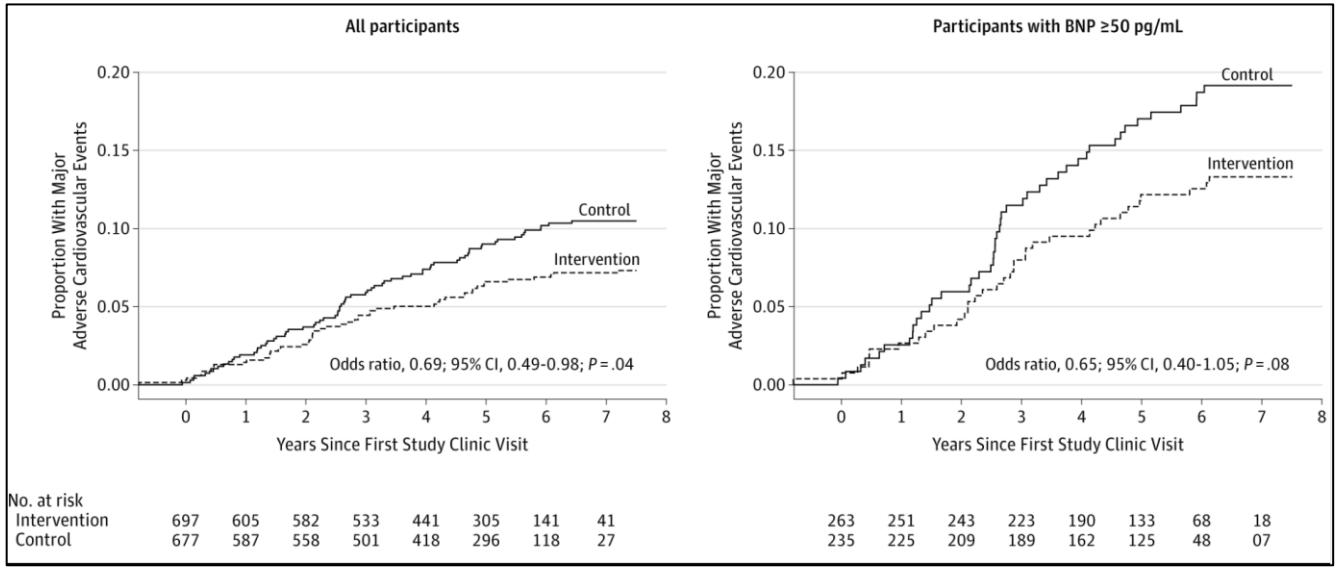
➢ Avoids the High Cost of Late-Stage Treatment

•Stage C & D HF often leads to hospitalizations, costly procedures (e.g., ICDs, LVADs), and intensive management.
•Stage B treatment is much more cost-effective than managing advanced HF

St. Vincent's Screening to Prevent Heart Failure (STOP-HF) Trial

Objective:
To evaluate whether a screening and intervention program using B-type natriuretic peptide (BNP) levels can prevent heart failure (HF) and left ventricular dysfunction in at-risk patients

Study Design:
- **Type:** Prospective, open-label, cluster-randomized controlled trial
- **Participants:** Adults at risk for heart failure (e.g., those with hypertension, diabetes, or cardiovascular risk factors) but without a history of heart failure (1374 participants)
- **Intervention Group:** BNP screening combined with collaborative cardiology care if BNP ≥ 50 pg/mL
- **Control Group:** Standard primary care without BNP screening



Key Findings:
- BNP screening and early intervention led to a **significant reduction in the incidence of left ventricular dysfunction and clinical heart failure**.
- Patients in the intervention group received earlier cardiovascular interventions, such as intensified medical therapy and lifestyle modifications.
- The approach demonstrated **improved outcomes without increasing healthcare utilization costs**.

Why is this important????

Using strategies to identify those high-risk, asymptomatic heart failure patients with evidence of cardiovascular damage can allow for more intensive, targeted approach and improve the progression to symptomatic heart failure

Ledwidge M, Gallagher J, Conlon C, et al. Natriuretic Peptide–Based Screening and Collaborative Care for Heart Failure: The STOP-HF Randomized Trial. *JAMA*. 2013;310(1):66–74. doi:10.1001/jama.2013.7588

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Making the Diagnosis of Heart Failure: Looking for the Clues

Defining Heart Failure

Heart failure (HF) is a **clinical syndrome** caused by **structural or functional cardiac abnormalities** that impair the heart's ability to pump blood effectively enough to meet the body's metabolic demands, or it can only do so at the expense of elevated intracardiac pressures.

Defining Heart Failure

The heart compensates for impaired contractility (whether it's a weak pump or a stiff pump), by increasing intracardiac pressures to maintain a normal cardiac output (CO).

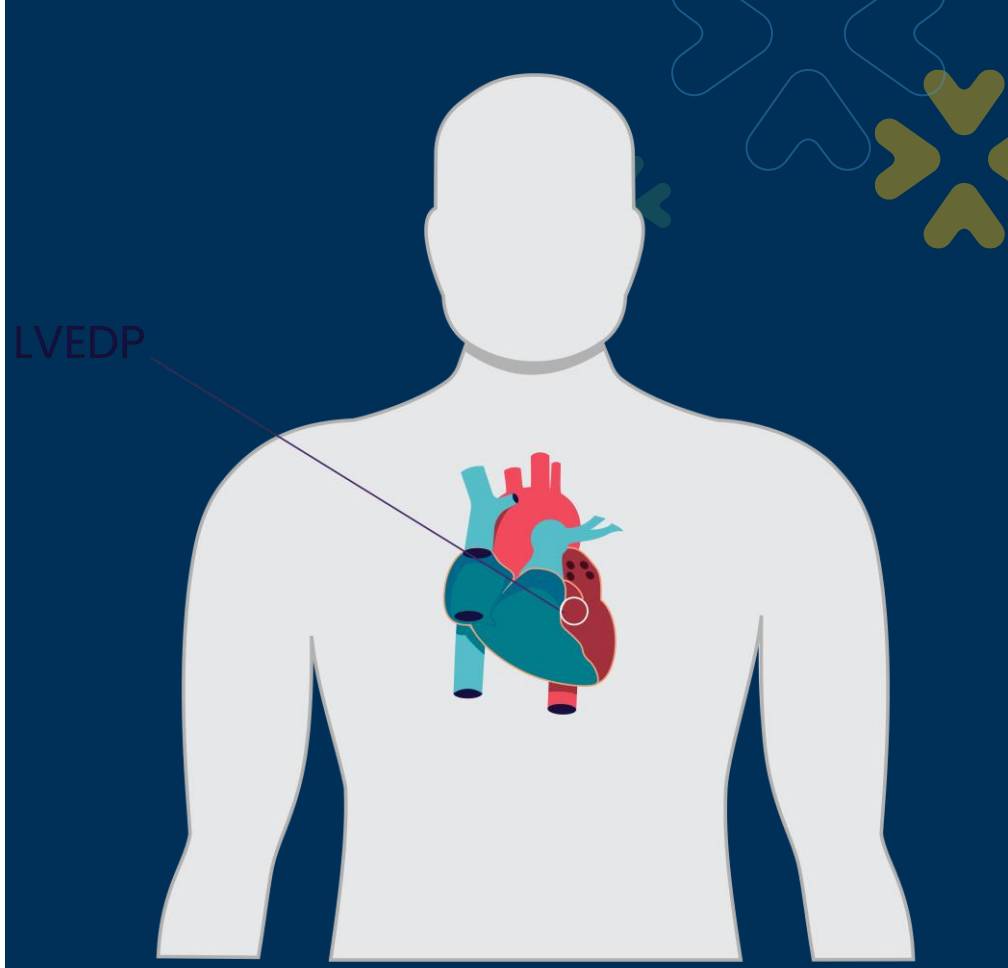
Preload= Left Ventricular End-Diastolic Pressure (LVEDP) To maintain CO in the HF heart, LVEDP increases.

Our Stage B HF patient has an elevated LVEDP without symptoms.

In our Stage C HF patient, the heart cannot fully compensate on its own and symptoms develop.

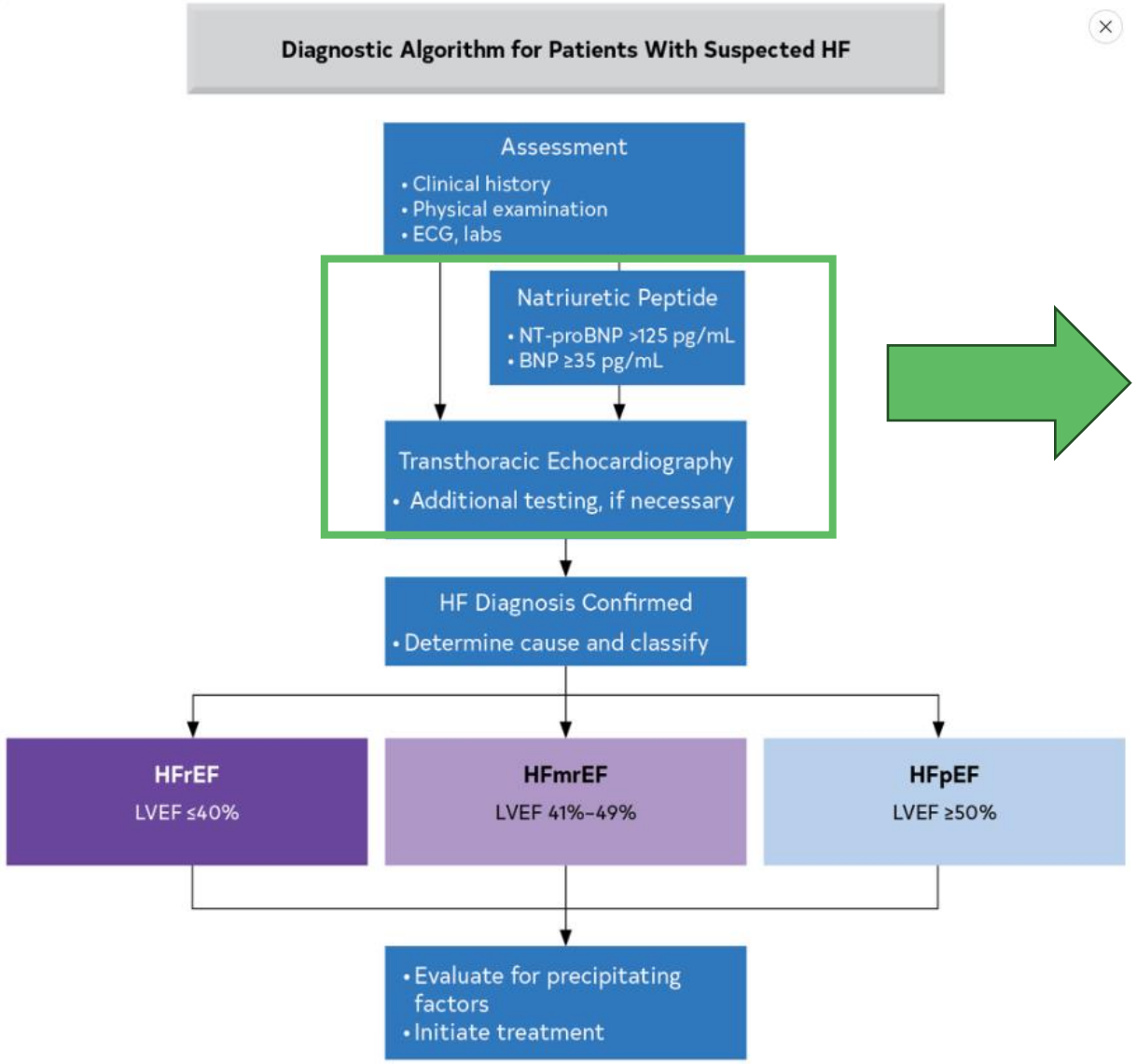
HF & Elevated LVEDP

- LVEDP is a specific pressure inside the left ventricle measured using cardiac catheterization[1]
- Elevated LVEDP is the definition of heart failure and is considered diagnostic[1-9]
- Elevated LVEDP is recognized as diagnostic by the American Heart Association, European Society of Cardiology and ICD-10 Coding Clinic Handbook[10-11]



1. Kern M. Cardiac catheterization techniques: Normal hemodynamics. www.uptodate.com. Published November 1, 2019. Accessed July 21, 2023. https://www.uptodate.com/contents/cardiac-catheterization-techniques-normal-hemodynamics
2. McDonagh TA, Metra M, Adamo M, et al. 2021 ESC Guidelines for the Diagnosis and Treatment of Acute and Chronic Heart Failure. European Heart Journal. 2021;42(36):3599-3726. doi:https://doi.org/10.1093/eurheartj/ehab368
3. Choi, Ki Hong. "Discriminative role of invasive left heart catheterization in patients suspected of heart failure with preserved ejection fraction." Journal of the American Heart Association, vol. 12, no. 6, 21 Mar. 2023, https://doi.org/10.1161/jaha.122.027581.
4. Pieske B, Tschöpe C, de Boer RA, et al. How to diagnose heart failure with preserved ejection fraction: the HFA–PEFF diagnostic algorithm: a consensus recommendation from the Heart Failure Association (HFA) of the European Society of Cardiology (ESC). European Heart Journal. 2019;40(40):3297-3317. doi:https://doi.org/10.1093/eurheartj/ehz641
5. Pappachan JM, Varughese GI, Sriraman R, Arunagirinathan G. Diabetic cardiomyopathy: Pathophysiology, diagnostic evaluation and management. World Journal of Diabetes. 2013;4(5):177. doi:https://doi.org/10.4239/wjd.v4.i5.177
6. Andersen OS, Smiseth OA, Dokainish H, et al. Estimating Left Ventricular Filling Pressure by Echocardiography. Journal of the American College of Cardiology. 2017;69(15):1937-1948. doi:https://doi.org/10.1016/j.jacc.2017.01.058
7. Mandinov L. Diastolic heart failure. Cardiovascular Research. 2000;45(4):813-825. doi:https://doi.org/10.1016/s0008-6363(99)00399-5
8. Plitt GD, Spring JT, Moulton MJ, Agrawal DK. Mechanisms, diagnosis, and treatment of heart failure with preserved ejection fraction and diastolic dysfunction. Expert Review of Cardiovascular Therapy. 2018;16(8):579-589. doi:https://doi.org/10.1080/14779072.2018.1497485
9. Ariyaratnam JP, Elliott AD, Mishima RS, Gallagher C, Lau DH, Sanders P. Heart failure with preserved ejection fraction: An alternative paradigm to explain the clinical implications of atrial fibrillation. Heart Rhythm O2. 2021;2(6):771-783. doi:https://doi.org/10.1016/j.hroo.2021.09.015
10. Heidenreich PA, Bozkurt B, Aguilar D, Allen LA, Byun JJ, Colvin MM, Deswal A, Drazner MH, Dunlay SM and Evers LR. 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. Journal of the American College of Cardiology. 2022;79:e263-e421.
11. Leon-Chisen, Nelly. ICD-10-CM and ICD-10-PCS Coding Handbook, with Answers, 2024. AHA PRESS, 2023.

Initial Evaluation for Heart Failure



Current tools to noninvasively assess LVEDP lack sensitivity – particularly with early- stage heart failure

BNP

- B-type Natriuretic Peptide is a blood test indicative of cardiac wall stress[1]
- BNP is insensitive to elevated LVEDP – particularly among HFpEF patients[2,3]
- Up to 60% of HFpEF patients have normal BNP levels (Sensitivity = 40%)[4]
- Suspected to be insensitive to early-stage HF in particular[4,8]

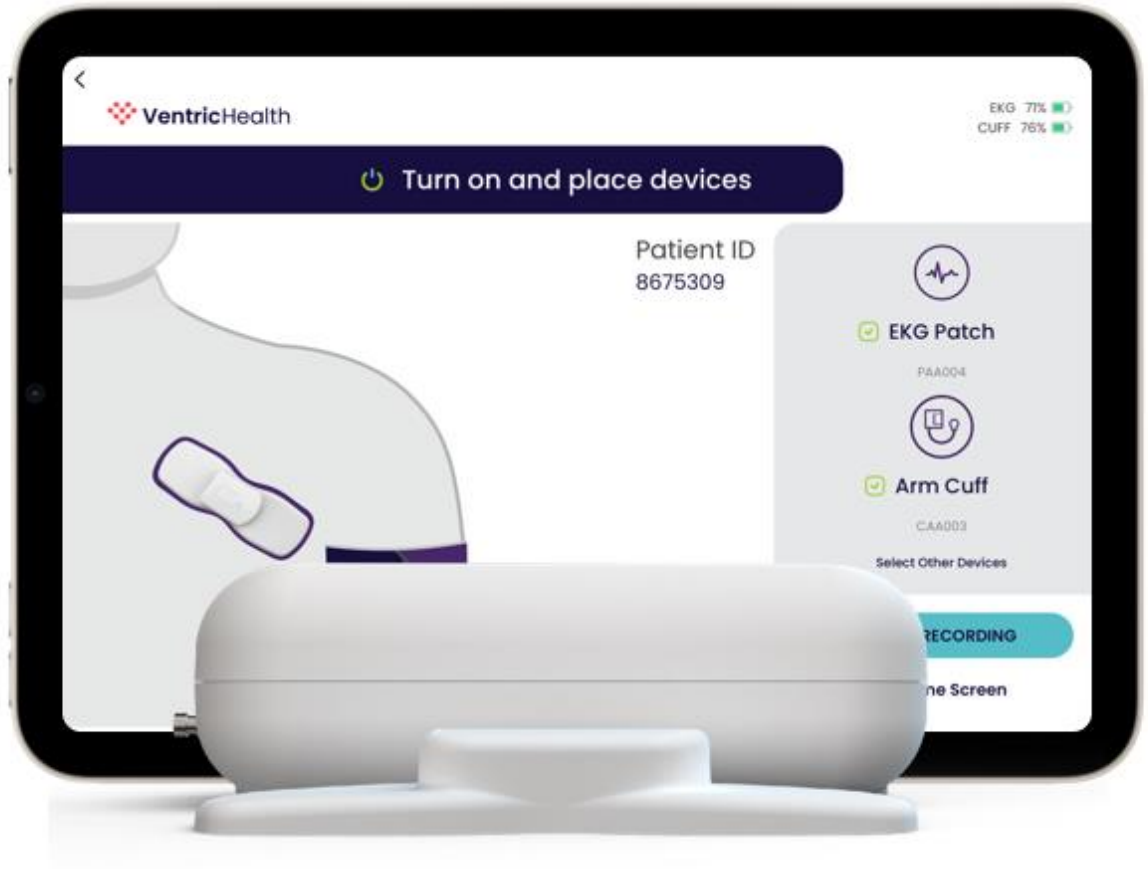
Echocardiogram

- E/e' is a measurement of blood flow velocities across the mitral valve[5]
- "a normal E/e' does not rule out HFpEF (or high filling pressures) because this index displays very poor sensitivity."[6]
- Up to 87% of patient with elevated LVEDP have normal E/e' values (Sensitivity = 13%)[7]
- "normal E/e' ratios do not exclude the diagnosis of HFpEF, particularly among patients with early-stage HFpEF"[8]

A New Way to Diagnose Heart Failure in Primary Care: Noninvasive Measurement of LVEDP

Evaluating LVEDP Noninvasively:
The Vivio System™

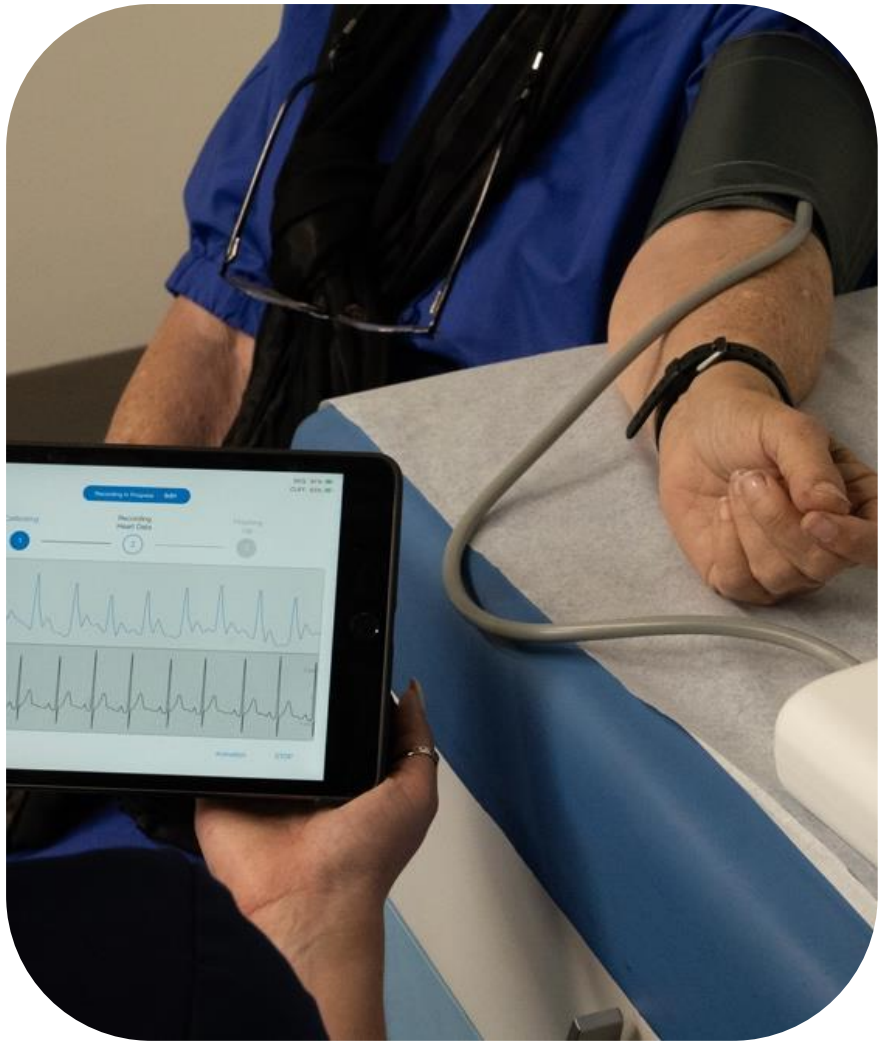
A five-minute non-invasive test estimating elevated LVEDP to enable heart failure diagnosis



The Vivio System™ is FDA cleared.

Noninvasive measurement of LVEDP empowers primary care to identify HF patients earlier

- Superior sensitivity to elevated LVEDP
- FDA enabling study showed 80% sensitivity and 83% specificity vs gold standard invasive Millar catheter[1]

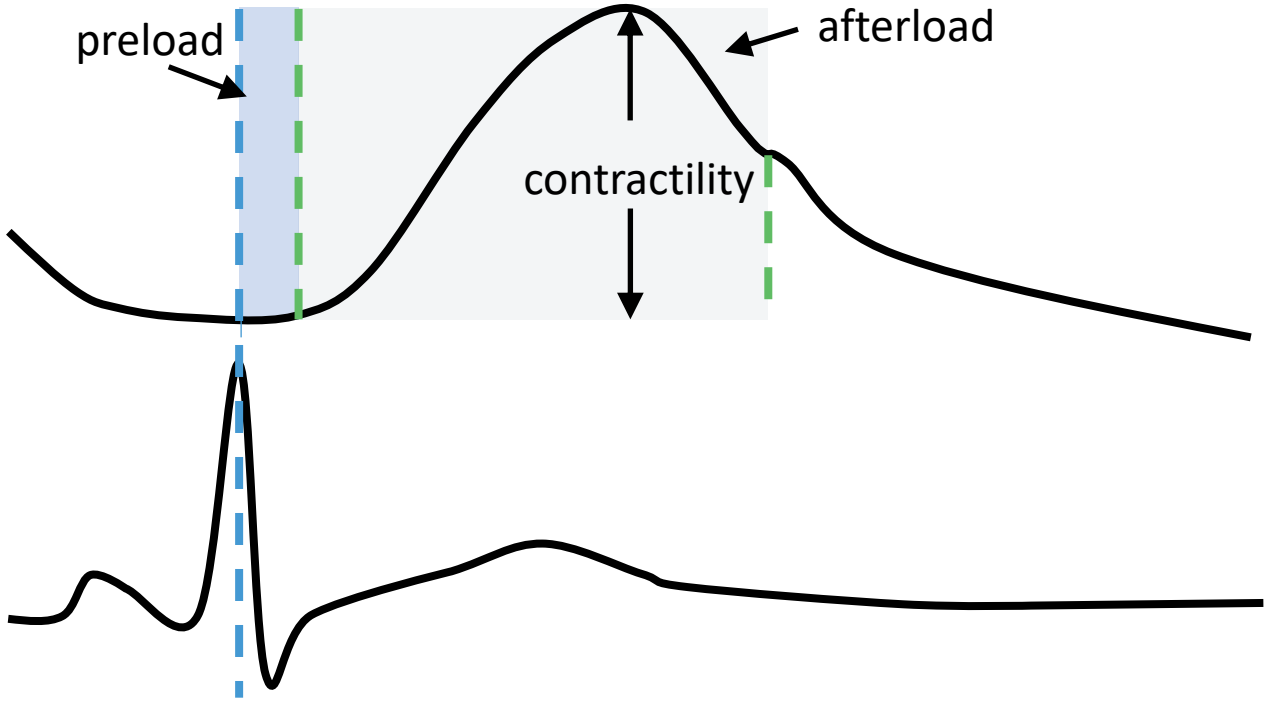


1.Shavelle, David. "Abstract 16544: A multicenter validation of a noninvasive brachial cuff-ECG system for estimation of elevated left ventricular end diastolic pressure." Circulation, vol. 148, no. Suppl_1, 2023, https://doi.org/10.1161/circ.148.suppl_1.16544.

Vivio System™ mechanism to measure LVEDP non-invasively

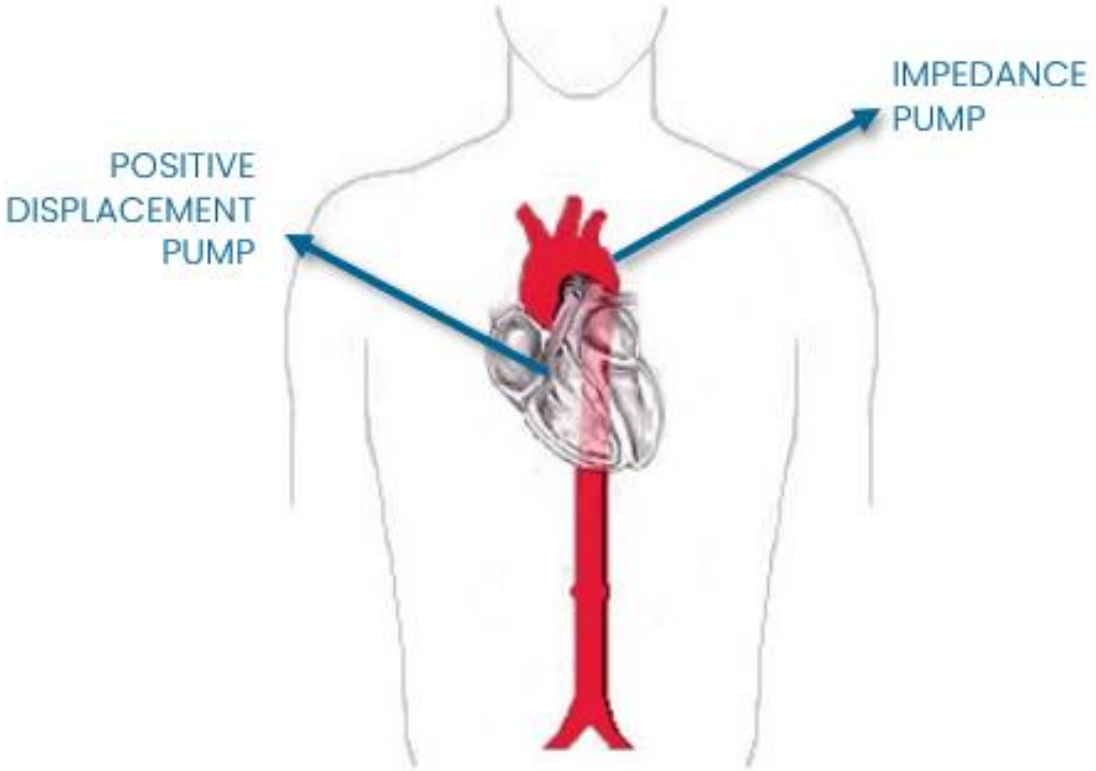
Clinical information from hemodynamics

- The Ventric Vivio system measures relationships between pressure waves produced during cardiac preload and afterload, along with contractility, to estimate left ventricular end diastolic volume.
- Incorporation of precisely synchronized waveform data from the EKG and proprietary blood pressure assessment device makes this possible.



Novel Approach to Thinking About the Heart-Aorta Interaction

Heart-Aorta modeled as a positive displacement pump and impedance pump and no longer as a pump and passive pipe



- Based on novel understanding of cardiovascular physiology
- Heart-Aorta viewed as one coupled system before the aortic valve closure
- Then two decoupled systems after closure
- Analysis requires only a simple arterial waveform for analysis

Vivio Cuff Event Sequence

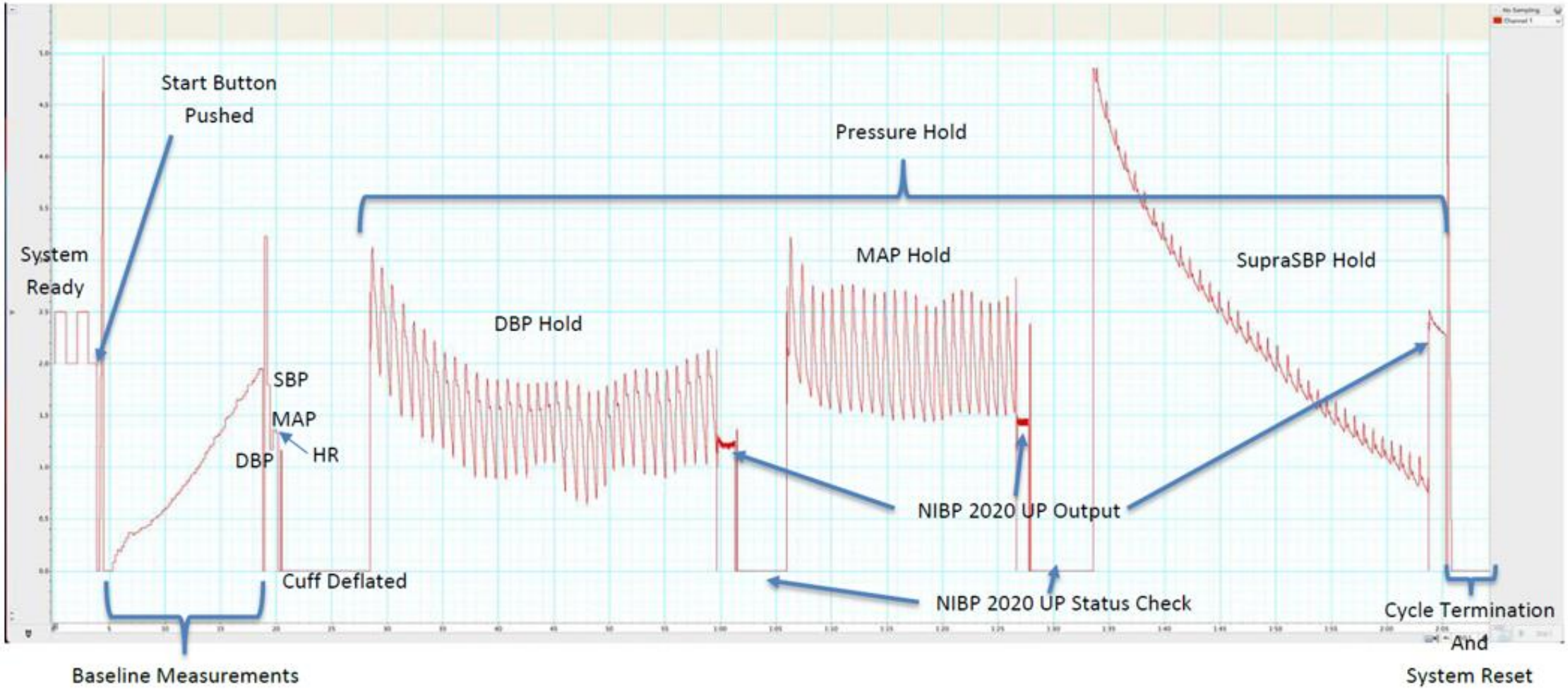
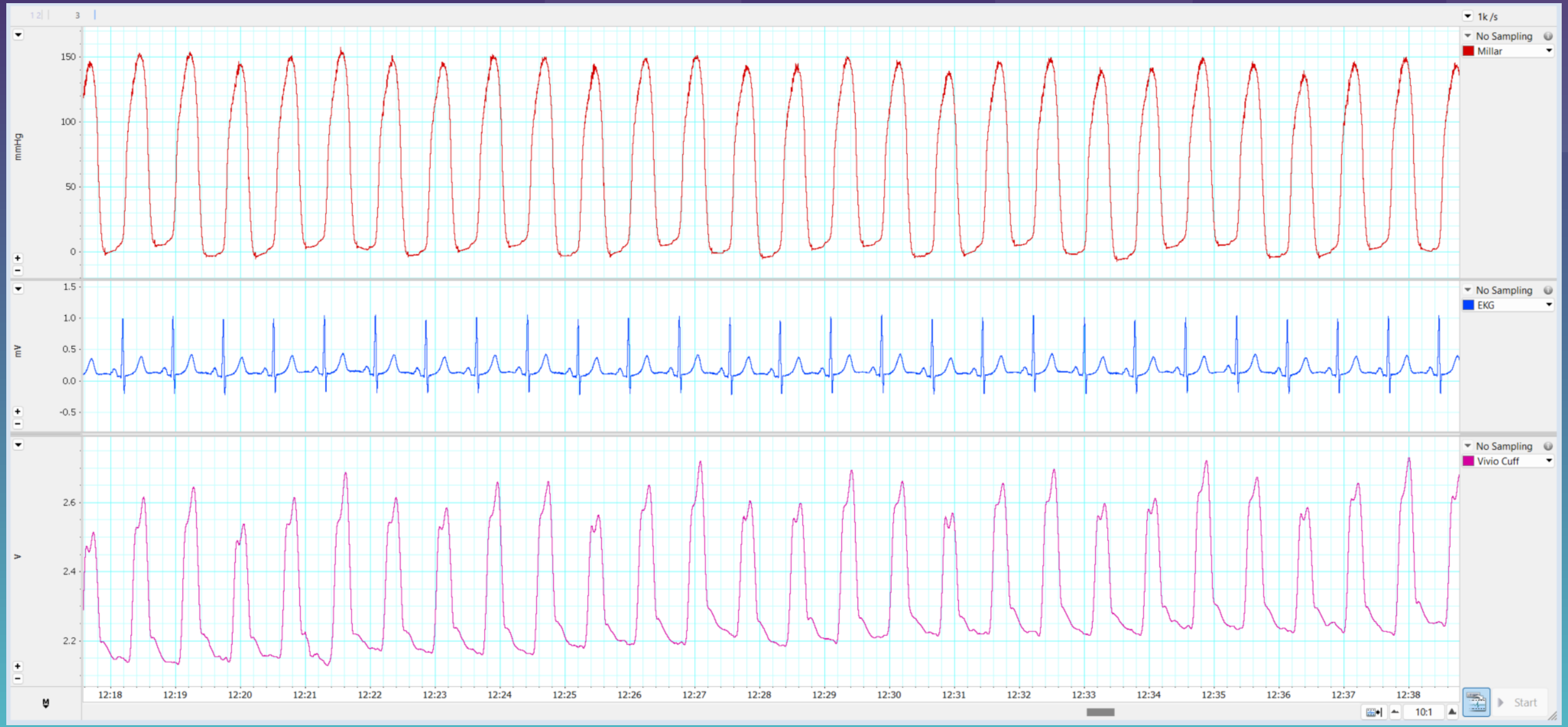


Figure 2. Functional Sequence of Events

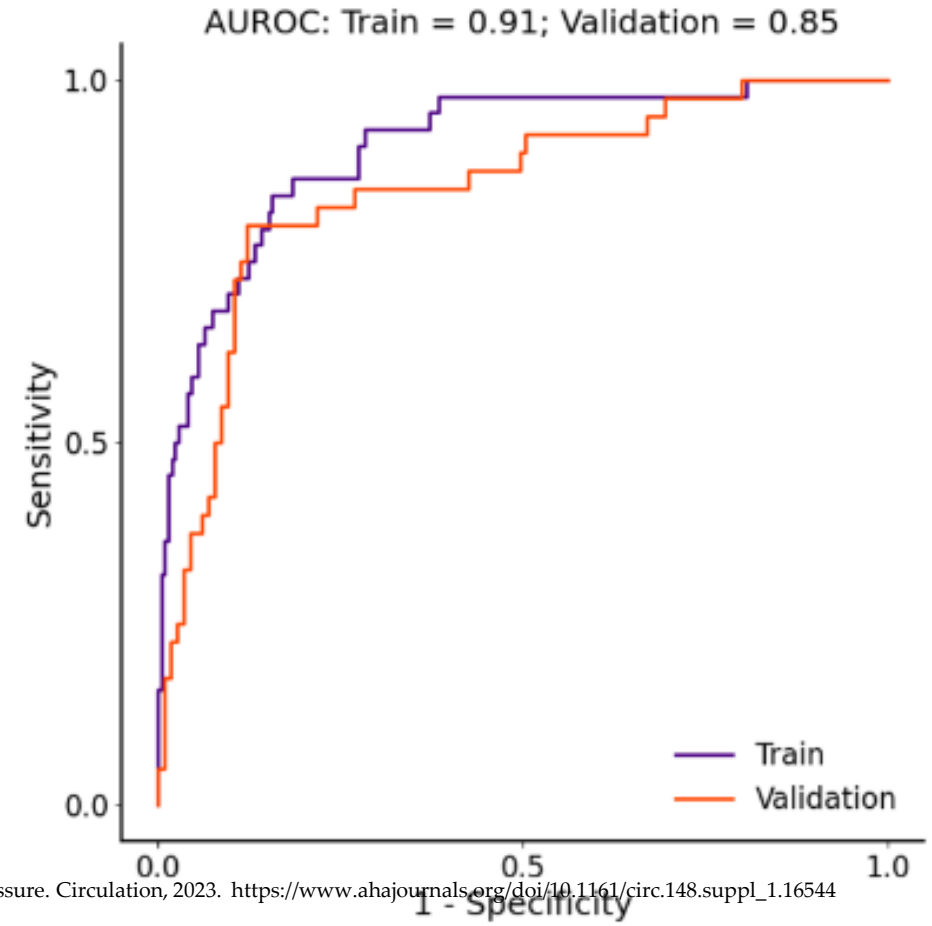
LabChart Data Intro



2023 AHA Scientific Sessions

A Multicenter Validation of a Noninvasive Brachial Cuff-ECG System for Estimation of Elevated Left Ventricular End Diastolic Pressure

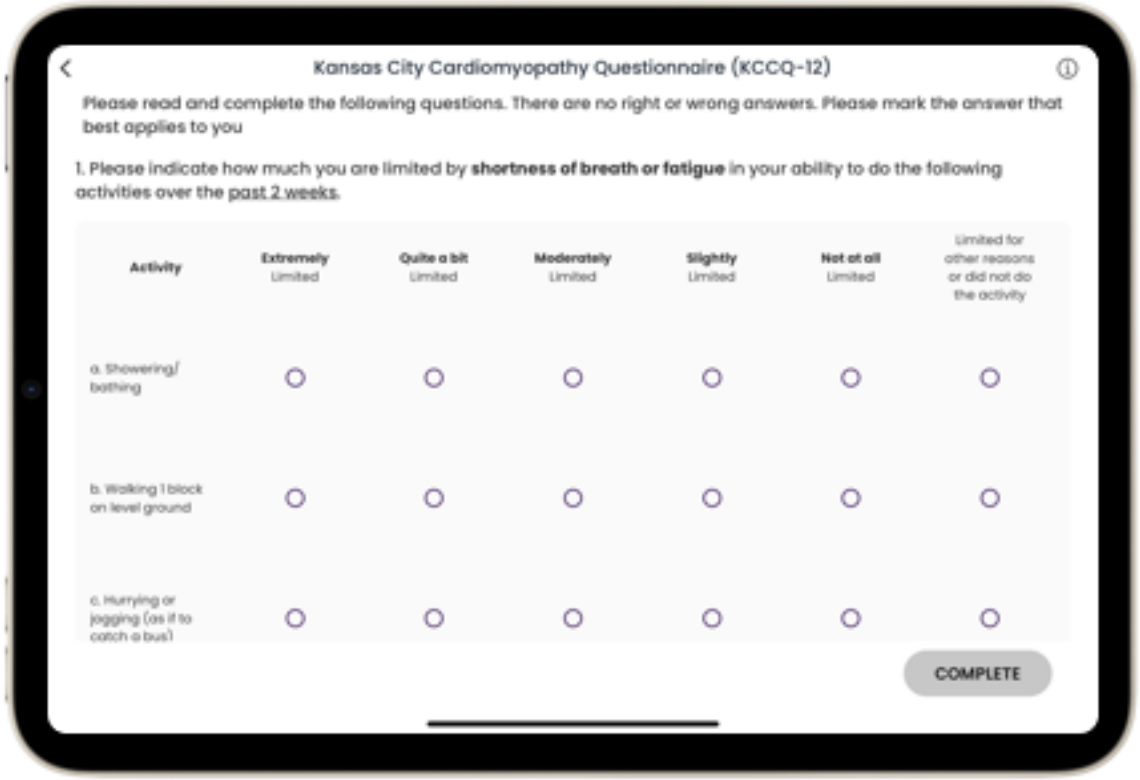
- 728 patients were enrolled from 7 medical centers in the USA
- Invasive LVEDP measurements were conducted using Millar catheters
- Sensitivity of 0.80 (95% CI: 0.64 - 0.91) and a specificity of 0.83



1. Shavelle et al. A Multicenter Validation of a Noninvasive Brachial Cuff-ECG System for Estimation of Elevated Left Ventricular End Diastolic Pressure. Circulation, 2023. https://www.ahajournals.org/doi/10.1161/circ.148.suppl_1.16544

Kansas City Cardiomyopathy Questionnaire-12

Assess and Monitor Newly Diagnosed Heart Failure



- Vivio incorporates the Kansas City Cardiomyopathy Questionnaire (KCCQ) into clinical workflows
- The KCCQ is the most commonly used tool to evaluate the health status of patients with heart failure[1]
- Supports consistent system-level workflows by providing a standardized validated history and assessment tool for all newly diagnosed heart failure patients[2]
- Together with the KCCQ the Vivio test results allow clinicians to assess the current and longitudinal health status of heart failure patients and help determine when patients may benefit from specialty referral

1. Yang, Mingming. "Knowledge about self-efficacy and outcomes in patients with heart failure and reduced ejection fraction." European Journal of Heart Failure, vol. 25, no. 10, 26 July 2023, pp. 1831–1839, https://doi.org/10.1002/ejhf.2944.
2. Spertus, John A. "Interpreting the Kansas City Cardiomyopathy Questionnaire in clinical trials and clinical care." Journal of the American College of Cardiology, vol. 76, no. 20, Nov. 2020, pp. 2379–2390, https://doi.org/10.1016/j.jacc.2020.09.542.

Who Should You Screen for Elevated LVEDP with Vivio??

- **It is critical to use the Vivio device (and all forms of screening) in the intended population.**
- Is there a reasonable pre-test probability of disease in the population and is the test sensitive and specific enough to confidently lead a clinician to act?
- High risk patient population considered for Vivio:
  - 65+ years old;
  - T2DM; and/or
  - CKD ≥ stage 3; and
  - Without HF diagnosis

Navigating Heart Failure Treatment By the Stages

Recommendation for Patients At-Risk of HF and with Asymptomatic Heart Failure

At Risk for HF (Stage A)

Primary Prevention

Patients with hypertension	Optimal control of BP (1)
Patients with Type 2 diabetes and CVD or high risk for CVD	SGLT2i (1)
Patients with CVD	Optimal management of CVD (1)
Patients with exposure to cardiotoxic agents	Multidisciplinary evaluation and management (1)
First-degree relatives of patients with genetic or inherited cardiomyopathies	Genetic screening and counselling (1)
Patients at risk for HF	Natriuretic peptide screening (2a)
Patients at risk for HF	Validated multivariable risk score (2a)

Asymptomatic HF (Stage B)

Preventing the Syndrome

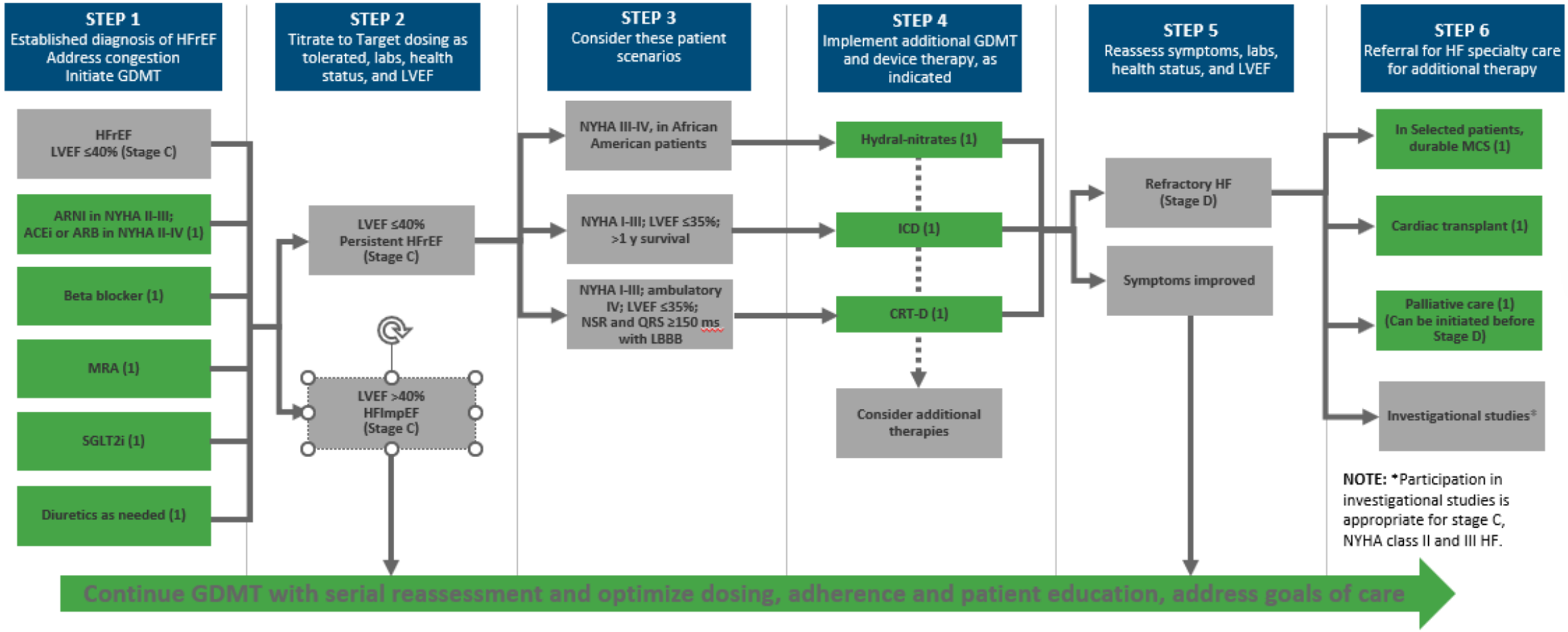
Patients with LVEF ≤ 40%	ACEi (1)
Patient with recent MI and LVEF ≤ 40 %	ARB if ACEi intolerant (1)
Patients with LVEF ≤ 40%	Beta blocker (1)
Patient with LVEF ≤ 30 %; >1 y survival; >40 d post MI	ICD (1)
Patients with nonischemic cardiomyopathy	Genetic counseling and testing (2a)

Continue Lifestyle modification and management strategies implemented in Stage A, through Stage B

Paul A. Heidenreich. Circulation. 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, Volume: 145, Issue: 18, Pages: e895-e1032, DOI: (10.1161/CIR.0000000000001063)

Abbreviations: ACEi indicates angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; BP, blood pressure; CVD, cardiovascular disease; HF, heart failure; ICD, implantable cardioverter-defibrillator; LVEF, left ventricular ejection fraction; MI, myocardial infarction; and SGLT2i, sodium glucose cotransporter 2 inhibitor.

Treatment of HFrEF Stages C and D



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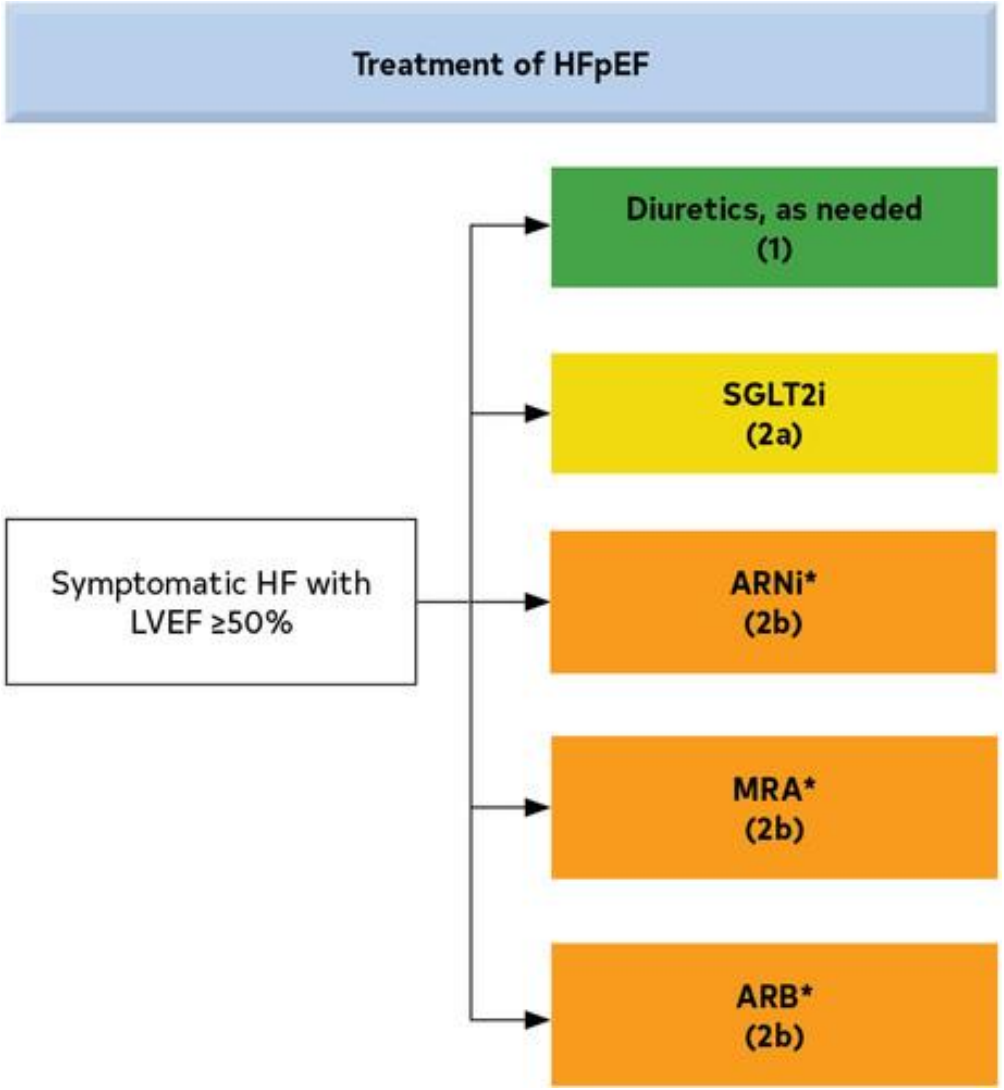
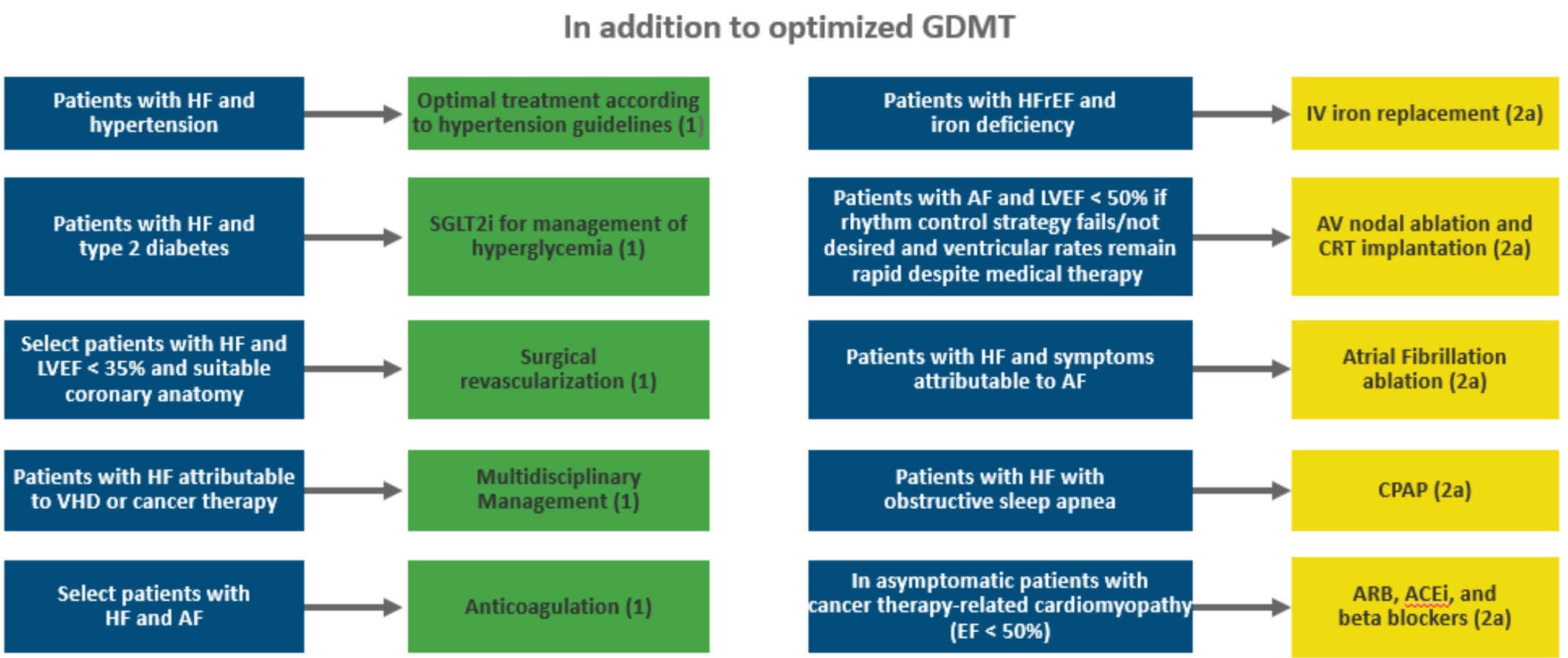
Treatment approach to HFpEF



COR	LOE	Recommendations
1	C-LD	1. Patients with HFpEF and hypertension should have medication titrated to attain blood pressure targets in accordance with published clinical practice guidelines to prevent morbidity.[1-3]
2a	B-R	2. In patients with HFpEF, SGLT2i can be beneficial in decreasing HF hospitalizations and cardiovascular mortality.[4]
2a	C-EO	3. In patients with HFpEF, management of AF can be useful to improve symptoms.
2b	B-R	4. In selected patients with HFpEF, MRAs may be considered to decrease hospitalizations, particularly among patients with LVEF on the lower end of this spectrum.[5-7]
2b	B-R	5. In selected patients with HFpEF, the use of ARB may be considered to decrease hospitalizations, particularly among patients with LVEF on the lower end of this spectrum.[8,9]
2b	B-R	6. In selected patients with HFpEF, ARNi may be considered to decrease hospitalizations, particularly among patients with LVEF on the lower end of this spectrum.[10,11]
3: No-Benefit	B-R	7. In patients with HFpEF, routine use of nitrates or phosphodiesterase-5 inhibitors to increase activity or QOL is ineffective.[12,13]

Paul A. Heidenreich. Circulation. 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, Volume: 145, Issue: 18, Pages: e895-e1032

Additional Therapies to Address HF and Comorbidities



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When Is It the Right Time to Engage Cardiology?

What Are the Indicators that Cardiology &/or HF Expertise is Valuable?

- Uncontrolled or worsening symptoms
- Diagnosis confirmation if uncertainty
- Severe or new onset symptoms
- Complexity of heart failure (signs of advanced HF or arrhythmias)
- Co-existing comorbidities complicating HF management
- Consideration for advanced therapies

Role of Noninvasive LVEDP Measurement in Primary Care with Vivio and the KCCQ-12

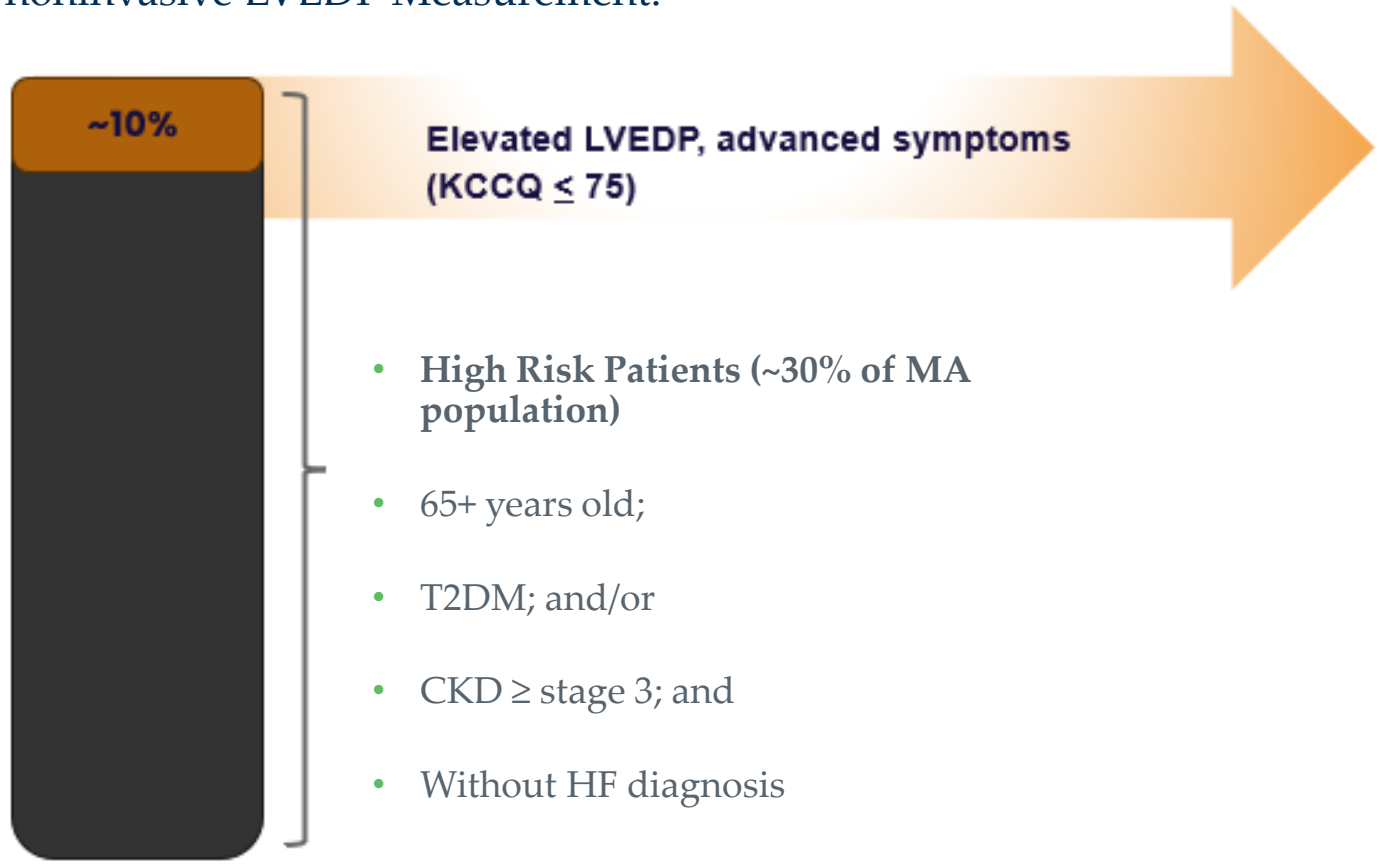
How we manage today:

- **High Risk Patients (~30% of MA population)**
- 65+ years old;
- T2DM; and/or
- CKD ≥ stage 3; and
- Without HF diagnosis

Our patients tend to receive the same treatment without clear differentiation of those at higher risk.

Triage patients most at-risk

How we can incorporate noninvasive LVEDP Measurement:



- **High Risk Patients (~30% of MA population)**
- 65+ years old;
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- CKD ≥ stage 3; and
- Without HF diagnosis

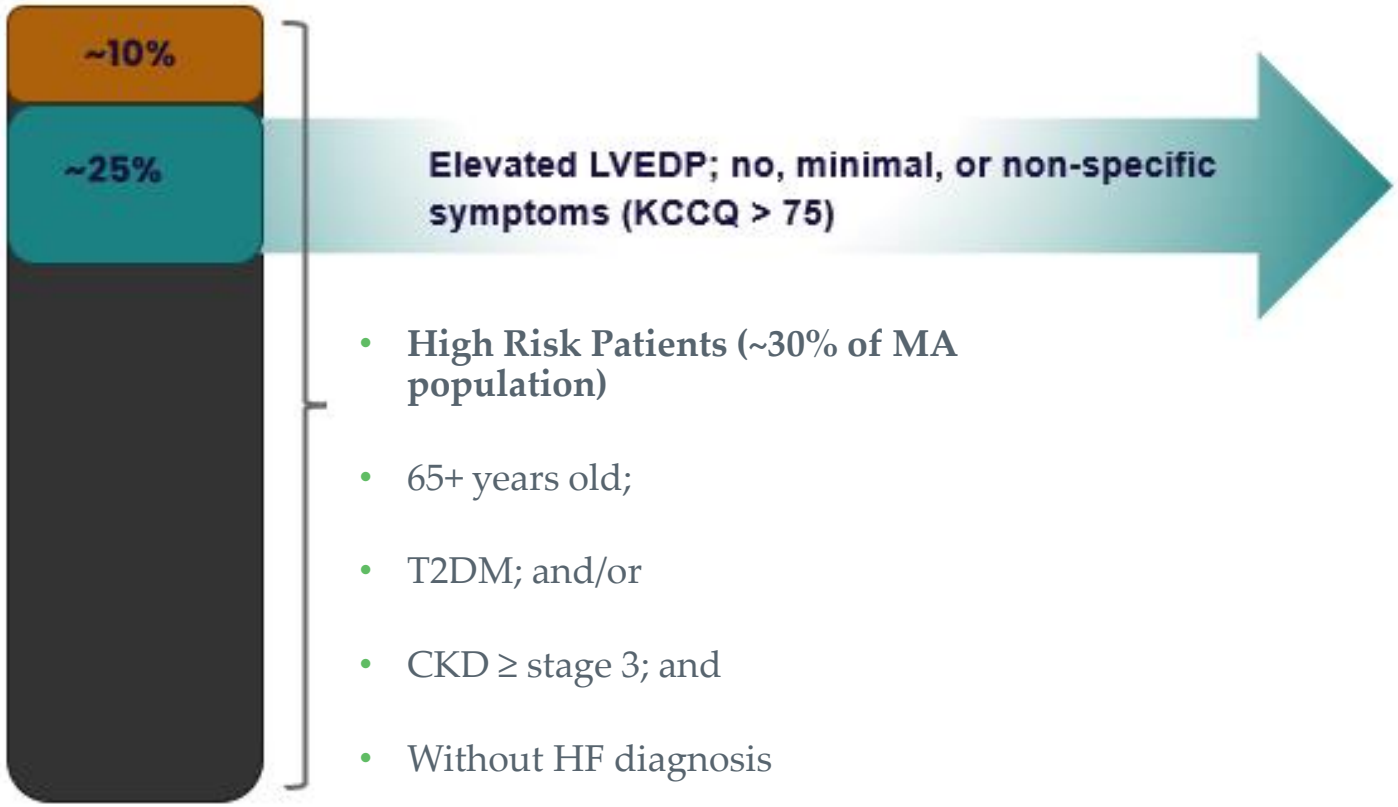
Consider referral to cardiology

- HF patients with KCCQs ≤ 75 have a greater than 40% chance of HF hospitalization or death within 12 months[1]
- GDMT can reduce cardiovascular mortality or first HF hospitalization by 64%[2]

1. Kalwani, Neil M. "The patient-reported outcome measurement in heart failure clinic trial: Rationale and methods of the PRO-HF trial." American Heart Journal, vol. 255, Jan. 2023, pp. 137–146, https://doi.org/10.1016/j.ahj.2022.10.081.
2. Tromp, Jasper. "A systematic review and network meta-analysis of pharmacological treatment of heart failure with reduced ejection fraction." JACC: Heart Failure, vol. 10, no. 2, Feb. 2022, pp. 73–84, https://doi.org/10.1016/j.jchf.2021.09.004.

Begin treating patients in the early stages of HF sooner

How we can incorporate
noninvasive LVEDP Measurement:



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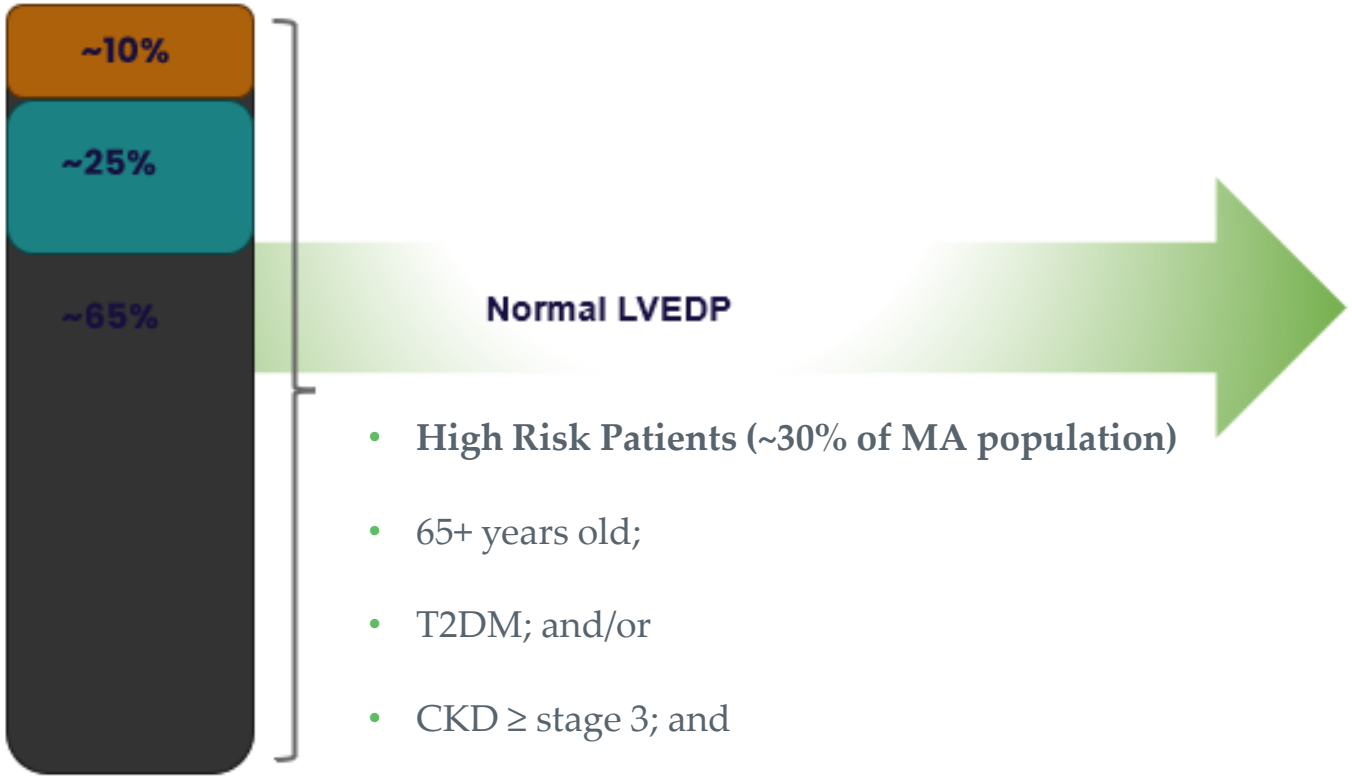
Intensifying attention to BP and diabetes control

- AHA HF Guidelines: "Identifying individuals with stage B HF provides an opportunity to initiate lifestyle modification and pharmacological therapy that may prevent or delay the transition to symptomatic HF (stage C/D)."1
- More intensive BP control reduces risk of adverse cardiovascular outcomes (including development of HF) by 25%[2]
- SGLT2i initiation reduces risk of HF hospitalization by 30% and CV mortality by 25%[3]

1.The SPRINT Research Group. "A Randomized Trial of Intensive versus Standard Blood-Pressure Control. N Engl J Med. 2015;373:2103-2116.
2.Packer M, Anker SD, Butler J, et al. Cardiovascular and renal outcomes with empagliflozin in heart failure. N Engl J Med. 2020;383:1413–1424
3.Heidenreich PA, Bozkurt B, Aguilar D, Allen LA, Byun JJ, Colvin MM, Deswal A, Drazner MH, Dunlay SM and Evers LR. 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. Journal of the American College of Cardiology. 2022;79:e263-e421.

Monitor high-risk patient annually

How we can incorporate
noninvasive LVEDP Measurement:



- **High Risk Patients (~30% of MA population)**
- 65+ years old;
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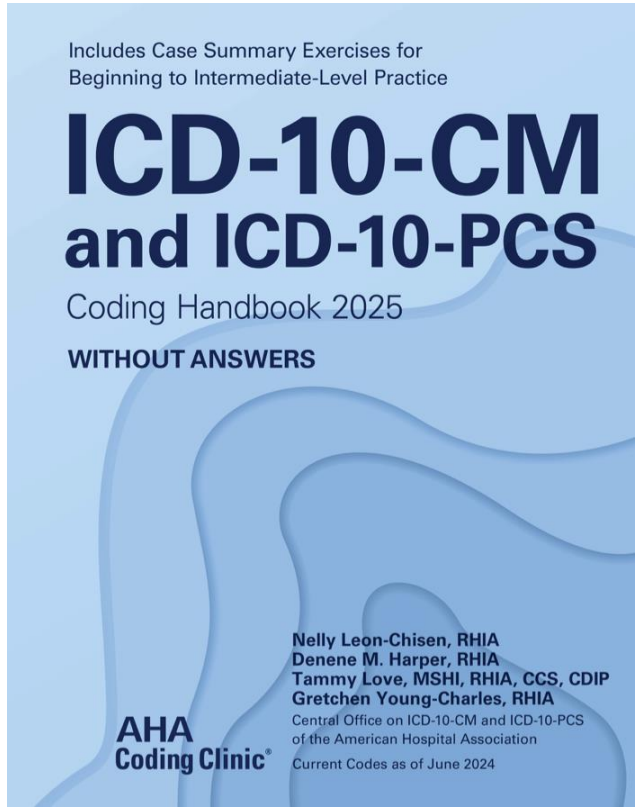
- CKD ≥ stage 3; and
- Without HF diagnosis

Monitor for signs/symptoms of heart failure and test again in 12 months; continue risk factor modification

Considerations for Coding for Heart Failure in Relation to Noninvasive LVEDP Measurement

- ICD-10 Coding Handbook defines HF as: "…the inability of the heart to pump blood at a rate commensurate with the body's needs or the ability to do so only from an *abnormal filling pressure*"
- An elevated LVEDP is an abnormal filling pressure
  - Stage B patients are asymptomatic because that elevated LVEDP is helping meet the body's needs. Symptoms are not required when diagnosing and coding Stage B HF.
  - Stage C patients have become symptomatic because the elevated LVEDP is not enough to avoid symptoms
  - Stage D patients are more advanced requiring advanced medication, device or transplant
- Coding guidelines do not allow Stage A to be coded as heart failure. Stages B, C and D should be coded as heart failure.
- Code I50.1, Left Ventricular Failure is assigned when the left ventricle is primarily affected



Key Takeaways

- HF remains a prevalent disease with significant mortality, morbidity, and economic impact.
- HF is a progressive disease on a continuum.
- Earlier diagnosis is critical to prevent progression and improve clinical outcomes for patients.
- Elevated LVEDP in a high-risk population, even before symptoms appear, allow clinicians and patients to be aggressive and proactive, which has a meaningful impact.
- Vivio offers a unique approach to measure LVEDP and, combined with the KCCQ-12, a roadmap to help support the appropriate treatment decision and clinically appropriate referrals to cardiology

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Questions??