MEDICAL MANAGEMENT OF HEART FAILURE: WHAT EVERY CLINICIAN SHOULD KNOW

SONU ABRAHAM, MD, FACC

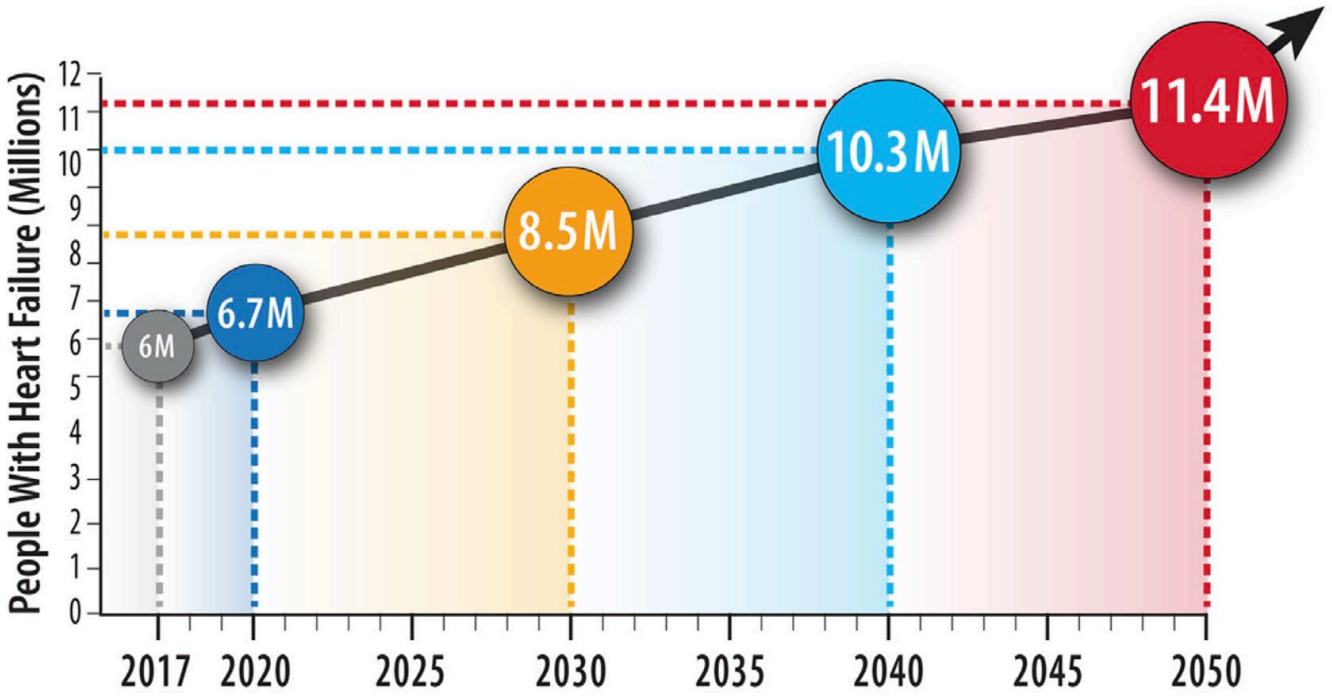
ASSISTANT PROFESSOR OF MEDICINE

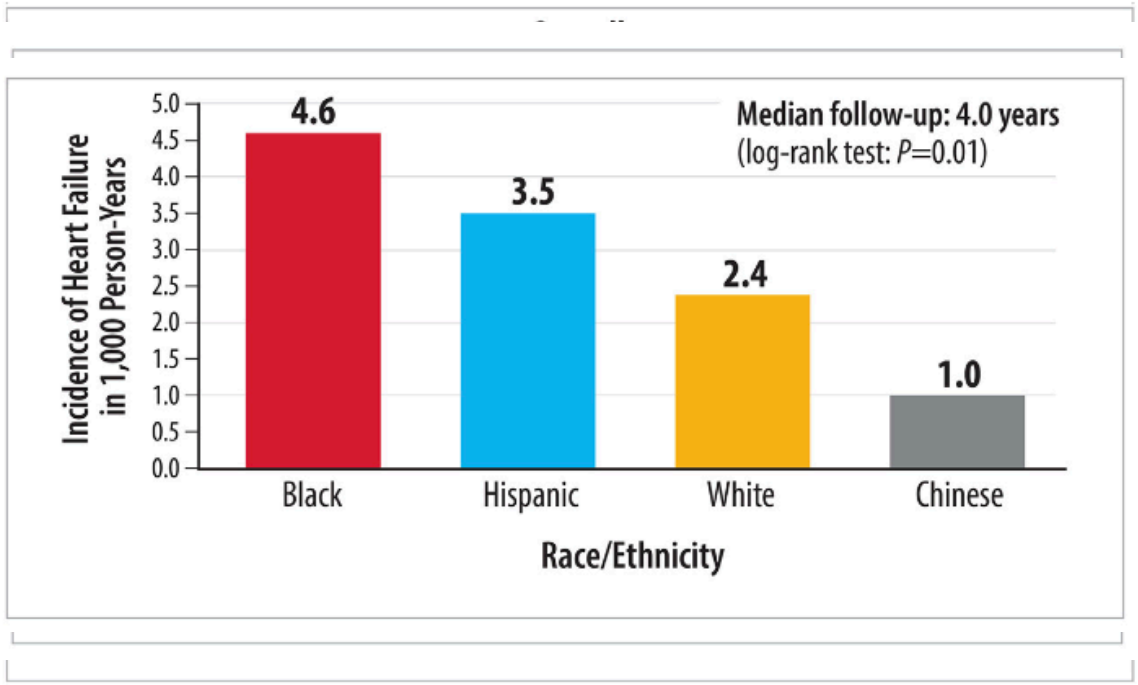
ADVANCED HEART FAILURE & TRANSPLANT CARDIOLOGY

GILL HEART & VASCULAR INSTITUTE

UNIVERSITY OF KENTUCKY

Prevalence and Incidence of Heart Failure





Lifetime Risk of Heart Failure

		Hazard Ratio (95% CI)	*P* value*
Heart Failure			
All	1 RF	1.31 (1.09-1.57)	
	2 RF	2.11 (1.77-2.51)	
	3+ RF	4.60 (3.88-5.46)	
African-American	1 RF	1.80 (1.01-3.20)	
	2 RF	3.19 (1.84-5.54)	
	3+ RF	7.31 (4.26-12.56)	0.18
White	1 RF	1.27 (1.05-1.54)	
	2 RF	1.95 (1.60-2.36)	
	3+ RF	4.07 (3.36-4.93)	
Hispanic	1 RF	1.72 (0.68-4.34)	
	2 RF	3.87 (1.60-9.37)	
	3+ RF	8.80 (3.62-21.42)	
Death Before Heart Failure			
All	1 RF	1.20 (1.10-1.32)	
	2 RF	1.43 (1.30-1.57)	
	3+ RF	2.02 (1.83-2.23)	
African-American	1 RF	1.30 (1.03-1.63)	
	2 RF	1.51 (1.21-1.89)	
	3+ RF	2.34 (1.88-2.91)	0.001
White	1 RF	1.19 (1.07-1.32)	
	2 RF	1.37 (1.23-1.54)	
	3+ RF	1.78 (1.56-2.02)	
Hispanic	1 RF	1.22 (0.87-1.71)	
	2 RF	2.11 (1.51-2.94)	
	3+ RF	2.99 (2.10-4.24)	
Death After Heart Failure			
All	1 RF	0.99 (0.76-1.29)	
	2 RF	1.08 (0.84-1.40)	
	3+ RF	1.14 (0.89-1.47)	
African-American	1 RF	0.77 (0.32-1.87)	
	2 RF	0.71 (0.30-1.65)	
	3+ RF	0.73 (0.32-1.67)	
White	1 RF	1.04 (0.78-1.38)	
	2 RF	1.14 (0.86-1.51)	
	3+ RF	1.25 (0.95-1.65)	

0.1 — Decreased Risk Compared to 0 RF

1

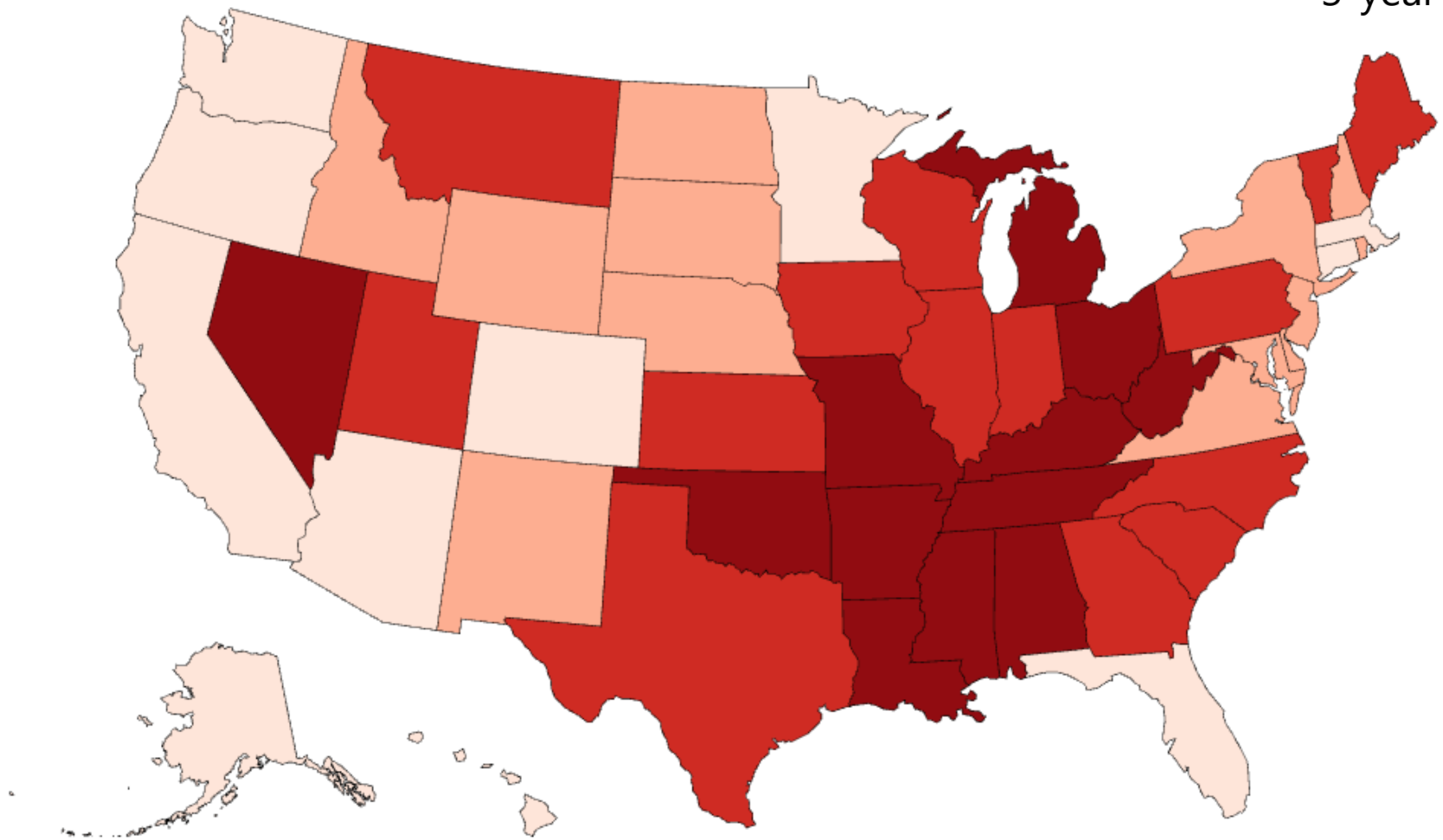
10 — Increased Risk Compared to 0 RF

**P* value for interation race/ethnicity by risk factor (RF) number.

The model is fully adjusted for menopausal hormone therapy status, age, and socioeconomic status. The reference is zero risk factors. CI indicates confidence interval.

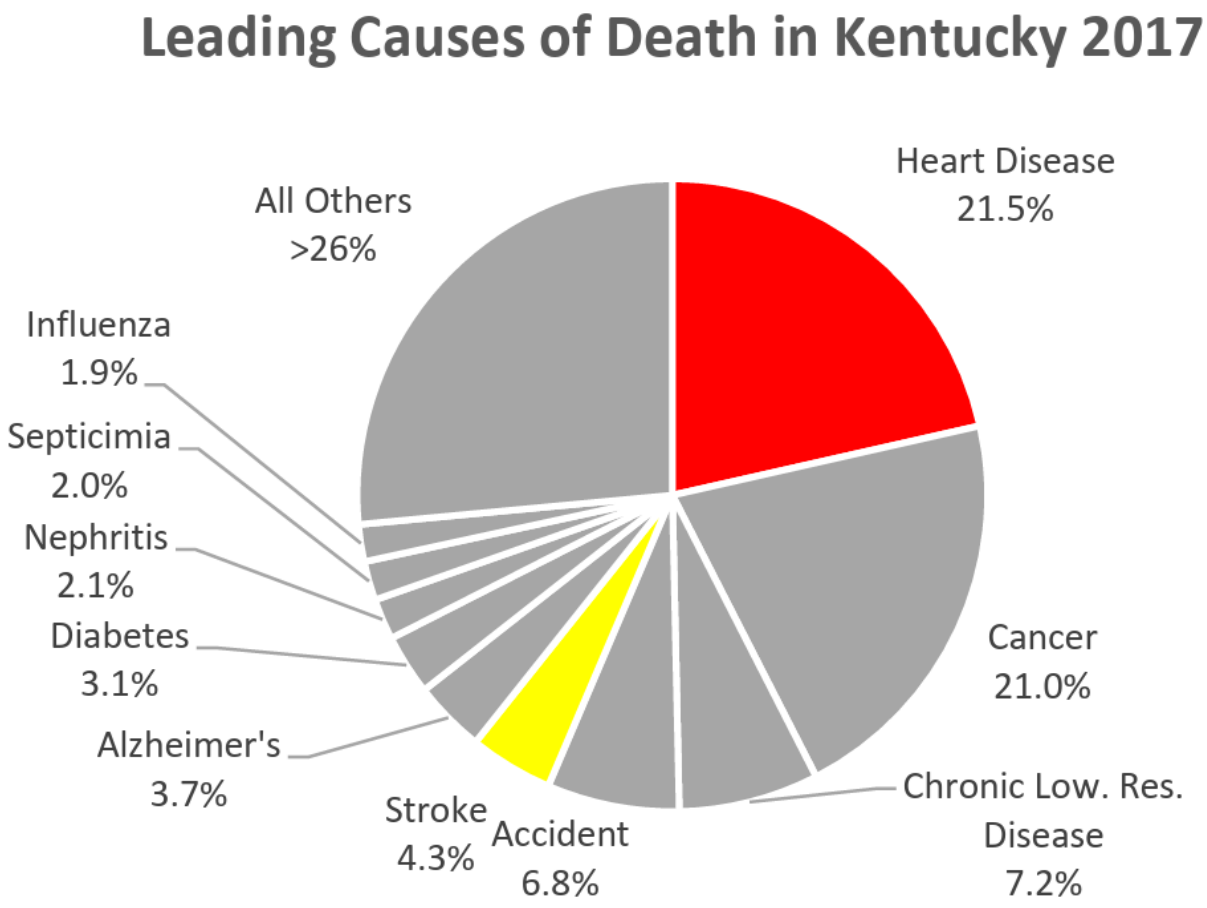
Heart Disease Death Rates in the United States

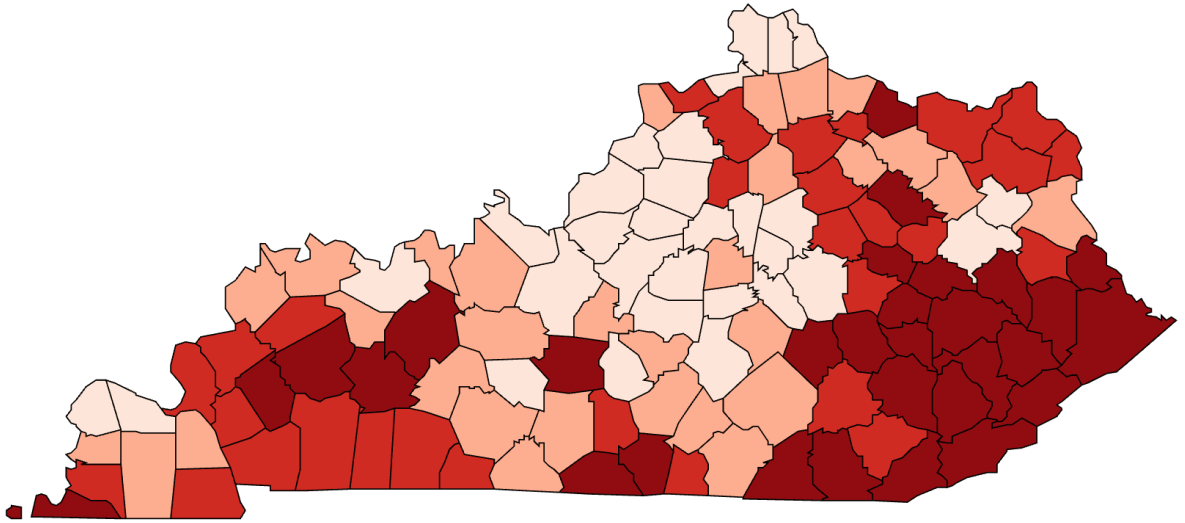
3-year averages, 2021-2023, ages 35+



CDC.gov

How are we doing in Kentucky with regards to heart disease?





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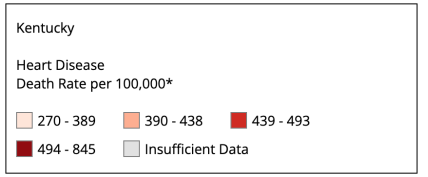
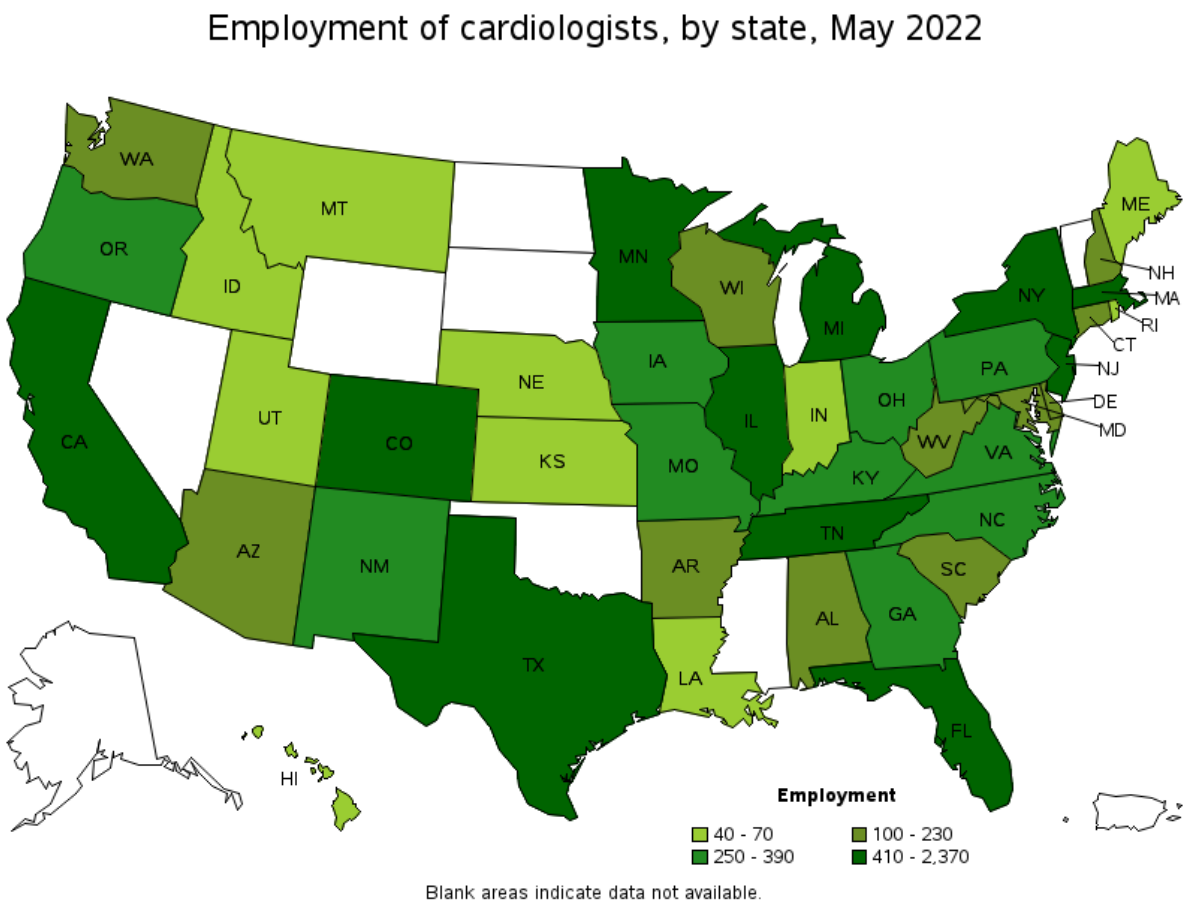
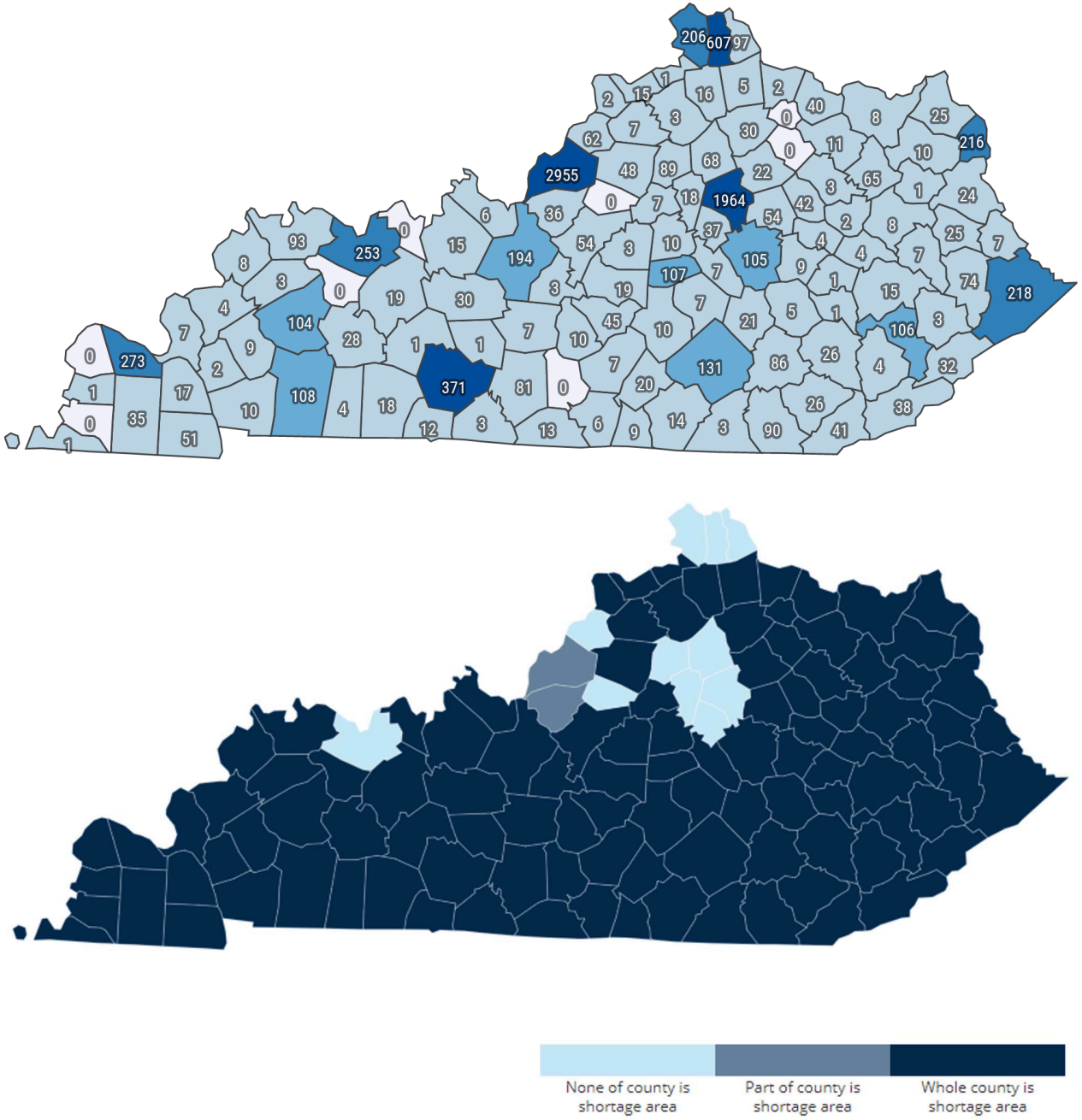


Kentucky has the 8th highest death rate from cardiovascular disease in the country.

What is the physician population of Kentucky?



Distribution of Physicians By County



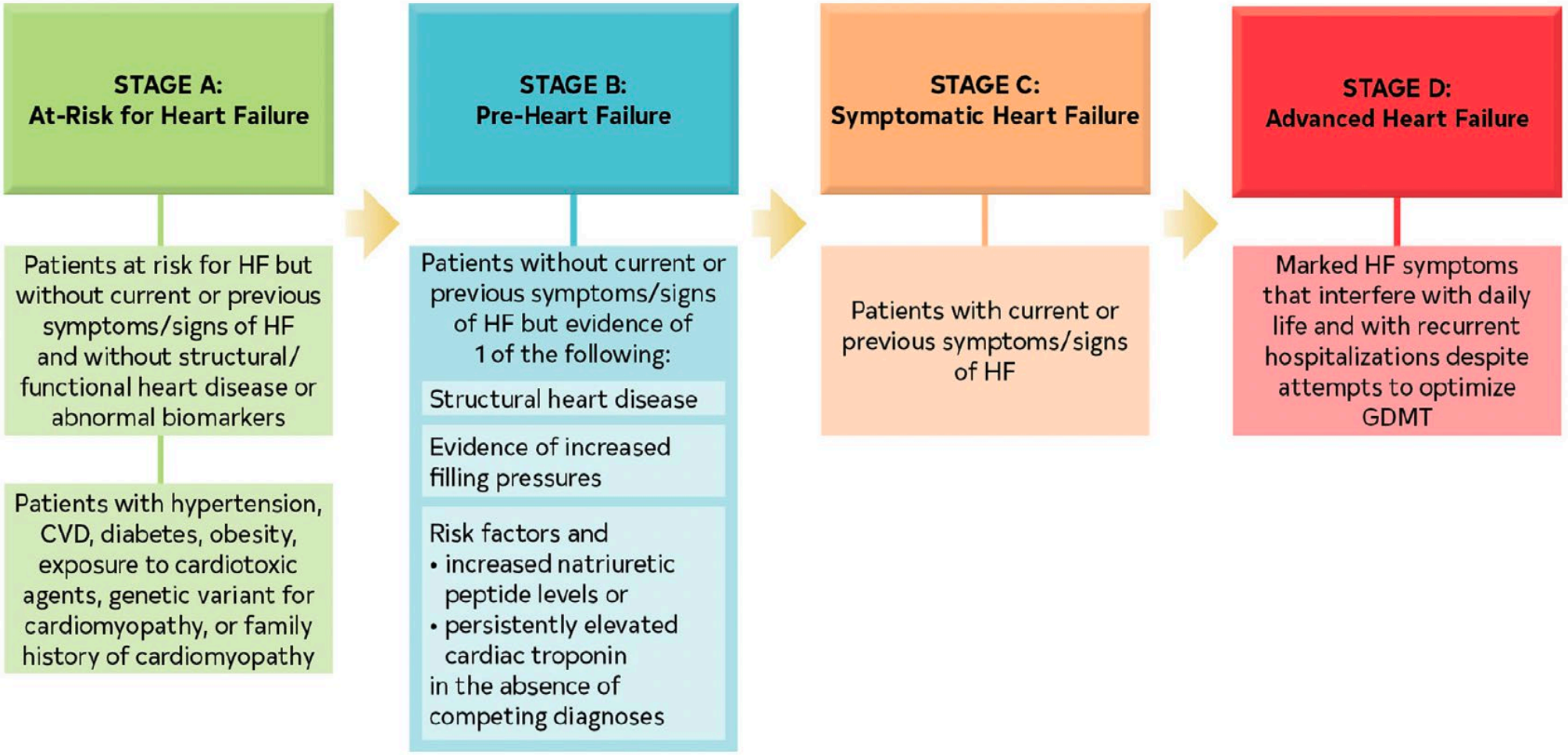
None of county is shortage area

Part of county is shortage area

Whole county is shortage area

US Bureau of Labor Statistics

Stages of Heart Failure



Trajectory of Stage C Heart Failure

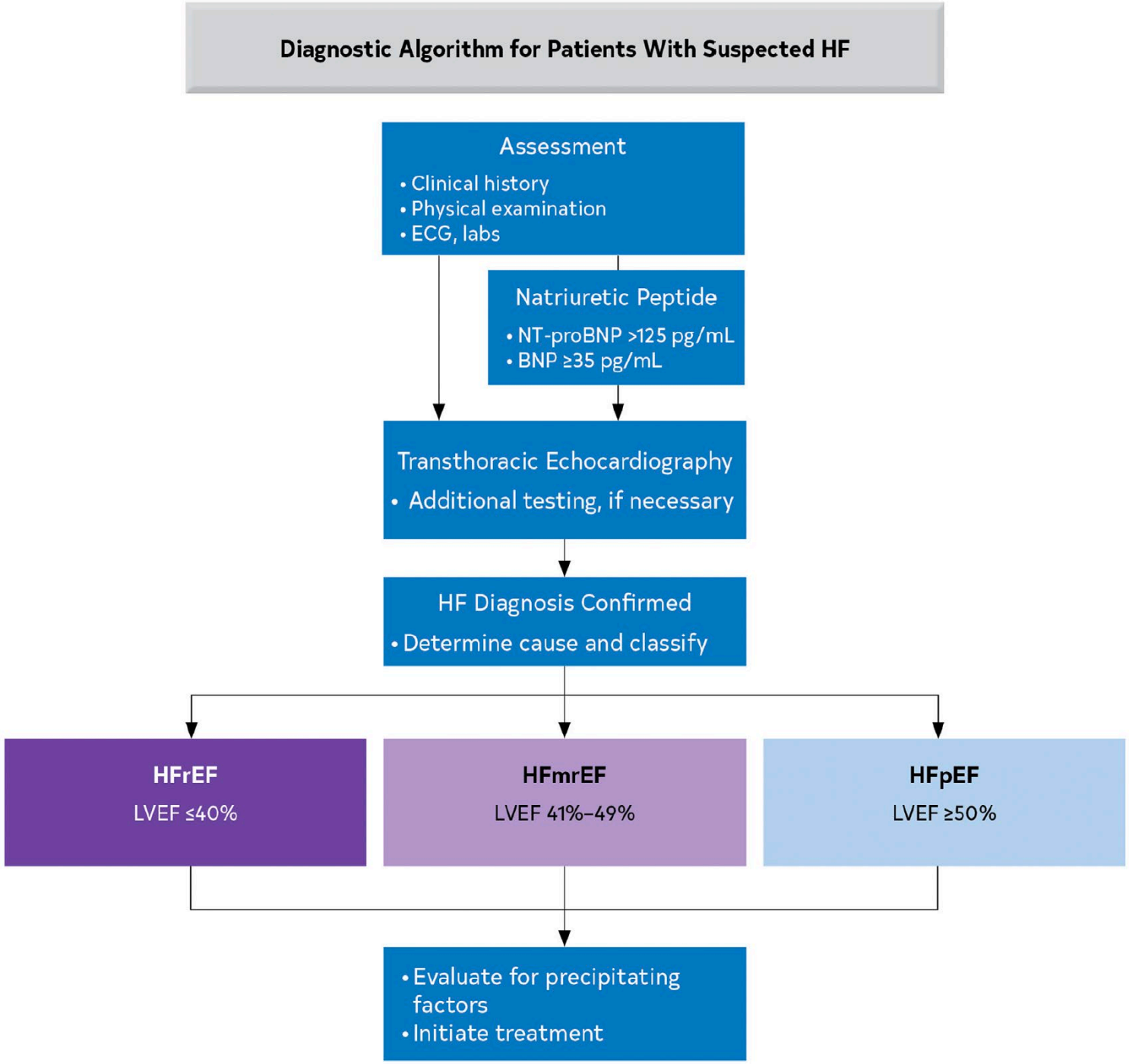
New Onset/De Novo HF:	Resolution of Symptoms:	Persistent HF:	Worsening HF:
• Newly diagnosed HF • No previous history of HF	• Resolution of symptoms/ signs of HF Stage C with previous symptoms of HF with persistent LV dysfunction → HF in remission with resolution of previous structural and/or functional heart disease*	• Persistent HF with ongoing symptoms/signs and/or limited functional capacity	• Worsening symptoms/ signs/functional capacity

HEART FAILURE CLASSIFICATION

Table 4. Classification of HF by LVEF

Type of HF According to LVEF	Criteria
HFrEF (HF with reduced EF)	LVEF ≤40%
HFimpEF (HF with improved EF)	Previous LVEF ≤40% and a follow-up measurement of LVEF >40%
HFmrEF (HF with mildly reduced EF)	LVEF 41%–49% Evidence of spontaneous or provokable increased LV filling pressures (eg, elevated natriuretic peptide, noninvasive and invasive hemodynamic measurement)
HFpEF (HF with preserved EF)	LVEF ≥50% Evidence of spontaneous or provokable increased LV filling pressures (eg, elevated natriuretic peptide, noninvasive and invasive hemodynamic measurement)

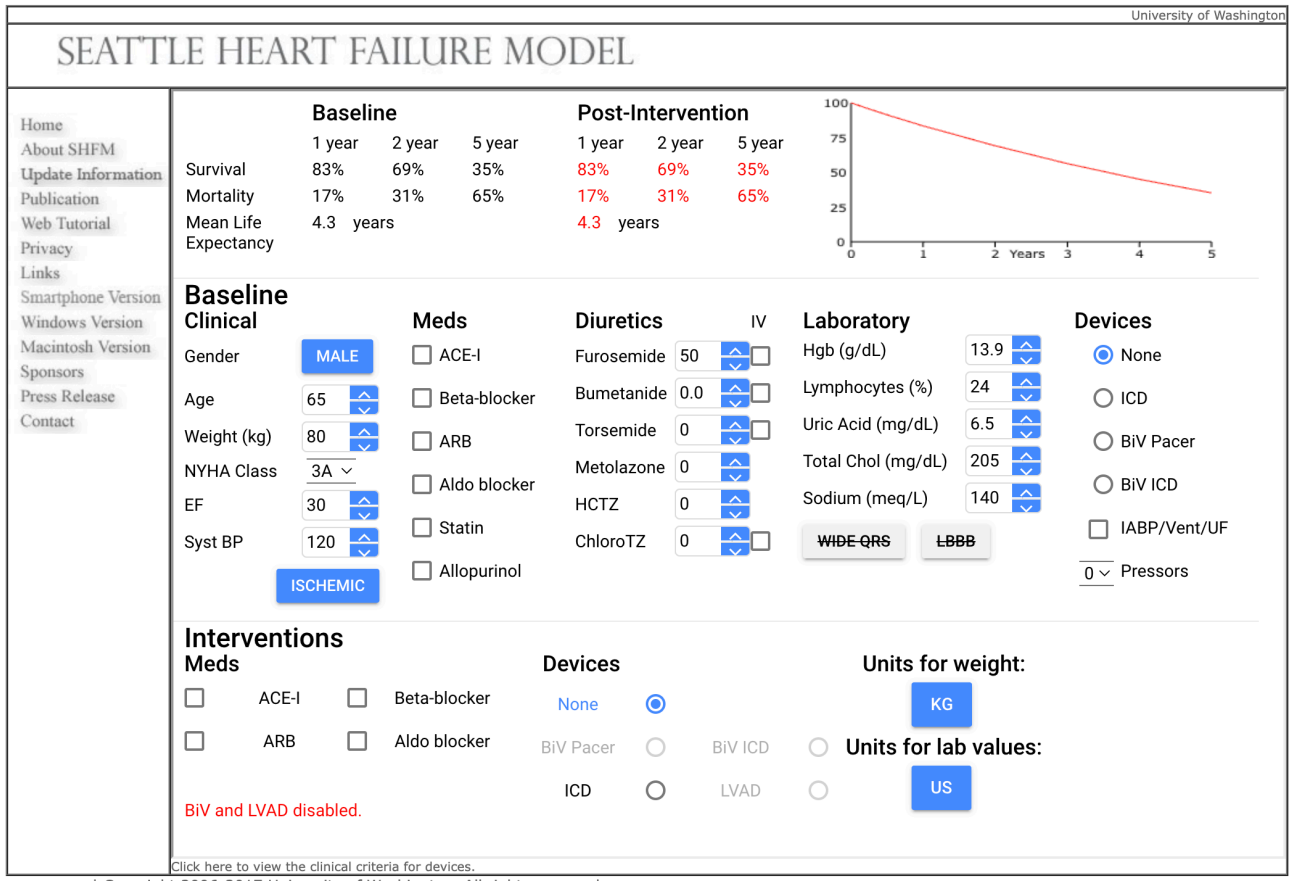
DIAGNOSTIC ALGORITHM



Risk Scores to Predict Outcome in HF

Risk Score	Reference/Link	Year Published
Chronic HF		
All Patients With Chronic HF		
Seattle Heart Failure Model	(2) https://depts.washington.edu/shfm/?width=1440&height=900 (15)	2006
Heart Failure Survival Score	(1)	1997
MAGGIC	(3) http://www.heartfailurerisk.org/ (16)	2013
CHARM Risk Score	(4)	2006
CORONA Risk Score	(5)	2009
Specific to Chronic HFrEF		
PARADIGM-HF	(6)	2020
HF-ACTION	(7)	2012
GUIDE-IT	(8)	2019
Specific to Chronic HFpEF		
I-PRESERVE Score	(9)	2011
TOPCAT	(10)	2020
Acutely Decompensated HF		
ADHERE Classification and Regression Tree (CART) Model	(11)	2005
AHA Get With The Guidelines Score	(12) https://www.mdcalc.com/gwtg-heart-failure-risk-score (17)	2010, 2021
EFFECT Risk Score	(13) http://www.ccort.ca/Research/CHFRiskModel.aspx (18)	2003, 2016
ESCAPE Risk Model and Discharge Score	(14)	2010

Risk Scores to Predict Outcome in HF



Heart Failure Risk Calculator

MAGGIC
Meta-Analysis Global Group in Chronic Heart Failure

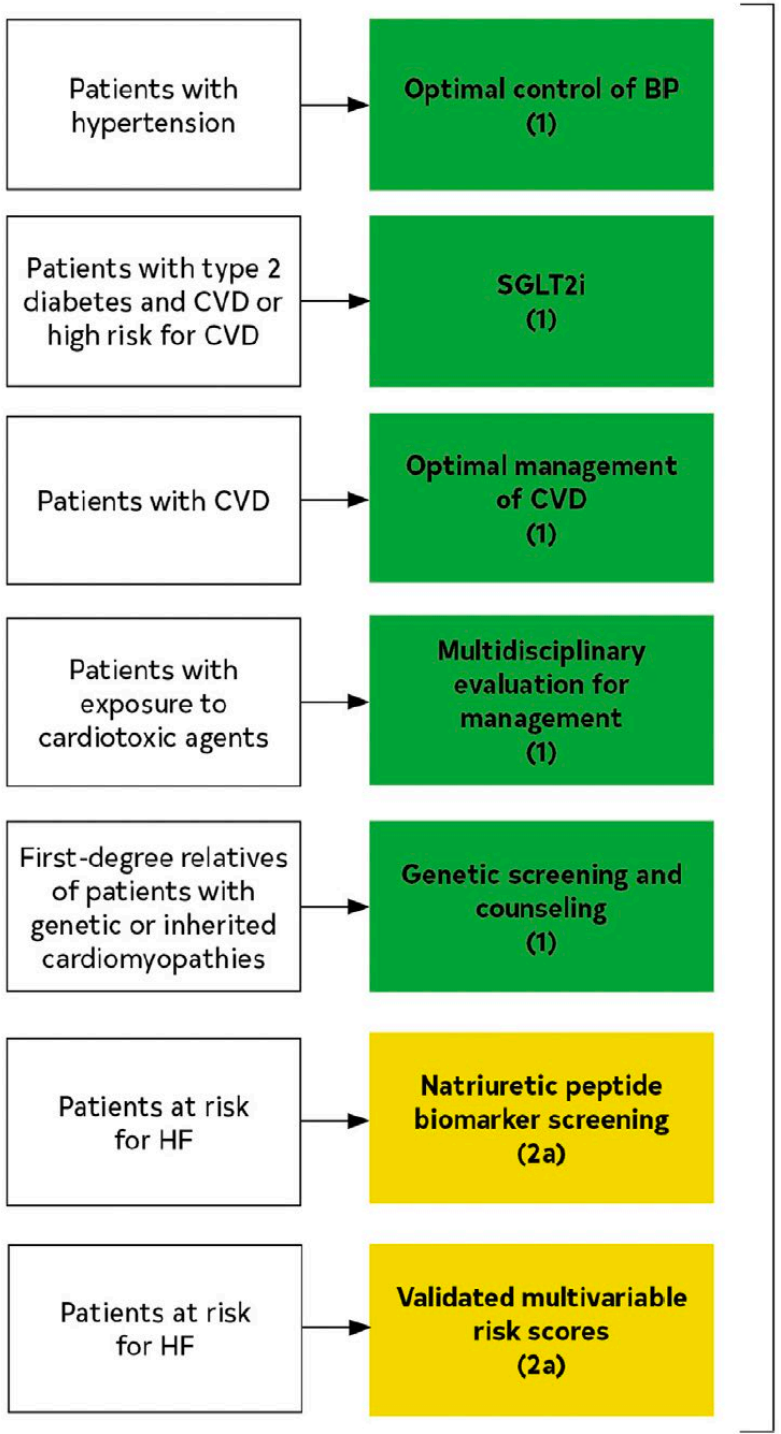
Patient Information

Return to terms and conditions

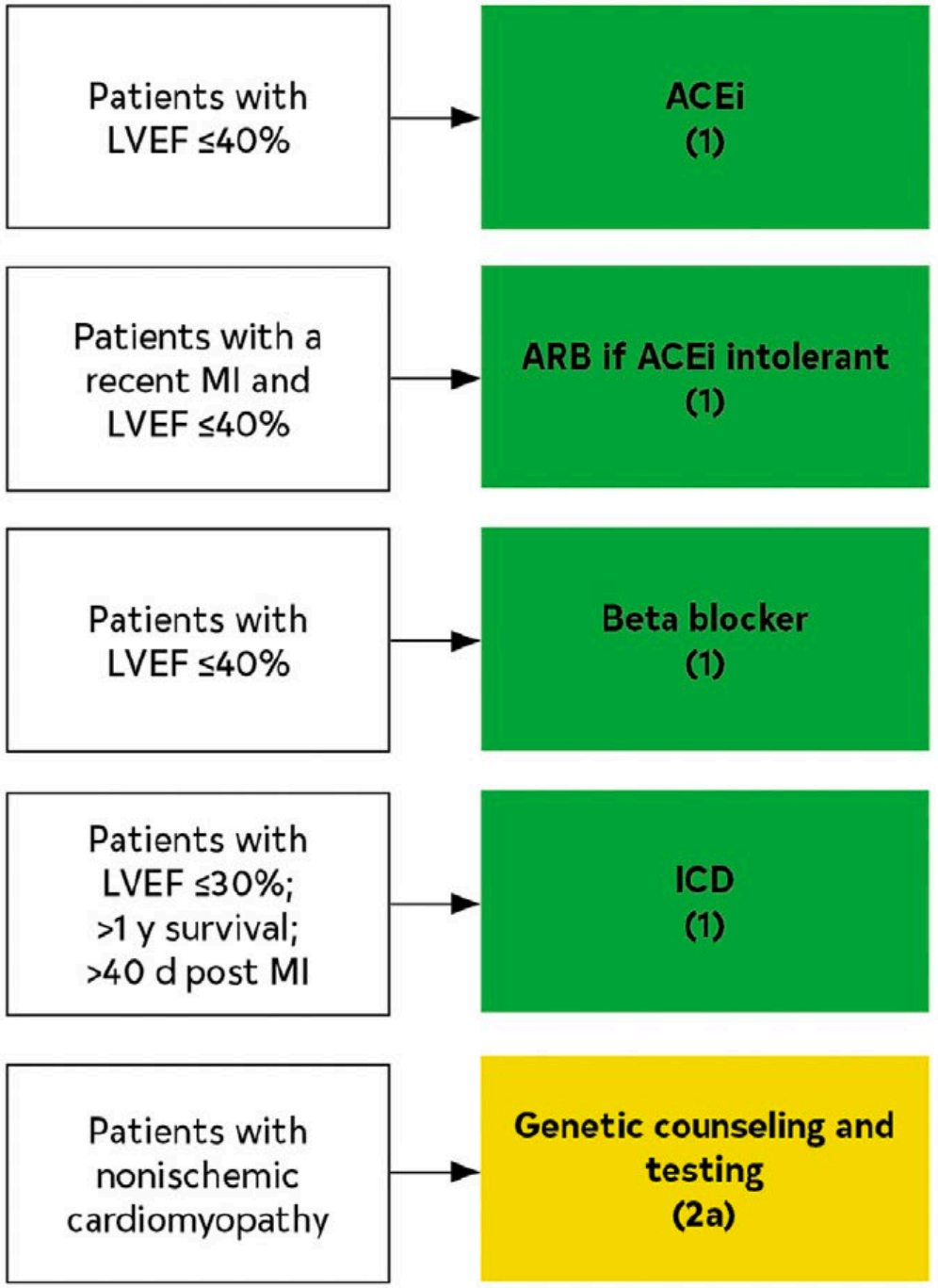
Patient Reference	Name or ID
Age	18-110
Gender	Female
Diabetes	○ Yes ○ No
COPD	○ Yes ○ No
Heart failure diagnosed within the last 18 months	○ Yes ○ No
Current smoker	○ Yes ○ No
NYHA Class	1
Receives beta blockers	○ Yes ○ No
Receives ACEi/ARB	○ Yes ○ No
BMI calculate BMI	10-50 kg/m^2
Systolic blood pressure	50-250 mmHg
Creatinine	20-1400 µmol/L
Ejection fraction	1-95 %

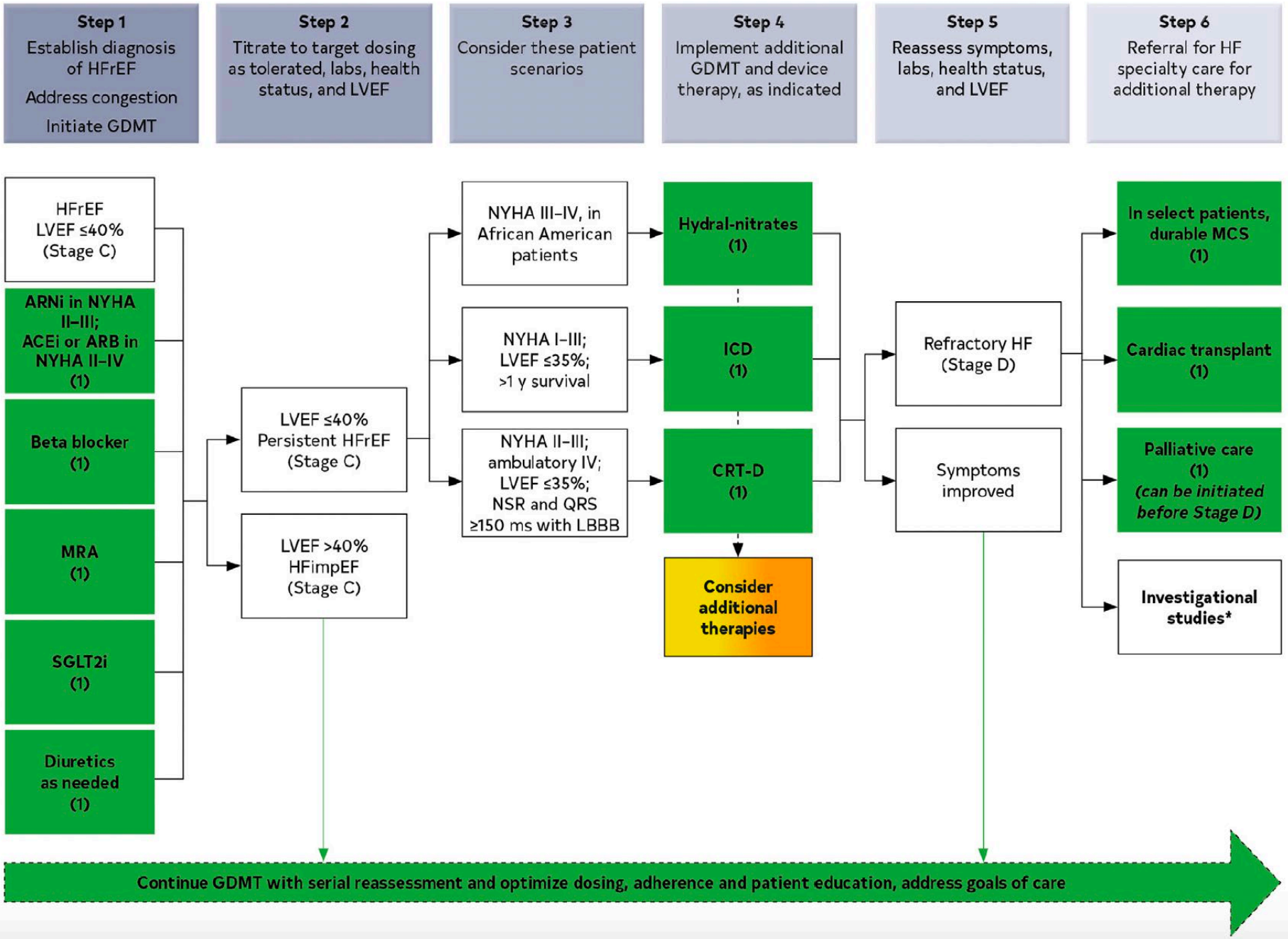
Calculate Risk **Clear the data**

STAGE A HEART FAILURE

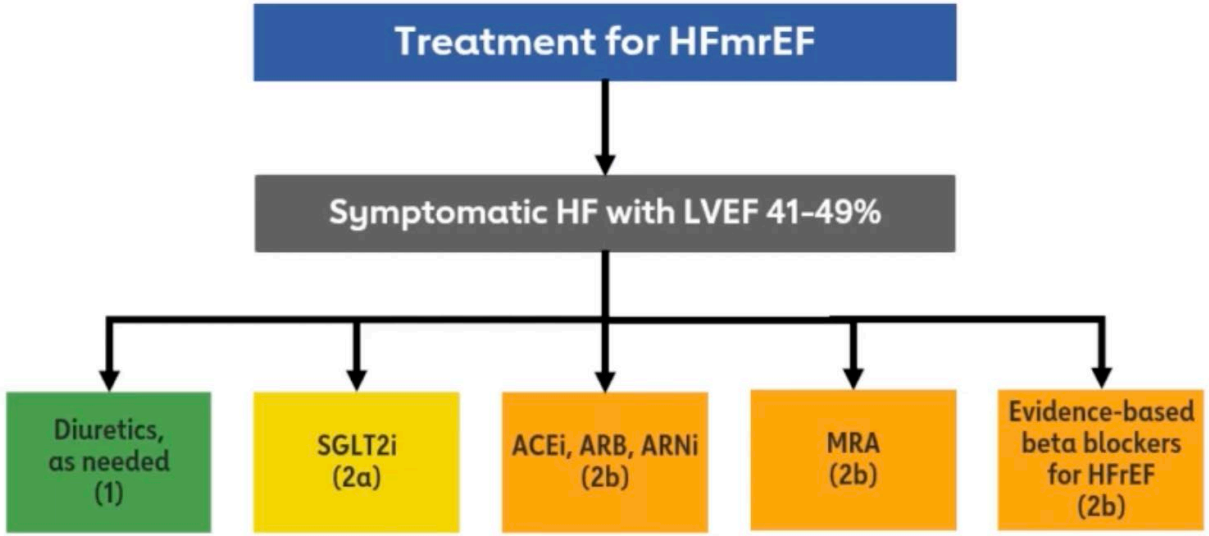


STAGE B HEART FAILURE




Step 1
Establish diagnosis of HFrEF
Address congestion
Initiate GDMT
Step 2
Titrate to target dosing as tolerated, labs, health status, and LVEF
Step 3
Consider these patient scenarios
Step 4
Implement additional GDMT and device therapy, as indicated
Step 5
Reassess symptoms, labs, health status, and LVEF
Step 6
Referral for HF specialty care for additional therapy
HFrEF
LVEF ≤40%
(Stage C)
ARNi in NYHA II–III;
ACEi or ARB in NYHA II–IV
(1)
Beta blocker
(1)
MRA
(1)
SGLT2i
(1)
Diuretics as needed
(1)
LVEF ≤40%
Persistent HFrEF
(Stage C)
LVEF >40%
HFimpEF
(Stage C)
NYHA III–IV, in African American patients
NYHA I–III;
LVEF ≤35%;
>1 y survival
NYHA II–III;
ambulatory IV;
LVEF ≤35%;
NSR and QRS ≥150 ms with LBBB
Hydral-nitrates
(1)
ICD
(1)
CRT-D
(1)
Consider additional therapies
Refractory HF
(Stage D)
Symptoms improved
In select patients, durable MCS
(1)
Cardiac transplant
(1)
Palliative care
(1)
(can be initiated before Stage D)
Investigational studies*
Continue GDMT with serial reassessment and optimize dosing, adherence and patient education, address goals of care

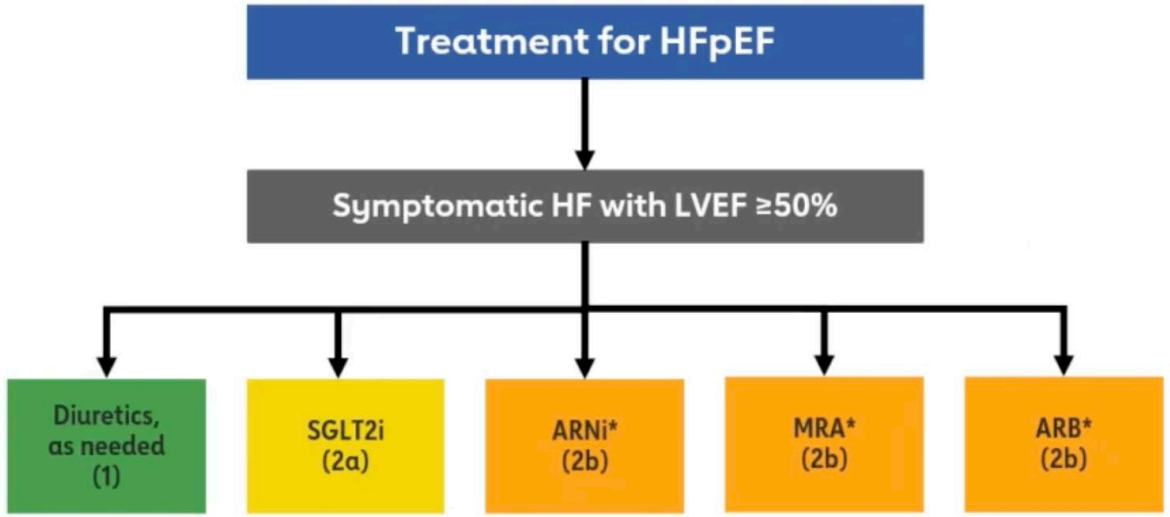
Stage C Mildly Reduced Ejection Fraction



Patients With HF*imp*EF

COR	RECOMMENDATIONS
1	1. In patients with HFimpEF after treatment, GDMT should be continued to prevent relapse of HF and LV dysfunction, even in patients who may become asymptomatic. (1)

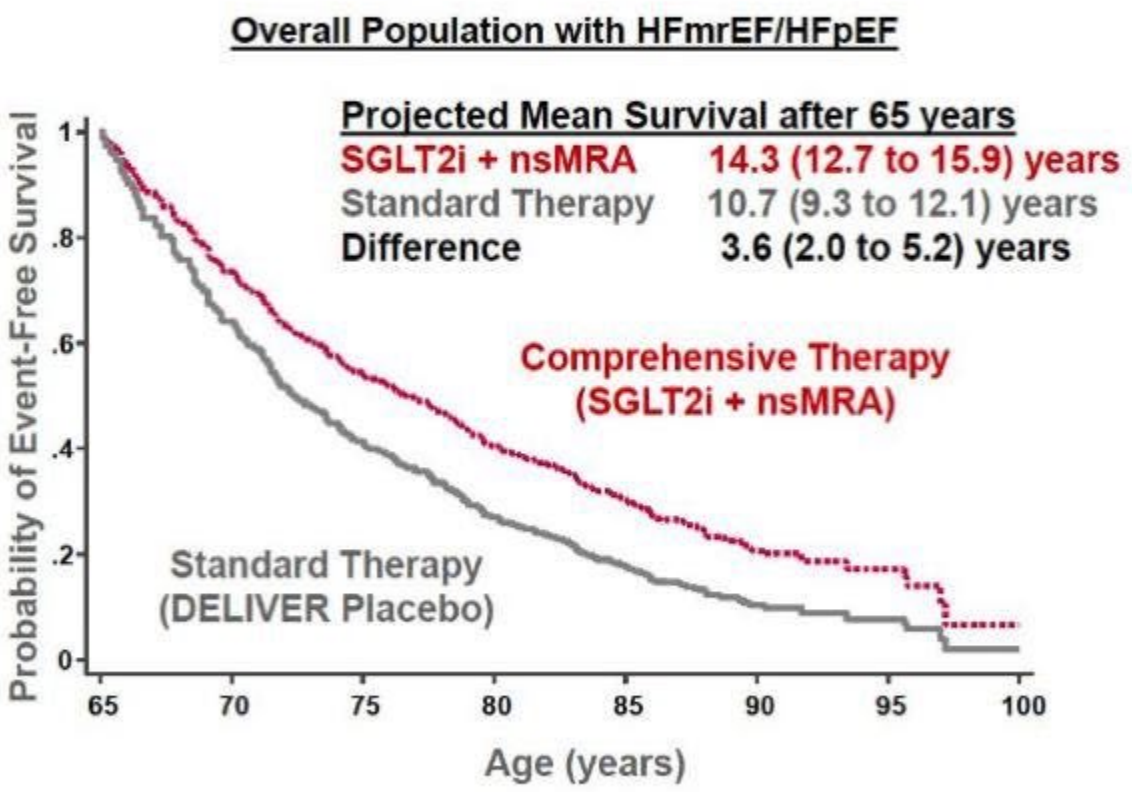
Stage C Heart Failure with Preserved EF

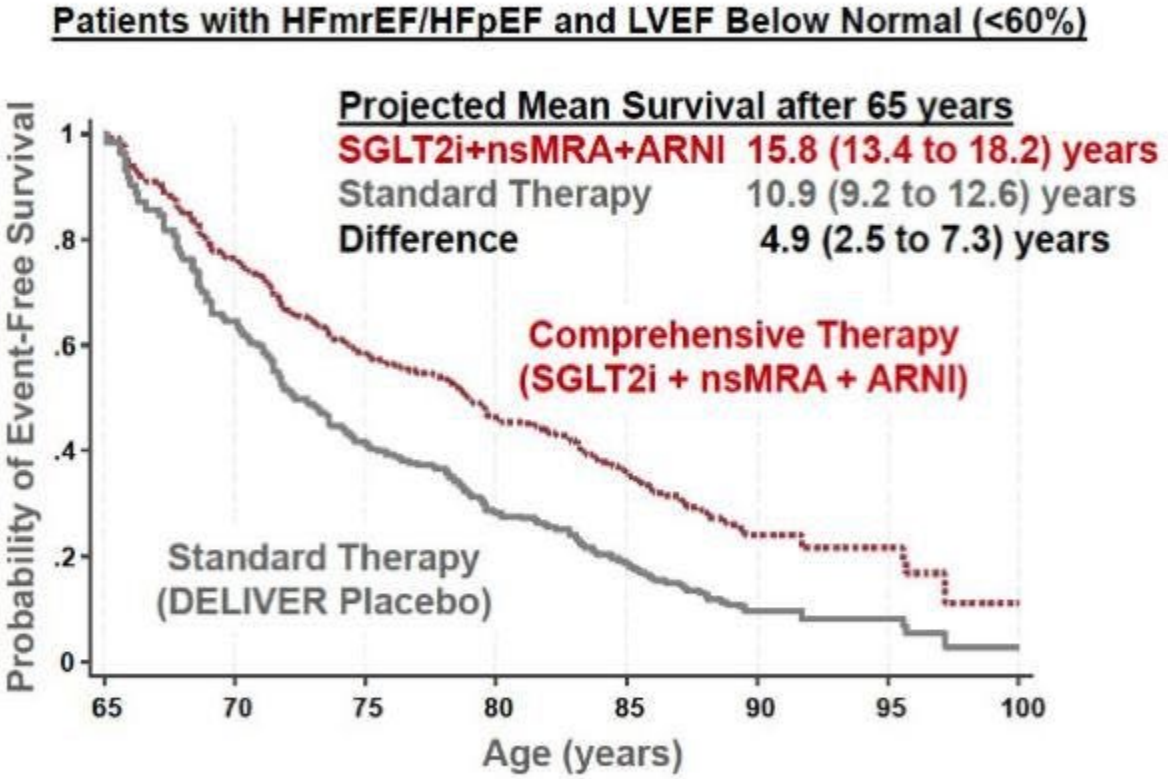


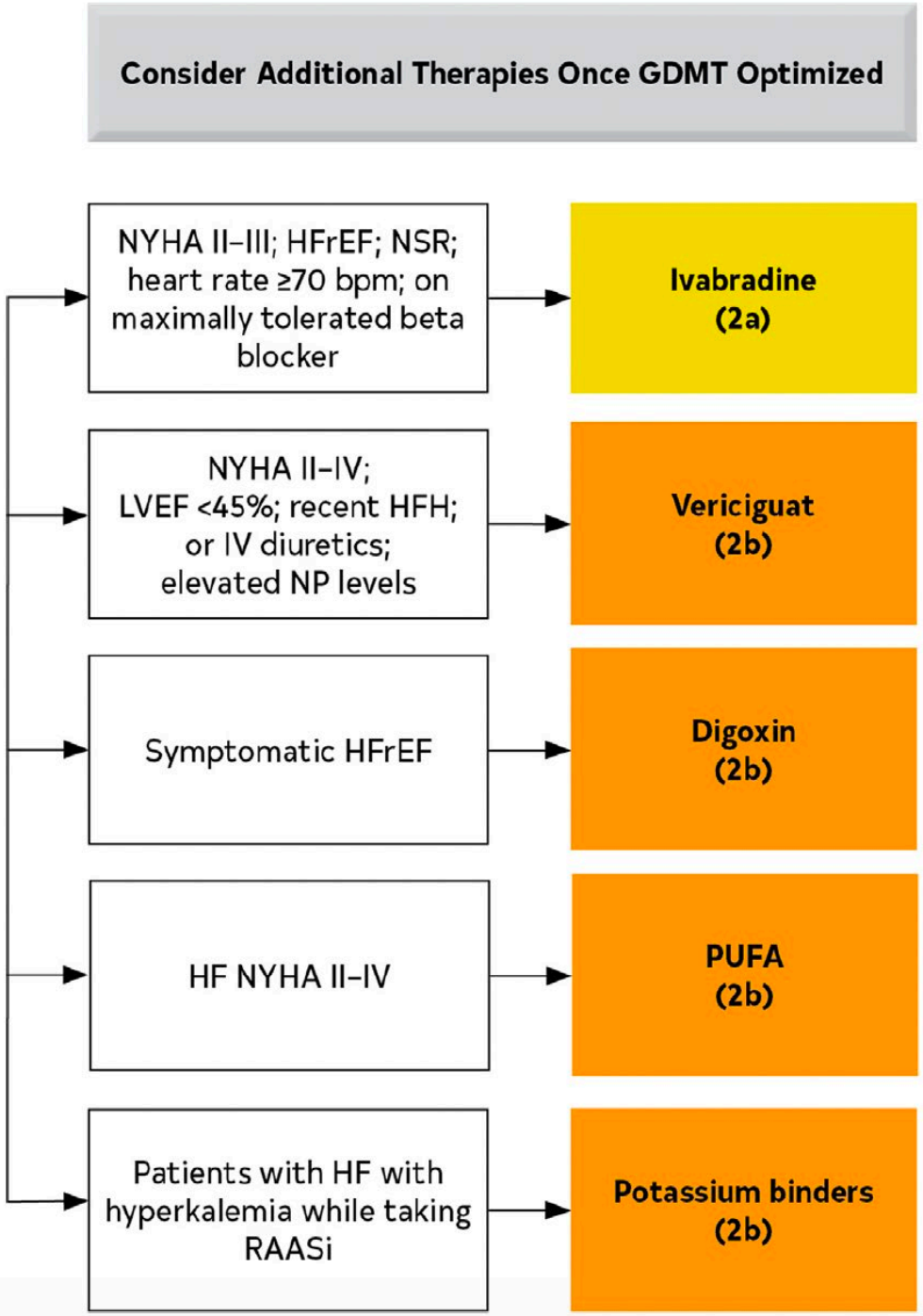
NOTE: *Greater benefit in patients with LVEF closer to 50%

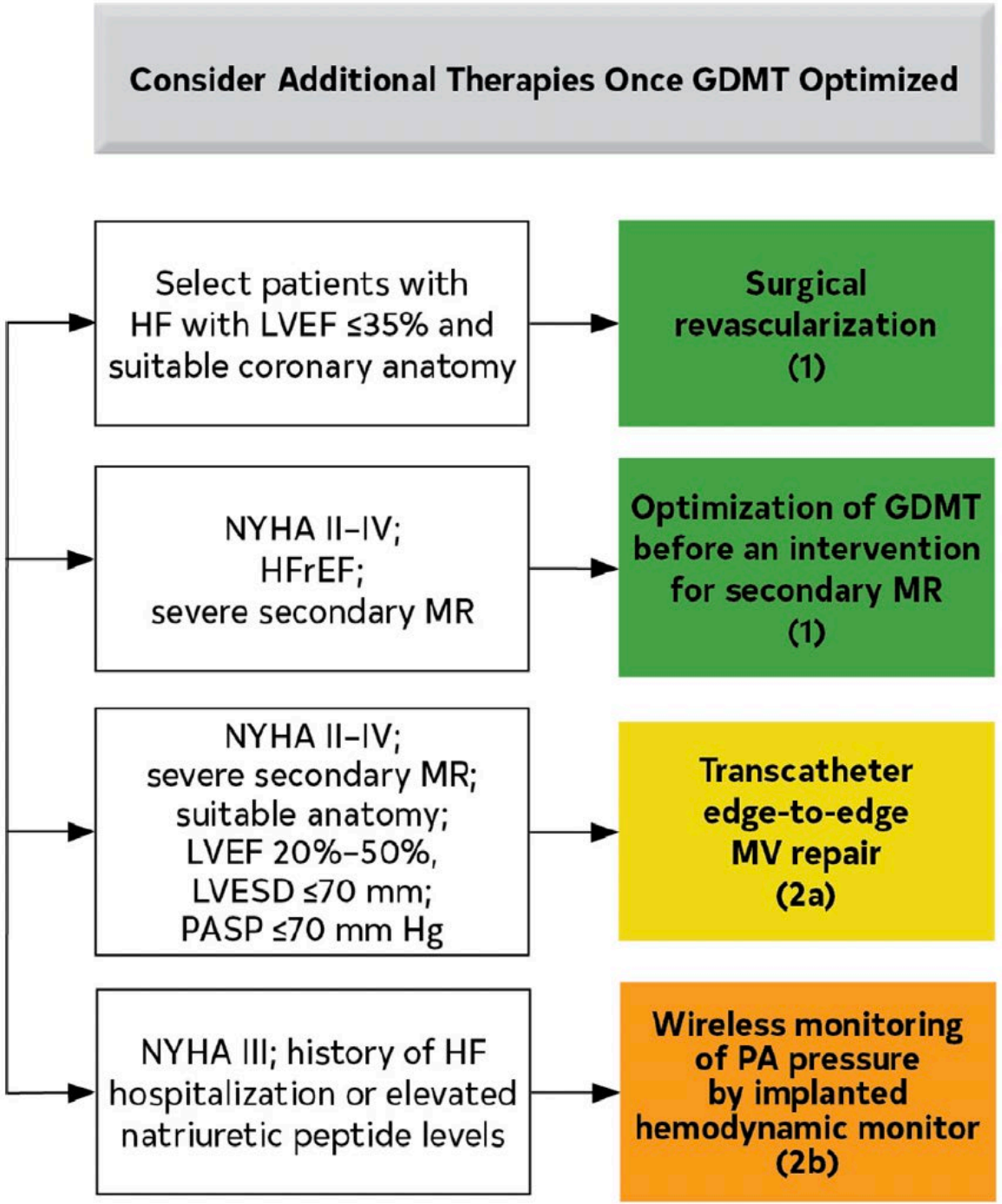
1	C-LD	1. Patients with HFpEF and hypertension should have medication titrated to attain blood pressure targets in accordance with published clinical practice guidelines to prevent morbidity.[1–3]
2a	B-R	2. In patients with HFpEF, SGLT2i can be beneficial in decreasing HF hospitalizations and cardiovascular 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]

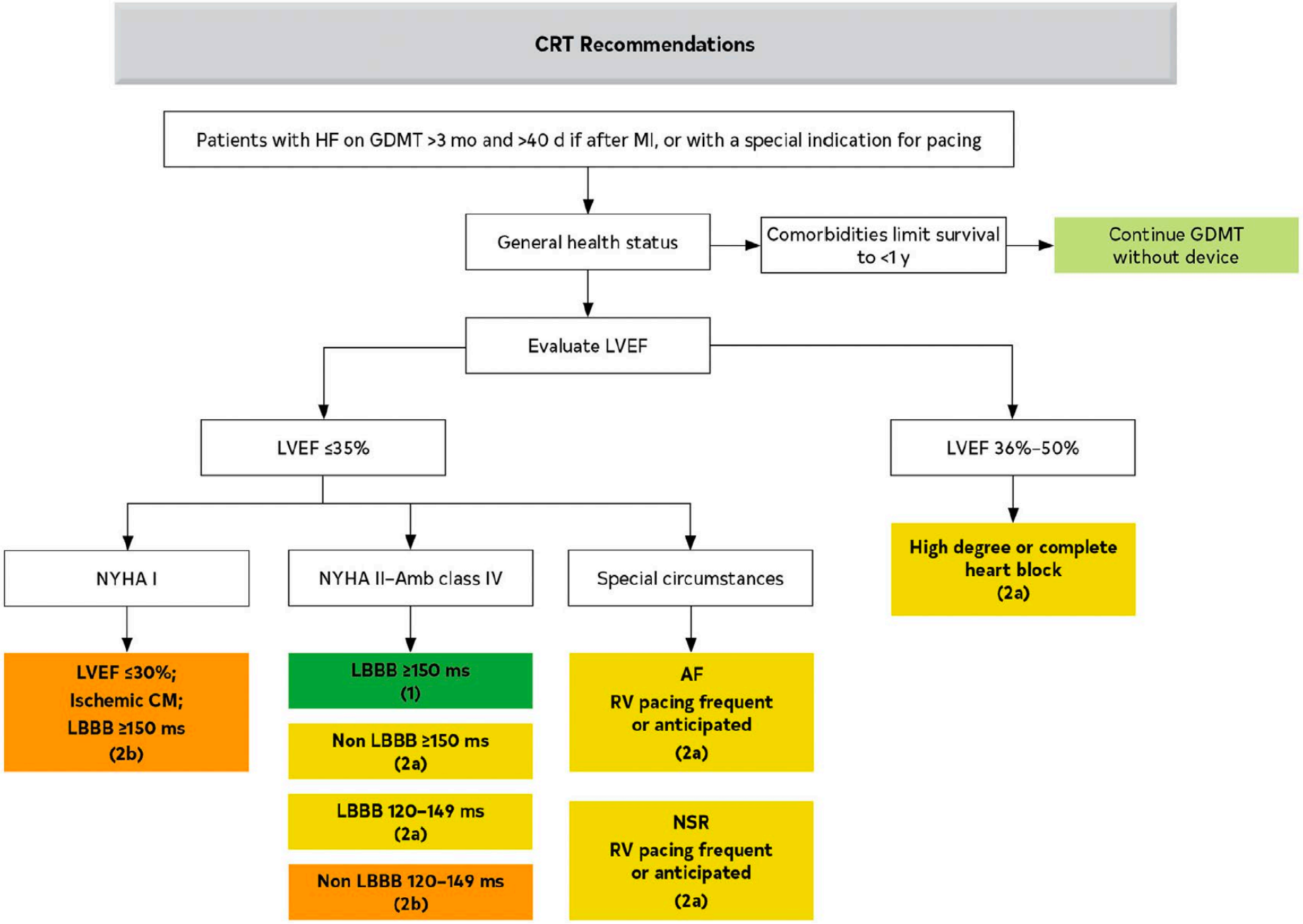
Lifetime Benefits of Comprehensive Medical Therapy in Heart Failure with Mildly Reduced or Preserved Ejection Fraction






Consider Additional Therapies Once GDMT Optimized
NYHA II–III; HFrEF; NSR; heart rate ≥70 bpm; on maximally tolerated beta blocker
Ivabradine (2a)
NYHA II–IV; LVEF <45%; recent HFH; or IV diuretics; elevated NP levels
Vericiguat (2b)
Symptomatic HFrEF
Digoxin (2b)
HF NYHA II–IV
PUFA (2b)
Patients with HF with hyperkalemia while taking RAASi
Potassium binders (2b)


Consider Additional Therapies Once GDMT Optimized
Select patients with HF with LVEF ≤35% and suitable coronary anatomy
Surgical revascularization (1)
NYHA II–IV; HFrEF; severe secondary MR
Optimization of GDMT before an intervention for secondary MR (1)
NYHA II–IV; severe secondary MR; suitable anatomy; LVEF 20%–50%, LVESD ≤70 mm; PASP ≤70 mm Hg
Transcatheter edge-to-edge MV repair (2a)
NYHA III; history of HF hospitalization or elevated natriuretic peptide levels
Wireless monitoring of PA pressure by implanted hemodynamic monitor (2b)


CRT Recommendations
Patients with HF on GDMT >3 mo and >40 d if after MI, or with a special indication for pacing
General health status
Comorbidities limit survival to <1 y
Continue GDMT without device
Evaluate LVEF
LVEF ≤35%
LVEF 36%–50%
NYHA I
NYHA II–Amb class IV
Special circumstances
High degree or complete heart block (2a)
LVEF ≤30%; Ischemic CM; LBBB ≥150 ms (2b)
LBBB ≥150 ms (1)
Non LBBB ≥150 ms (2a)
LBBB 120–149 ms (2a)
Non LBBB 120–149 ms (2b)
AF RV pacing frequent or anticipated (2a)
NSR RV pacing frequent or anticipated (2a)

Initial and Serial Evaluation

Adult patients with NYHA III HF

↓

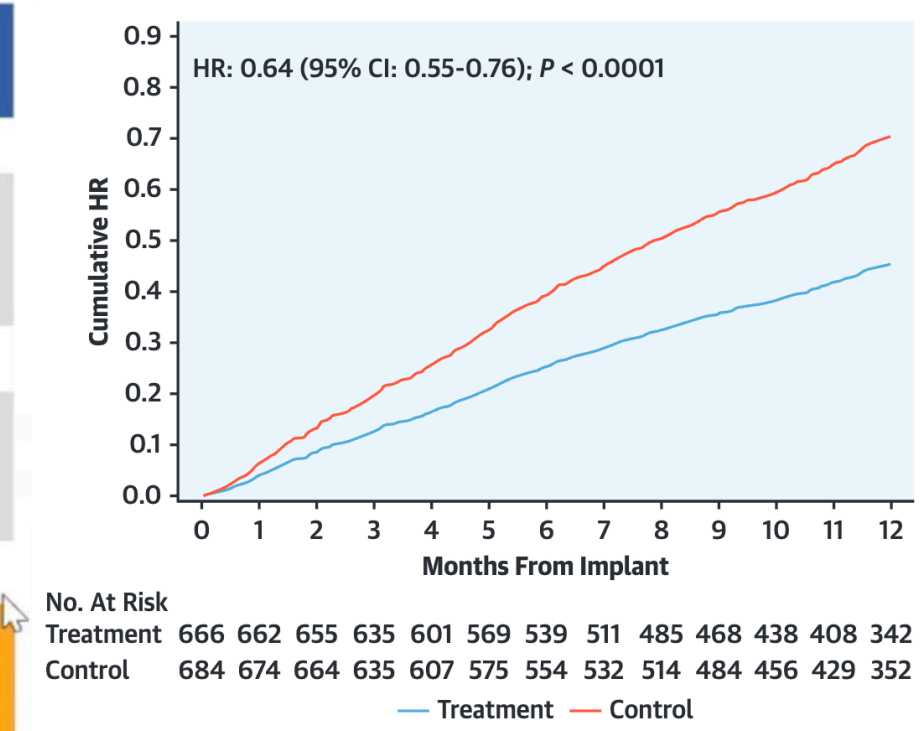
HF hospitalization in the past year or elevated natriuretic peptide levels

↓

Maximally tolerated stable doses of GDMT with optimal device therapy

↓

The usefulness of wireless monitoring of PA pressure by an implanted hemodynamic monitor to reduce the risk of subsequent HF hospitalizations is uncertain. (Class 2b)



Heart Failure Hospitalizations for Implantable Hemodynamic Monitoring and Medical Therapy in Pooled Population

COR	RECOMMENDATIONS
1	1. In patients with HF, assessment and documentation of NYHA functional
2a	4. In ambulatory patients with unexplained dyspnea, CPET is reasonable to **evaluate the cause of dyspnea**

Decompensated Heart Failure

Evaluation

COR	RECOMMENDATIONS
1	Address precipitating factors
1	Evaluate severity of congestion
1	Assess adequacy of perfusion

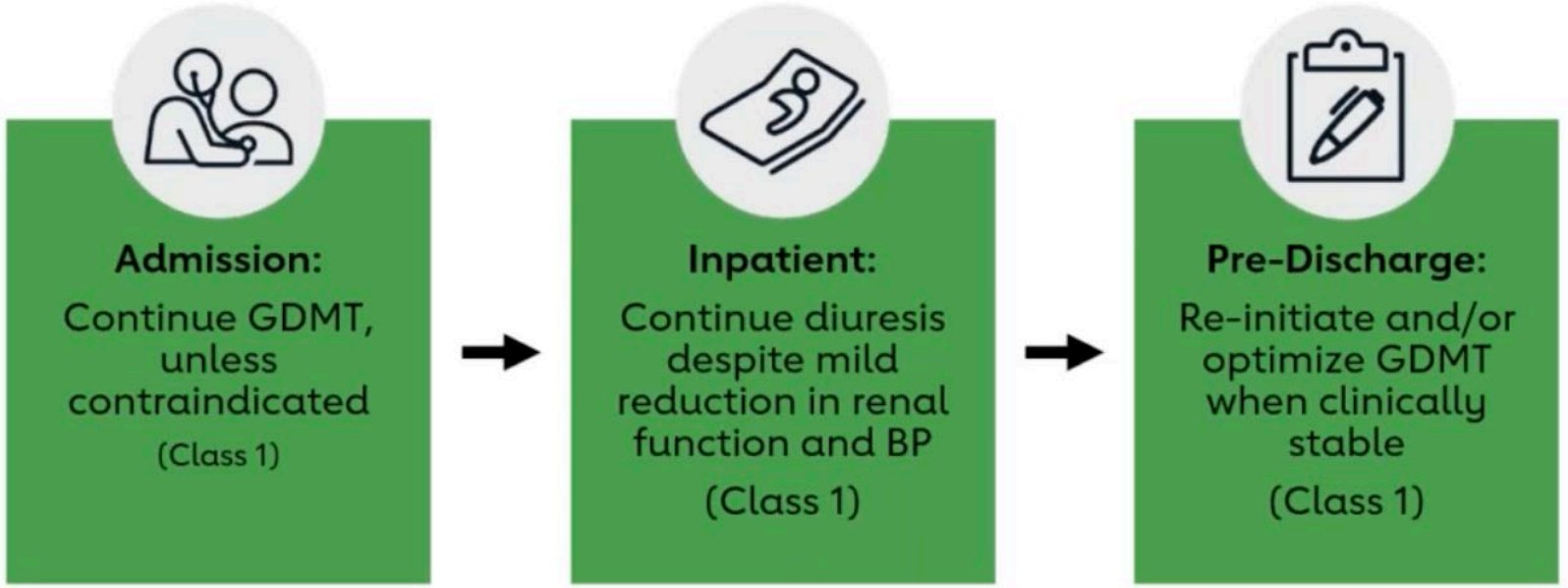
Goals for GDMT

COR	RECOMMENDATIONS
1	Optimize volume status
1	Address reversible factors
1	Continue or initiate GDMT

COMMON FACTORS PRECIPITATING HF HOSPITALIZATION

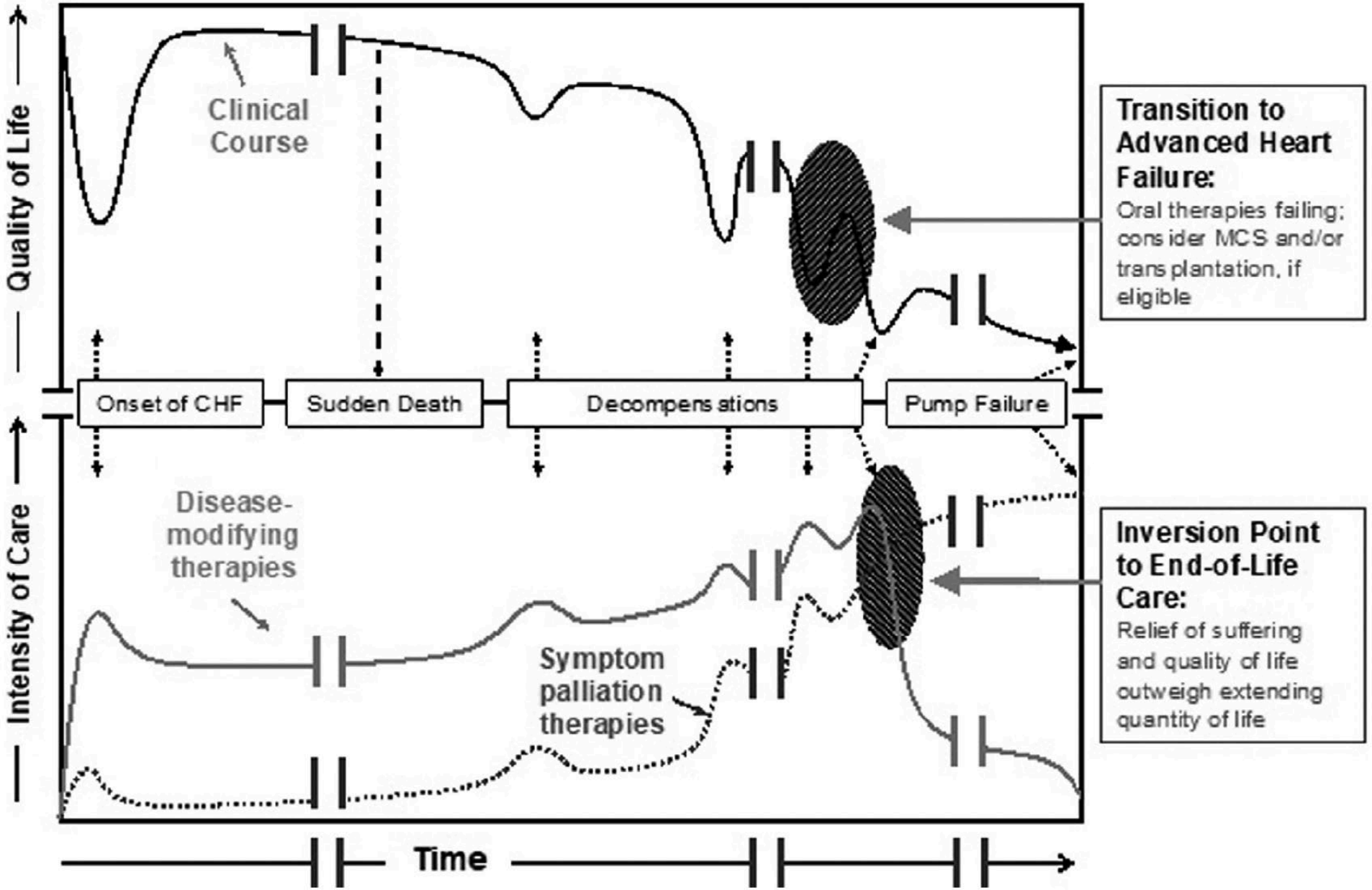
- Acute coronary syndrome
- Uncontrolled hypertension
- Atrial fibrillation and arrhythmias
- Additional cardiac disease
- Acute infections
- Non-adherence to medications or diet
- Anemia
- Hypo-/Hyperthyroidism
- Medications that increase sodium retention
- Medications with negative inotrope

Decompensated Heart Failure



Special considerations

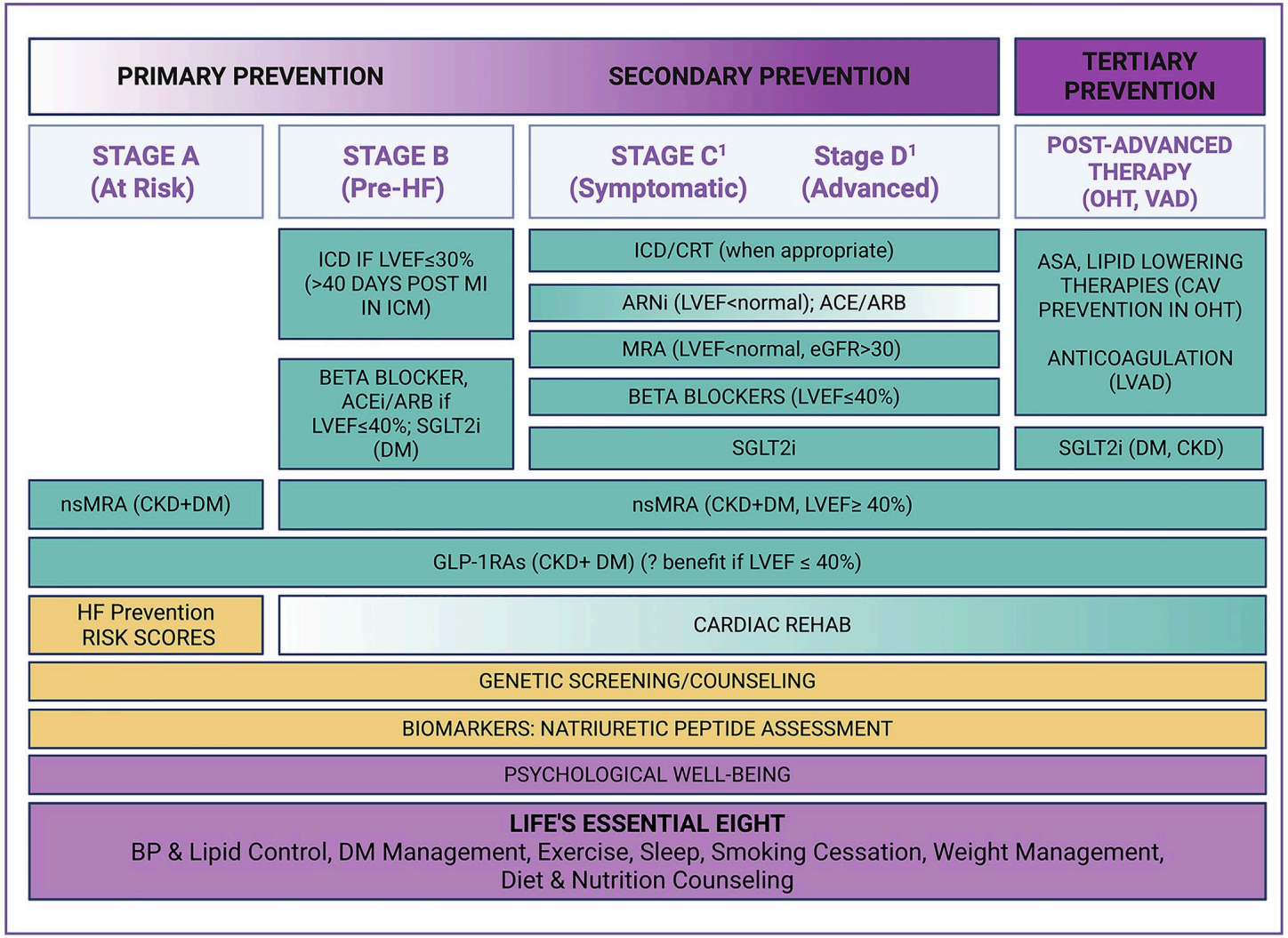
- Consider discontinuation of beta blockers in patients with low cardiac output, severe volume overload, advanced AV block or ACEi/ARNi with angioedema
- VTE prophylaxis is recommended in all hospitalized patients


Quality of Life
Clinical Course
Onset of CHF
Sudden Death
Decompensations
Pump Failure
Transition to Advanced Heart Failure:
Oral therapies failing; consider MCS and/or transplantation, if eligible
Intensity of Care
Disease-modifying therapies
Symptom palliation therapies
Inversion Point to End-of-Life Care:
Relief of suffering and quality of life outweigh extending quantity of life
Time

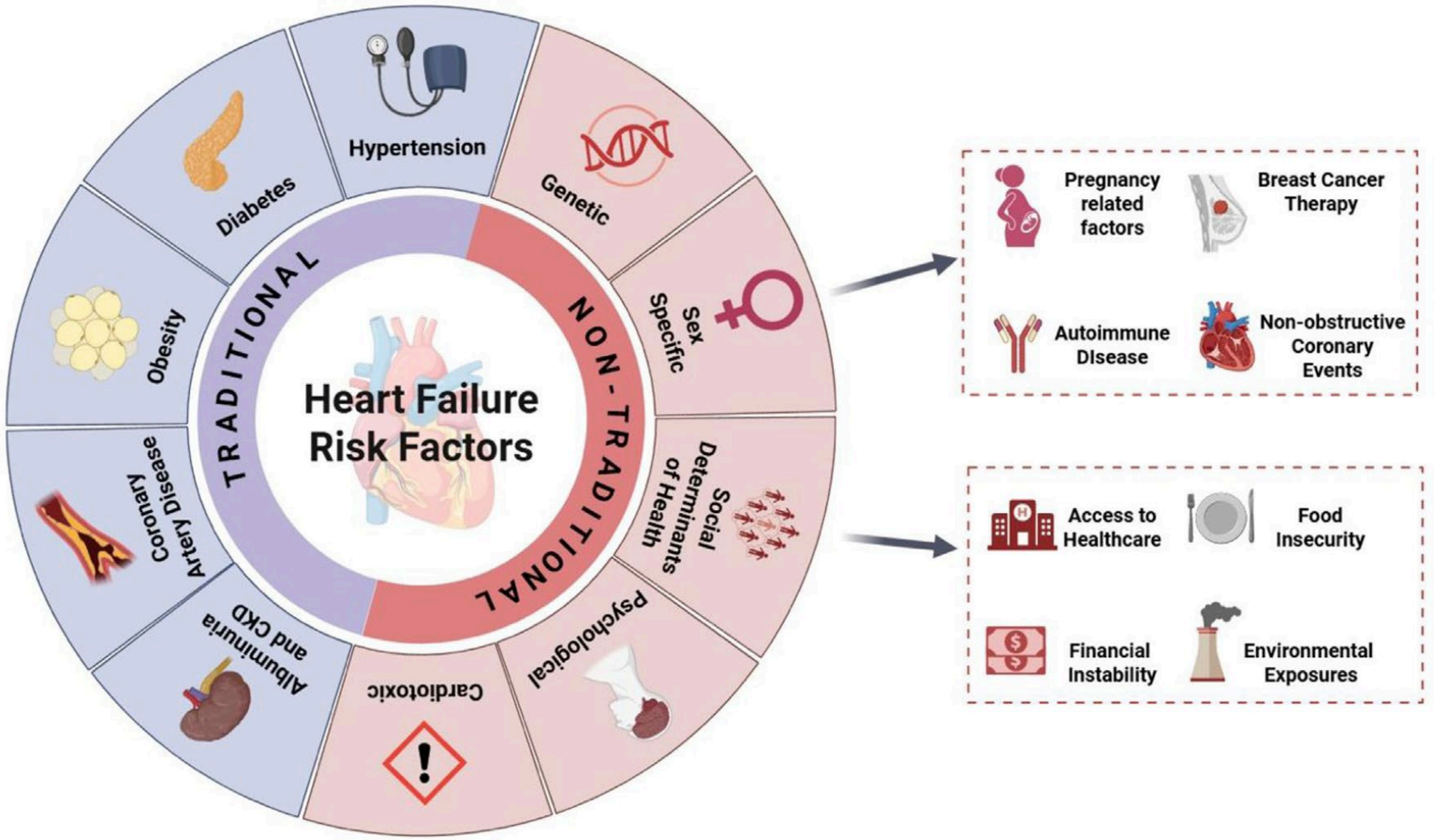
IS IT STAGE D HEART FAILURE?

I	Need for **inotropes**
N	**New** York Heart Association Class IV
E	Worsening **end-organ** dysfunction
E	**Ejection fraction** <20%
D	**Defibrillator** shocks for ventricular arrhythmias
H	Recurrent **HF** hospitalizations
E	**Escalating** diuretic dose
L	**Low blood pressure**
P	**Progressive** intolerance of GDMT

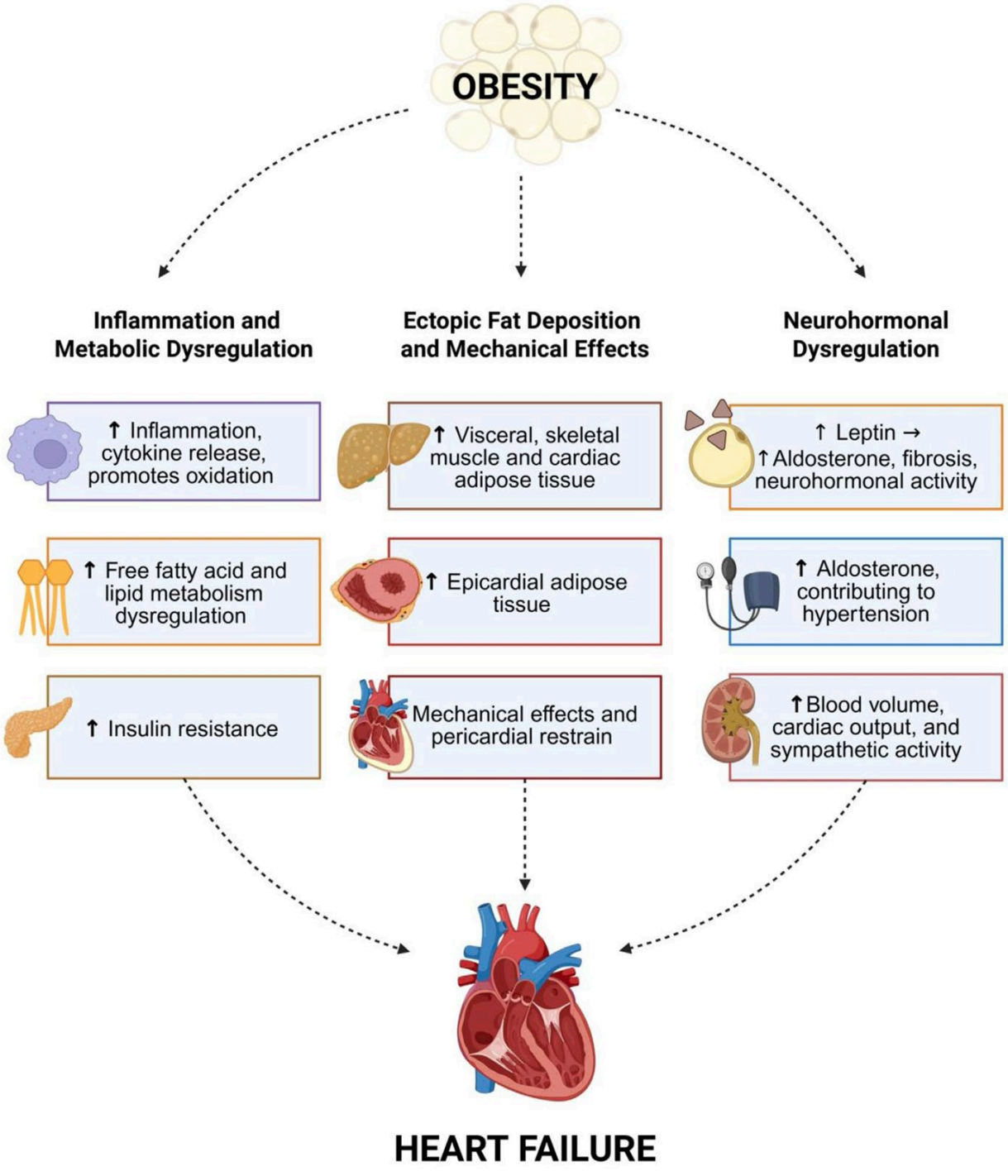
HEART FAILURE PREVENTION



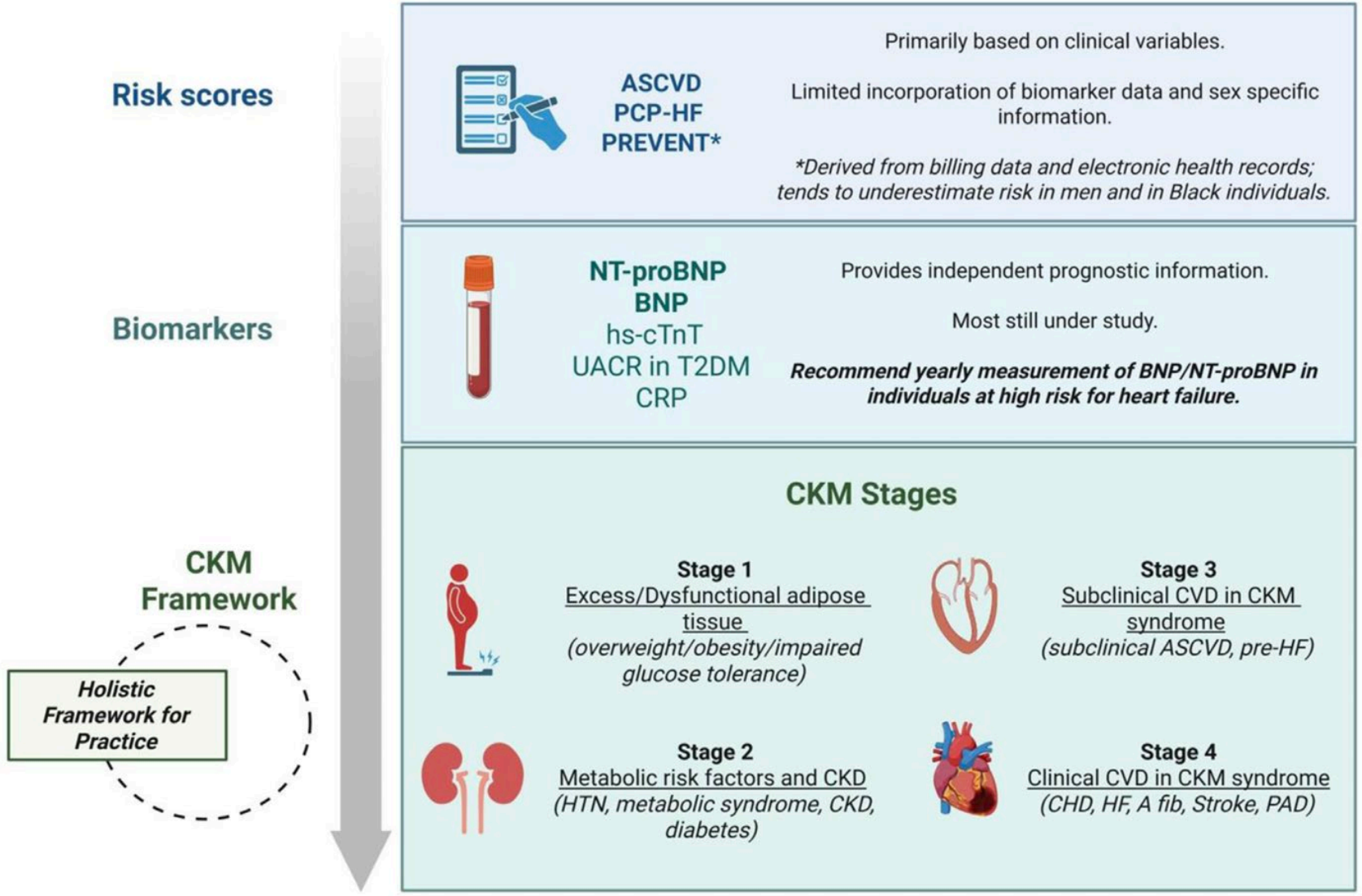
RISK FACTORS FOR HEART FAILURE



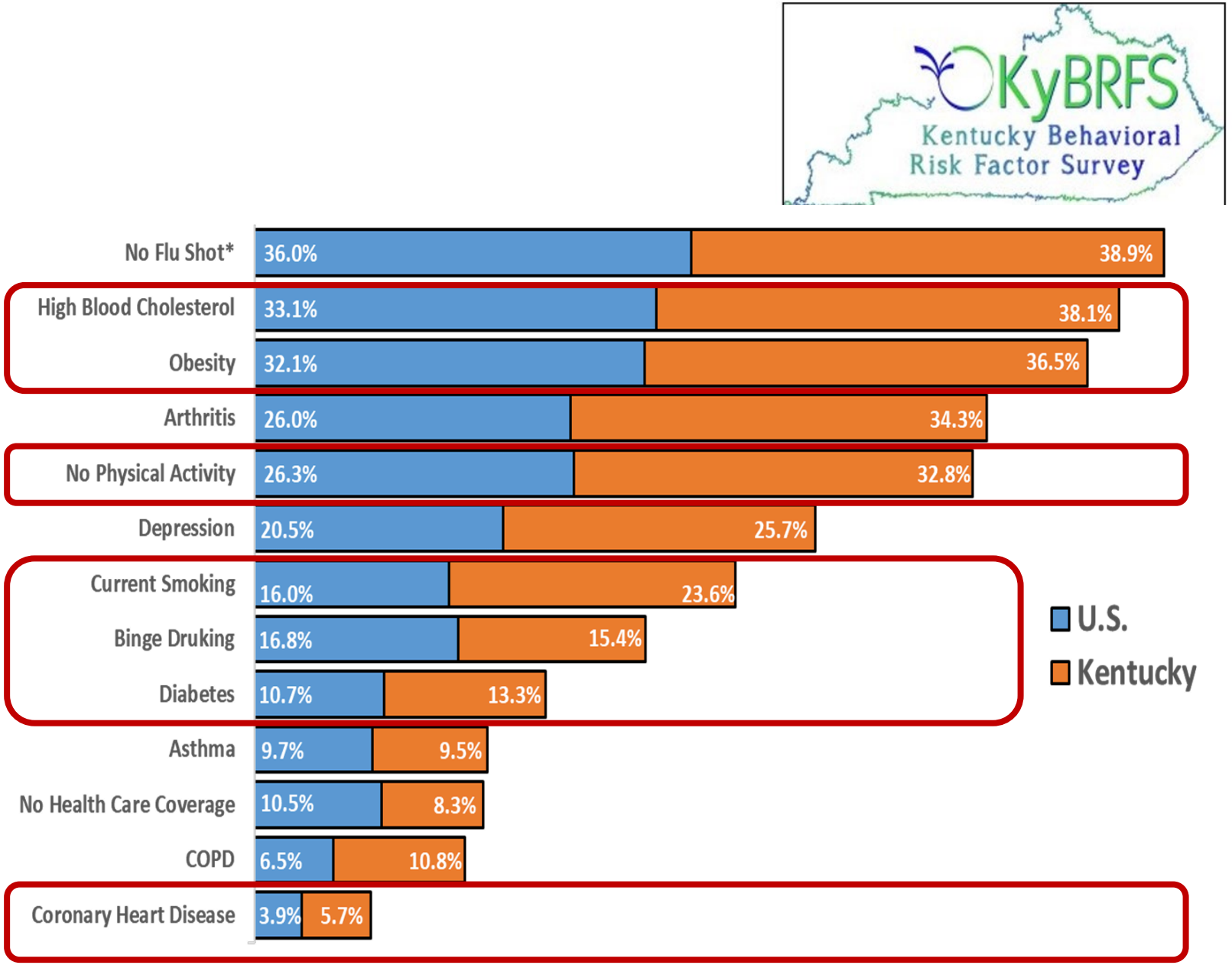
LINK BETWEEN OBESITY AND HEART FAILURE



RISK ASSESSMENT IN HEART FAILURE

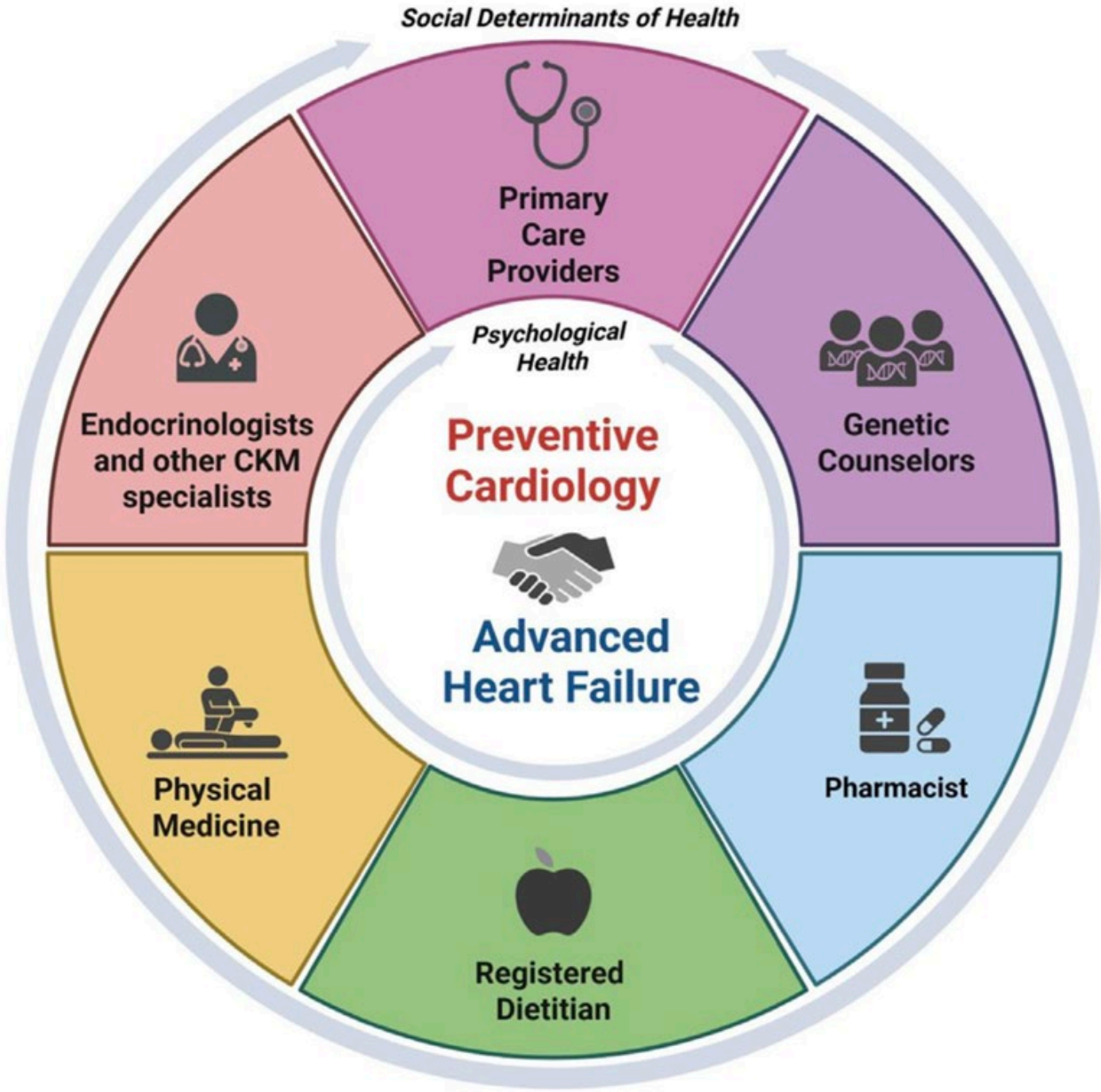


HEART FAILURE RISK FACTORS IN KENTUCKY

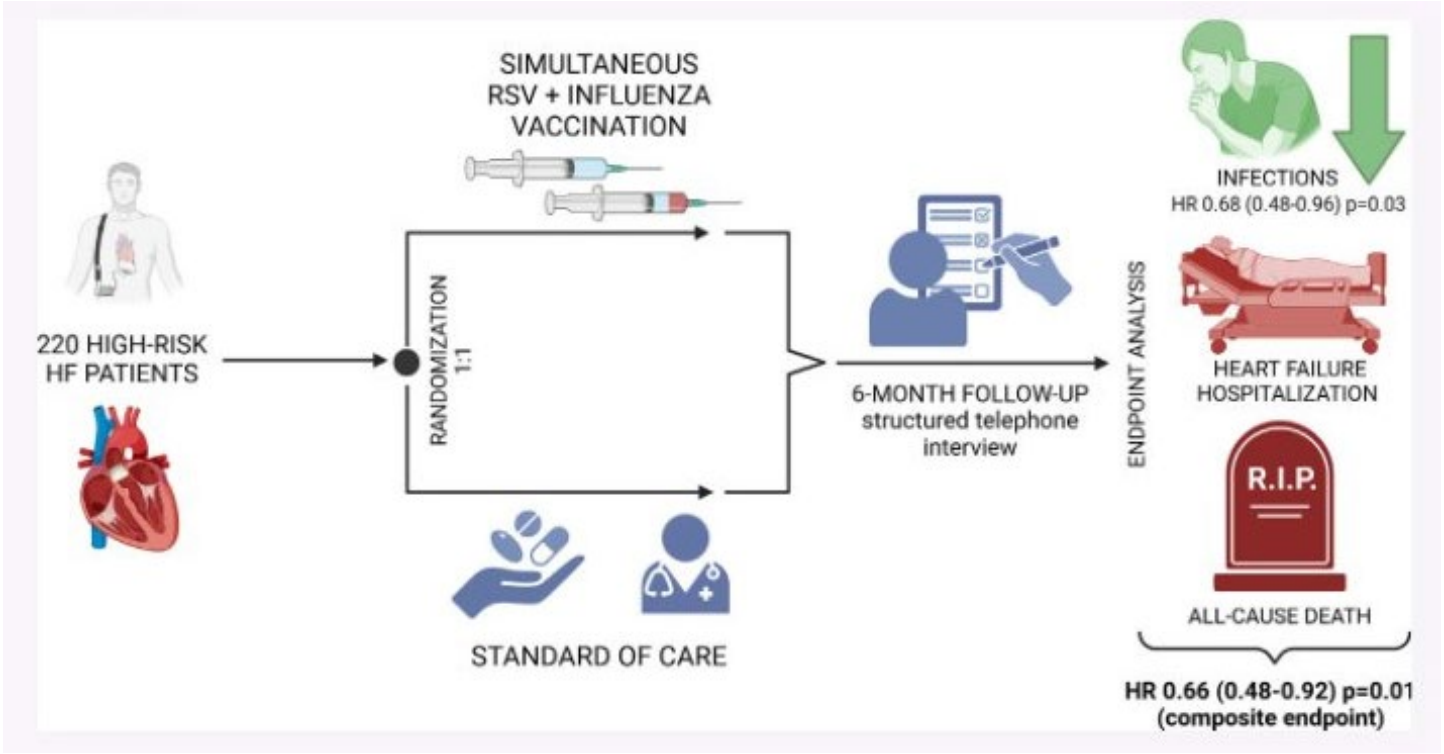


2021 KyBRFS Annual Data Report

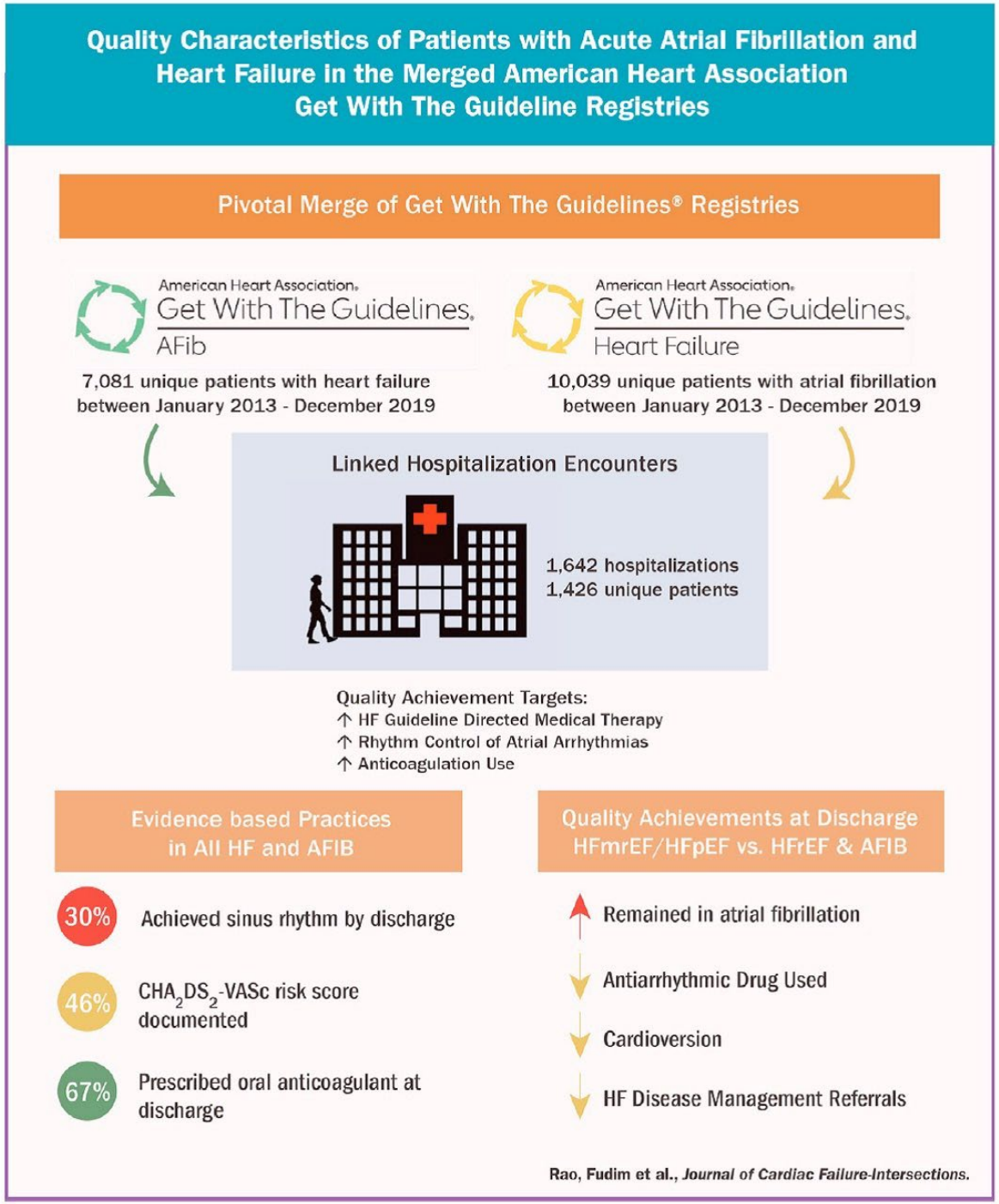
MULTI-DISCIPLINARY PARTNERSHIP



FLU VACCINATION

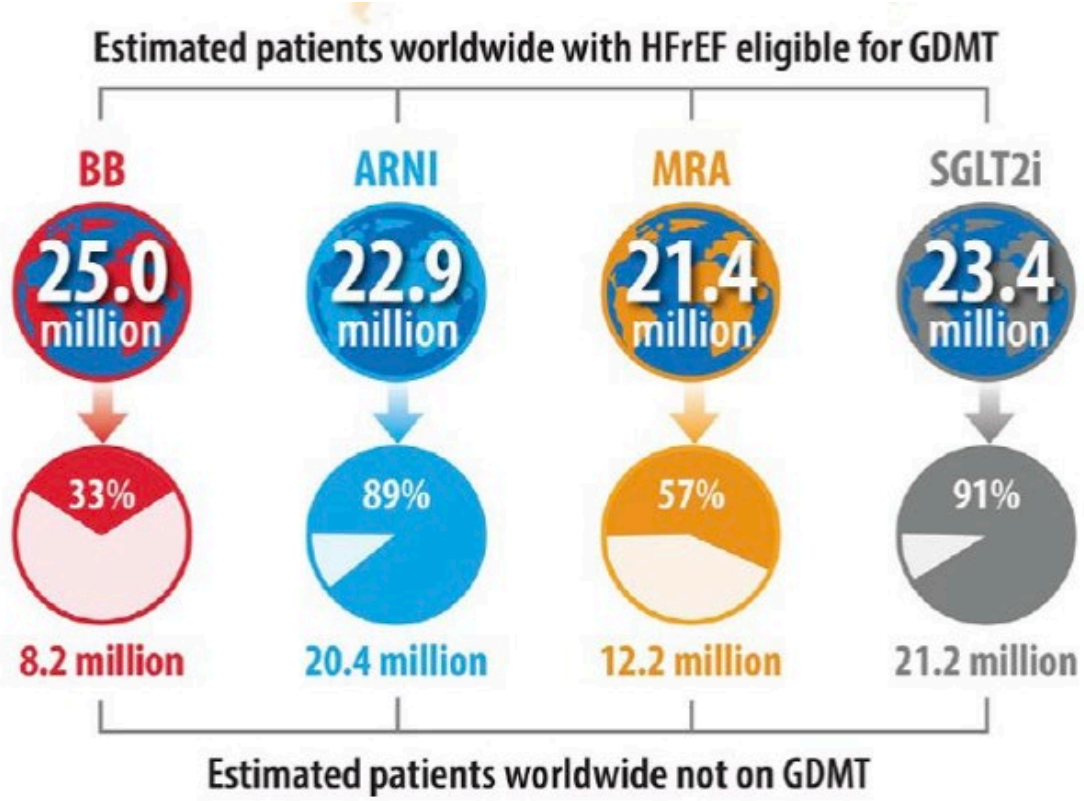


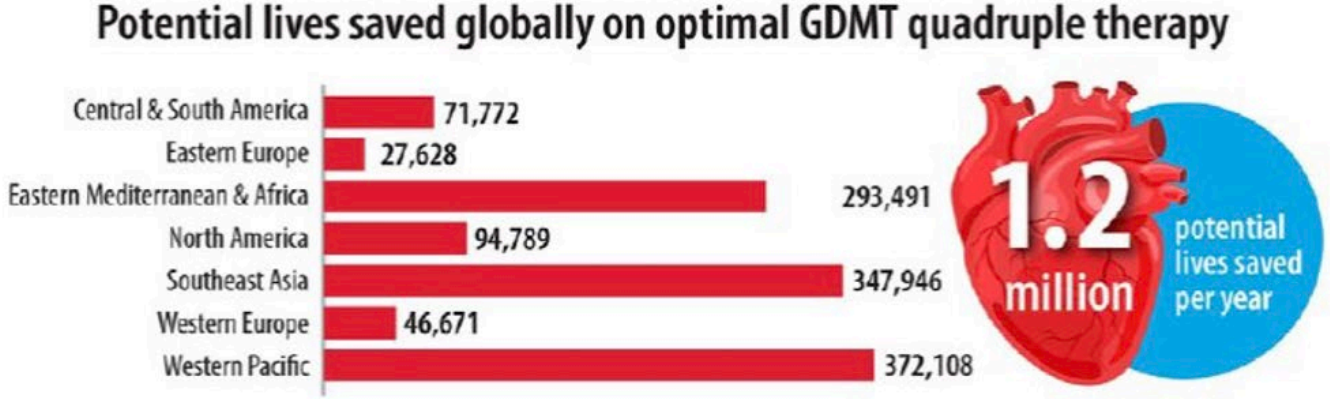
ATRIAL FIBRILLATION AND HEART FAILURE



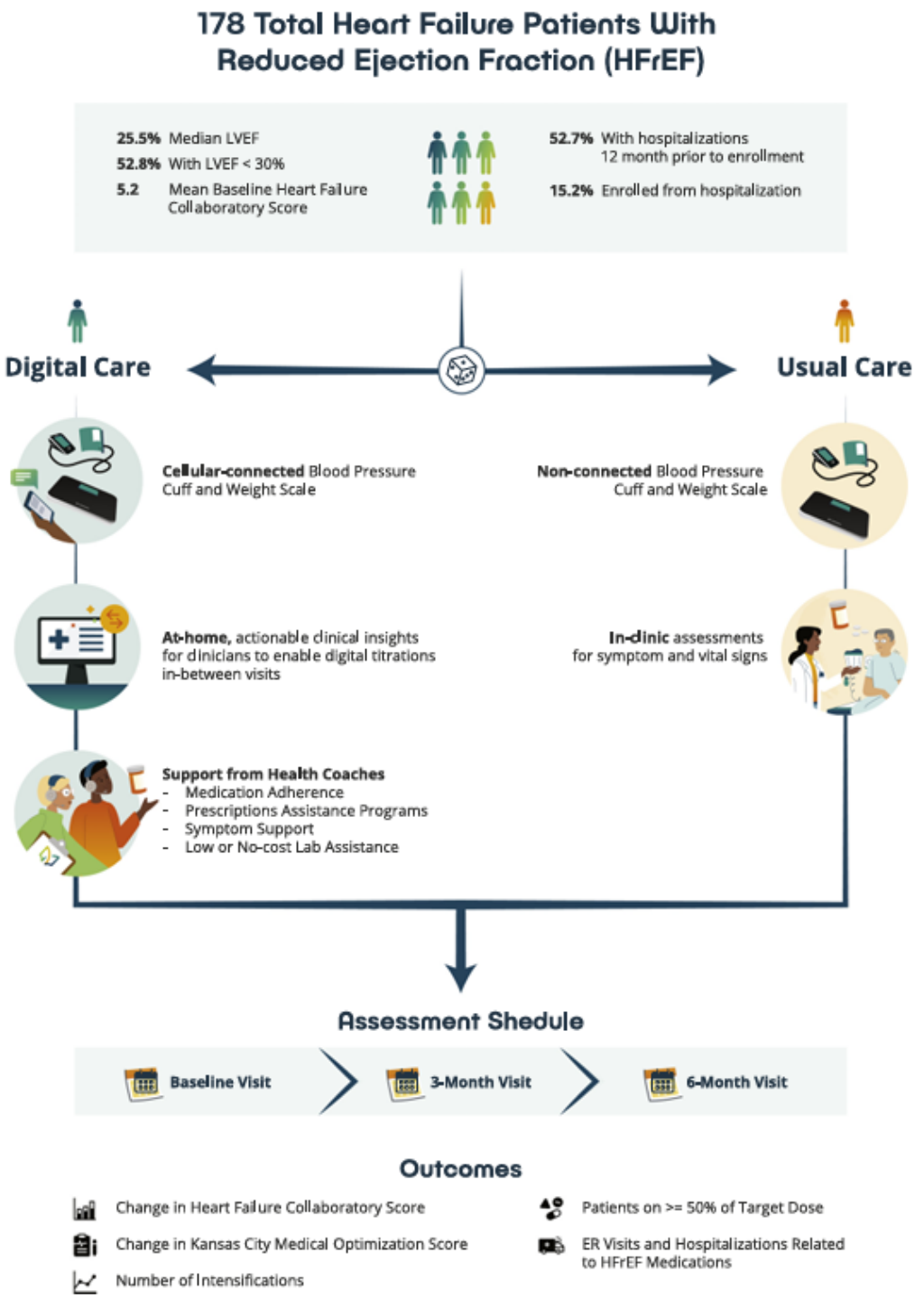
HFrEF Prevalence is Estimated at

29 million worldwide

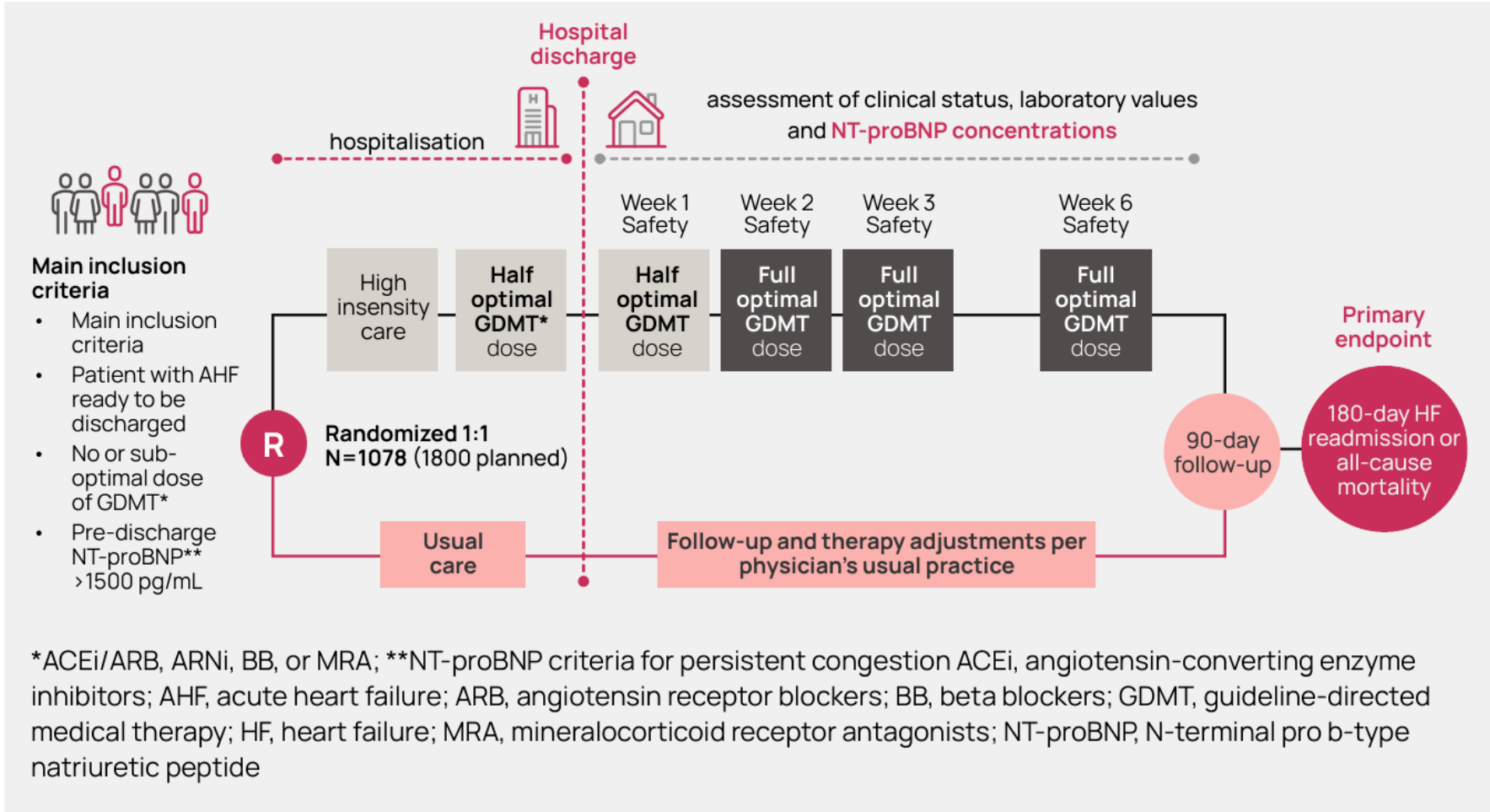




VITAL-HF TRIAL



STRONG-HF TRIAL



*ACEi/ARB, ARNi, BB, or MRA; **NT-proBNP criteria for persistent congestion ACEi, angiotensin-converting enzyme inhibitors; AHF, acute heart failure; ARB, angiotensin receptor blockers; BB, beta blockers; GDMT, guideline-directed medical therapy; HF, heart failure; MRA, mineralocorticoid receptor antagonists; NT-proBNP, N-terminal pro b-type natriuretic peptide

STRONG-HF TRIAL

Results

The high intensity care group: **34% relative** and **8.1% absolute risk reduction (ARR)** in the combination of death or heart failure readmission.[14]

CV (cardiovascular) death	HF readmission	All-cause death
26% lower	**44% lower**	**16% lower**

STRONG-HF study results demonstrated clear benefits for acute heart failure patients by adapting the strategy of care.

Rapid and Intensive Medical Therapy for Heart Failure with Reduced Ejection Fraction

Step #1
Rapid initiation of disease-modifying medical therapies

Quadruple Therapy			
ARNI	**BB**	**MRA**	**SGLT2i**

- Prioritize initiating (at least) low doses
- Prioritize initiating multiple/all medications prior to dose escalation of any one medication

Step #2
Dose escalation to target doses, as tolerated

Quadruple Therapy			
↑ARNI	**↑BB**	**↑MRA**	***Continue*** **SGLT2i**

- Achieve maximally tolerated or target doses (as well tolerated) within 4-6 weeks
- Prioritize dose escalation of BB as tolerated (strongest dose-response data)
- Consider including virtual/remote visits to facilitate rapid titration
- Serial laboratory monitoring of kidney function, serum potassium, and NT-proBNP during titration to confirm safety

Cumulative Risk Reduction

All-Cause Mortality
RRR 73%, ARR 26%, NNT = 3.9
Extend Median Survival 7-11 Years

5 Core Principles:

1. **Avoid Delays:** Speed of GDMT optimization and "time to quadruple therapy" matters.
2. **In-hospital Initiation is Essential:** The most evidence-based strategy for improving post-discharge outcomes and adherence.
3. **Overcome the Risk-Treatment Paradox:** Absolute benefits of GDMT are generally greater among patients less likely to be prescribed medication (e.g., older age, frailty, comorbidities).
4. **Acknowledge the Safety Profile:** Barring absolute contraindications, GDMT has a favorable safety profile across the spectrum of age, frailty, and comorbidities.
5. **Recognize Risks of Omission:** Barring absolute contraindications, "side effects" of omitting GDMT may include higher risks of death and hospitalization.

QUAD-HF Study - A novel treatment score (QUAD Score) to promote adherence to clinical practice guidelines for patients with heart failure and a reduced ejection fraction

To investigate the association between the QUAD score and risk of one-year outcomes of newly diagnosed patients with a left ventricular ejection fraction (LVEF) <50% and heart failure

QUAD Score
HFrEF Therapeutic Score

Medication Class	Score
ACEi, AIIRB, ARNI	
BB	
MRA	
SGLT2i	
Weight	
QUAD Score	

Legend	
Dose	Score
<50%	1
≥50%	4
Weight	8

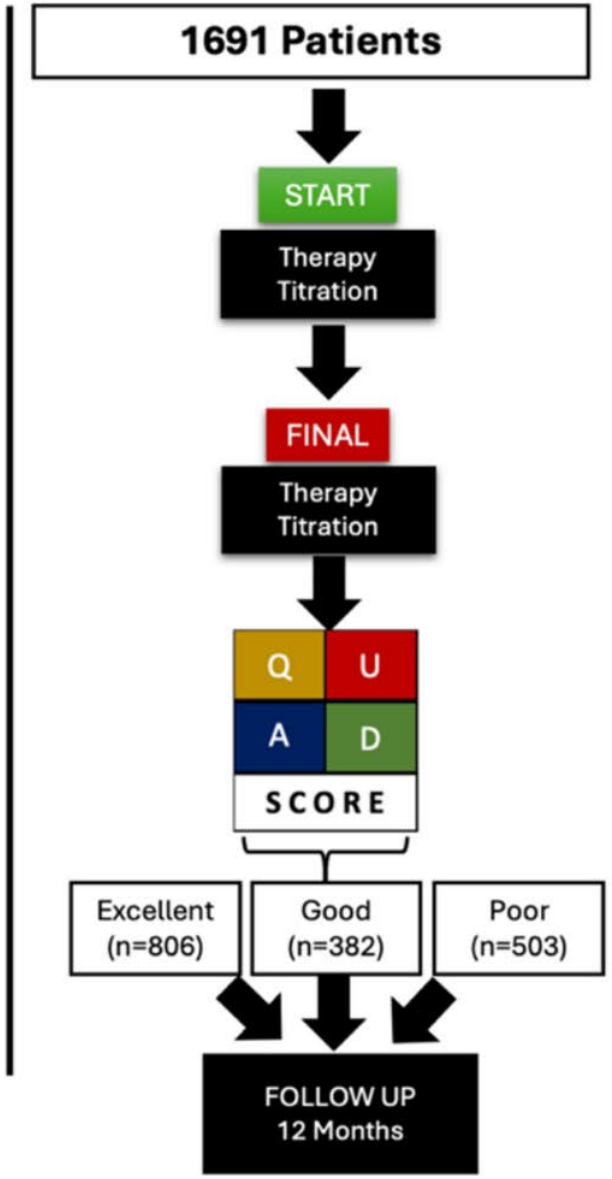
EXAMPLES
Excellent (15-24)
1. 4 medication classes at ≥50% dose (4+4+4+4)+8 = 24
(Sacubitril Valsartan 200mg, Bisoprolol 10mg, Eplerenone 50mg, Dapagliflozin 10mg)
2. 1 medication class at ≥50% and 3 at <50% dose (4+1+1+1)+8 = 15 (Dapagliflozin 10mg, Sacubitril Valsartan 50mg, Bisoprolol 2.5mg, Eplerenone 12.5mg)

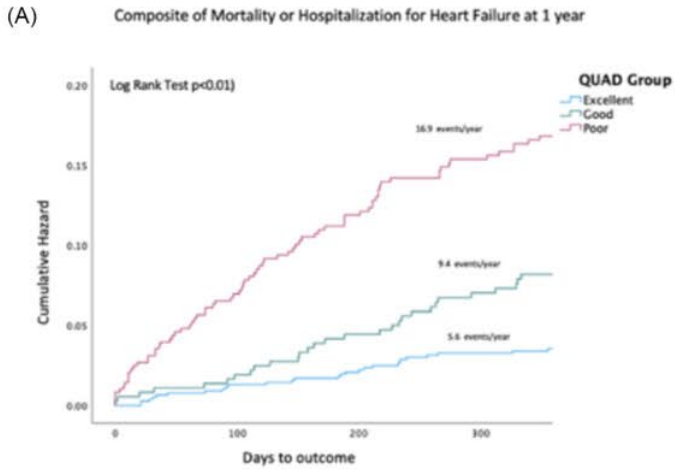
Good (8-14)
1. 3 medication classes at ≥ 50% dose (4+4+4)= 12
(Sacubitril Valsartan 100mg, Bisoprolol 5mg, Eplerenone 25mg)
2. 2 medication classes at 50% dose (4+4) = 8

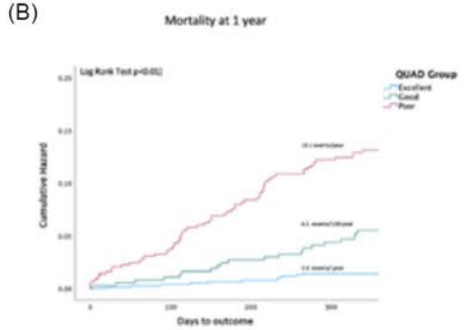
Poor (<8)
1. 3 medication classes at <50% dose (1+1+1) = 3
(Sacubitril Valsartan 50mg, Bisoprolol 1.25mg, Eplerenone 12.5mg)
2. 1 medication class at ≥50% dose = 4
(Dapagliflozin 10mg)

An 'e' is added to the score to mark an exemption or variance in medication class use. For example, if a patient is on >50% doses of 3 medication classes but have a clinical reason they are exempt from an MRA, they would be scored a 12e, with appropriate documentation in the clinical notes.

Dose – Percentage of maximum guideline recommended HFrEF dose of drug, **Weight** – Premium score added if all four foundational medication classes prescribed – 8. **QUAD Score Interpretation** – Poor <8 , Good 8-14, Excellent 15-24.
HFrEF – Heart Failure with a Reduced Ejection Fraction, **ACEi** – Angiotensin Converting Enzyme inhibitor, **ARNI** – Angiotensin Receptor, Neprilysin Inhibitor, **AIIRB** – Angiotensin II Receptor blocker, **BB** – Betablocker, **MRA** – Mineralocorticoid Receptor Antagonist, **SGLT2i** – Sodium Glucose Co-transporter II Inhibitor.



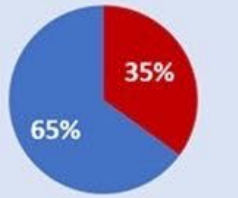




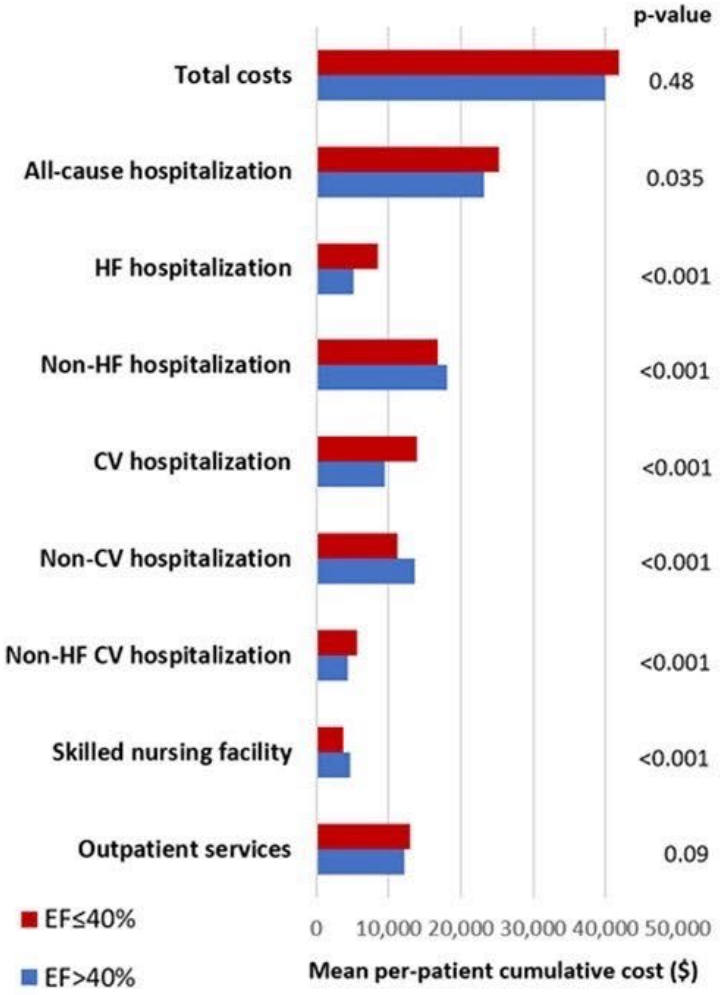
GWTG-HF

patients ≥ 65 years old

N=146,003



Total and Cause-Specific Costs through 1 Year Post-Discharge



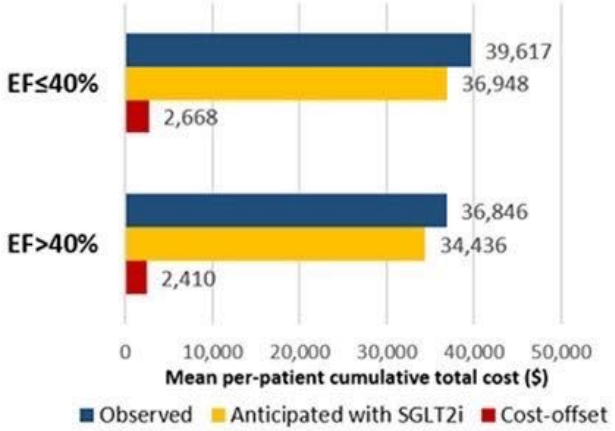
92% of cohort
estimated as
eligible for SGLT2i

N=133,914

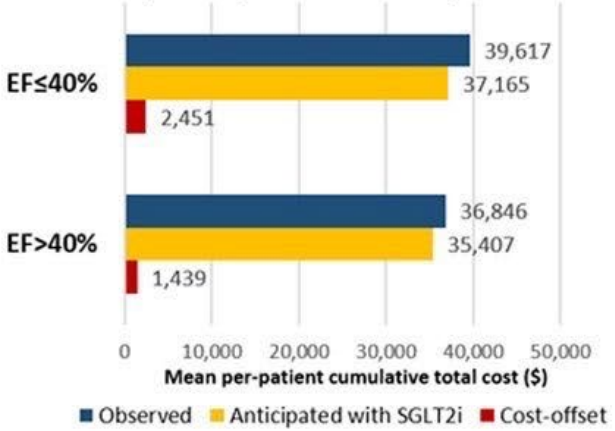
Projecting Cost-Offset in Total Costs through 1 Year Post-discharge with SGLT2i

using treatment effects from trial-level meta-analysis from 5 clinical trials
(DAPA-HF, EMPEROR-Reduced, EMPEROR-Preserved, SOLOIST-WHF, and DELIVER)

SGLT2i reduces total all-cause hospitalizations
(RR 0.89, 95%CI: 0.84-0.93)



SGLT2i reduces total HF hospitalizations
(RR 0.71, 95%CI: 0.66-0.76)



THANK YOU