Heart Failure

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Faculty of Health Sciences

Fakulteit Gesondheidswetenskappe
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Disclosure

I manage a large diabetes project funded by the Lilly Global Health Programme

I have received honoraria by most pharmaceutical companies

In SA for talks given over the last 15 years

The majority of slides I am presenting are those of the American Heart Association

AHA Clinical Update

ADAPTED FROM:

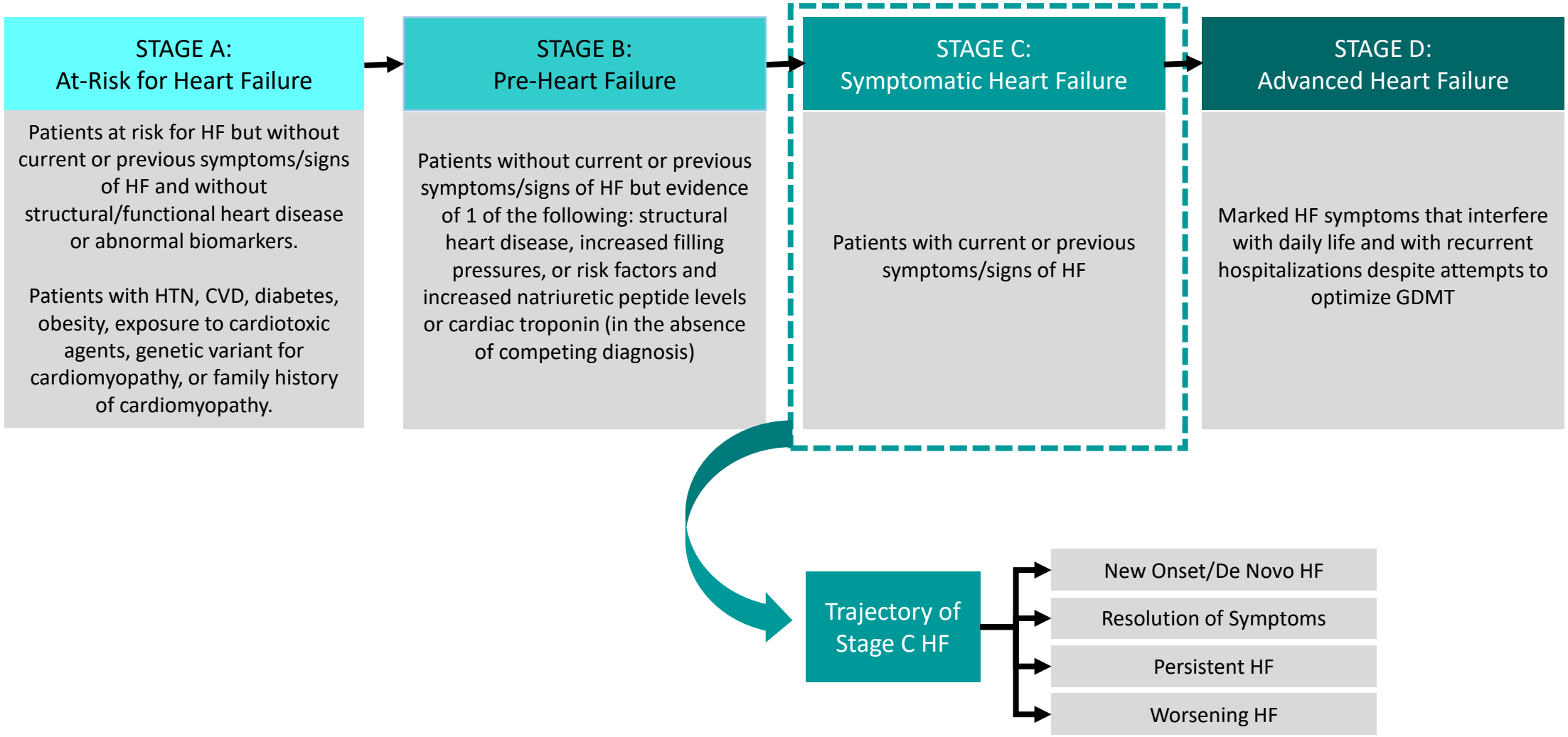
2022 AHA/ACC/HFSA Guideline for Heart Failure

American Heart Association.

Overview: Key concepts

1. The stages of heart failure
2. The types of LV heart failure
3. The current Guideline Derived Management and Therapy (GDMT)
4. The use of devices (ICD, CRT)
5. Transition of care
6. Management of comorbidities

Stages of Heart Failure



Abbreviations: CVD indicates cardiovascular disease; GDMT, guideline-directed medical therapy; HF, heart failure; HTN, hypertension; and NYHA, New York Heart Association.

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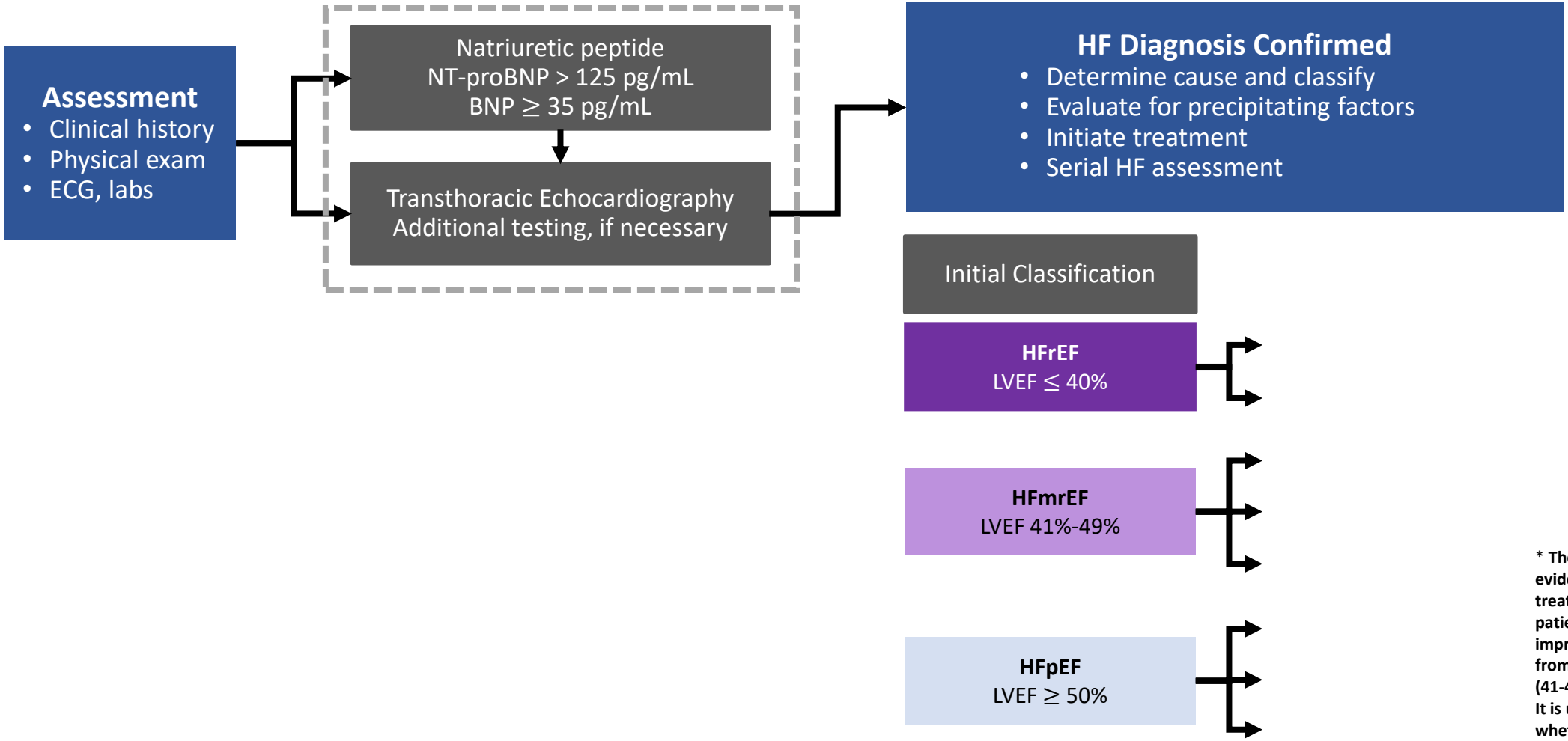
Diagnostic Algorithm for HF and LVEF Based on HF Classification



*** There is limited evidence to guide treatment for patients who improve their LVEF from mildly reduced (41-49%) to ≥50%. It is unclear whether to treat these patients as HFpEF or HFmrEF.**

Abbreviations: BNP indicates B-type natriuretic peptide; ECG, electrocardiogram; HF, heart failure; HFimpEF, heart failure with improved ejection fraction; HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; LV, left ventricle; LVEF, left ventricular ejection fraction; and NT-proBNP, N-terminal pro-B type natriuretic peptide.

Heidenreich, P. A. et al. (2022). 2022 AHA/ACC/HFSA Guideline for Heart Failure. *Circulation*.

Heart of Soweto Study 2008

- Chris Hani Baragwanath Hospital services the 1.1 million black African community of Soweto, South Africa. Of 1,960 cases of HF and related cardiomyopathies in 2006, we prospectively collected detailed demographic and clinical data from all 844 de novo presentations (43%).

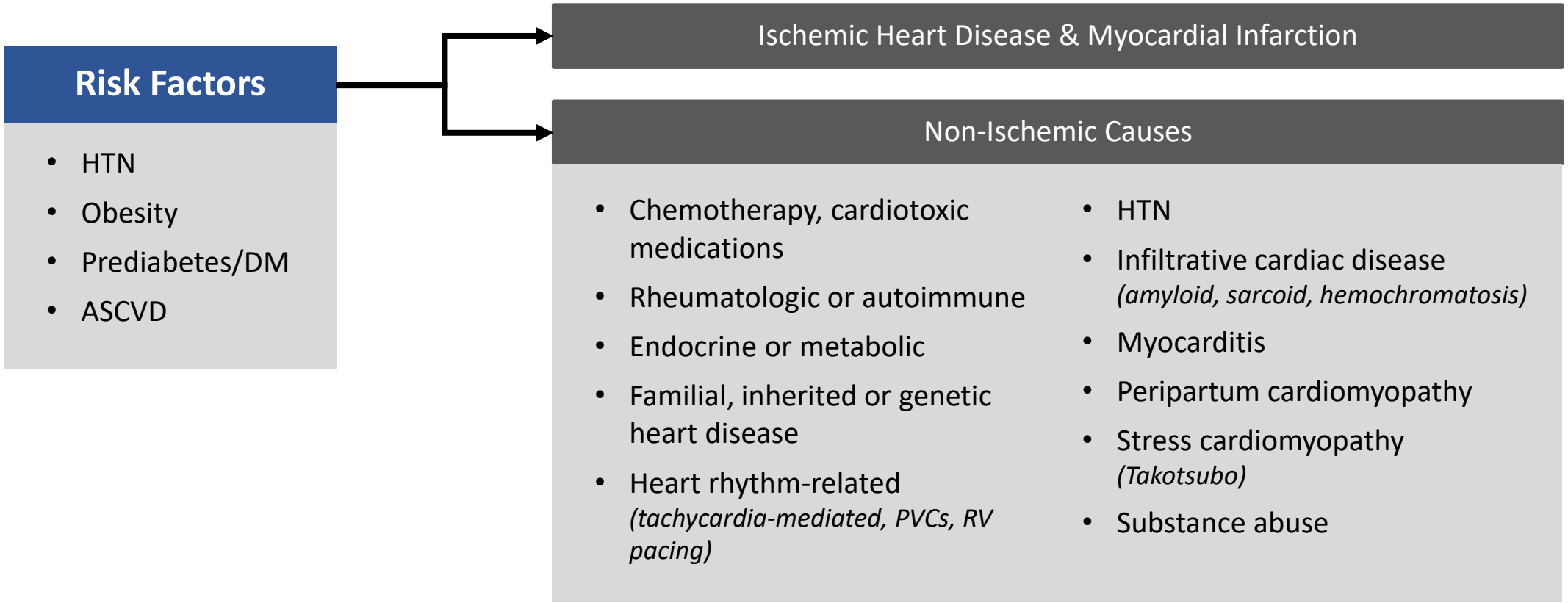
- Mean age was 55 +/- 16 years, and women (479 [57%]) and black Africans (739 [88%]) predominated.
- 180 patients (23%) had isolated diastolic dysfunction,
- 234 (28%) tricuspid regurgitation,
- 121 (14%) isolated right HF,
- and 100 (12%) mitral regurgitation.

Circulation 2008 Dec 2;118(23):2360-7.doi:10.1161/CIRCULATIONAHA.108.786244.

Heart of Soweto Study 2008

- The most common diagnoses were hypertensive HF (281 [33%]), idiopathic dilated cardiomyopathy (237 [28%]), and, surprisingly, right HF (225 [27%]).
- Black Africans had less ischemic cardiomyopathy (adjusted odds ratio, 0.12; 95% CI, 0.07 to 0.20) but more idiopathic and other causes of cardiomyopathy (adjusted odds ratio, 4.80; 95% CI, 2.57 to 8.93).
- Concurrent renal dysfunction, anemia, and atrial fibrillation were found in 172 (25%), 72 (10%), and 53 (6.3%) cases, respectively.

Causes of Heart Failure



Abbreviations: ASCVD indicates atherosclerotic cardiovascular disease; DM, diabetes mellitus; HTN, hypertension; PVC, premature ventricular contraction; and RV, right ventricle.

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Initial Evaluation of Patients with Heart Failure

History and Physical exam

Class 1 Recommendations:

- Measure vitals signs and assess for evidence of congestion
- Evaluate for the presence of advanced HF
- In patients with cardiomyopathy use a 3-generation family history to screen for inherited disease
- Use H&P to direct diagnostic strategies to uncover causes which require disease specific management
- Identify cardiac & non-cardiac diseases, lifestyle & behavioral factors, and SDOH which may cause or worsen HF

Laboratory and ECG testing

Class 1 Recommendations:

CBC, UA, serum electrolytes, serum creatinine, BUN, glucose, lipid profile, LFTs, iron studies, and TSH

12-lead ECG to optimize management

For patients presenting with HF, the specific cause of HF should be explored using additional laboratory testing for appropriate management

Abbreviations: BUN indicates blood urea nitrogen; CBC indicates complete blood count; ECG, electrocardiogram; H&P, history and physical; HF, heart failure; LFTs, liver function tests; SDOH, social determinates of health; and TSH, thyroid-stimulating hormone.

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Cardiac imaging

- CXR
- ECHO
- CT/MR/SPECT/PET
- Angio

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Recommendations for Patients at Risk of HF & Pre-HF

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)

Pre-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 counselling and testing (2a)

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

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.

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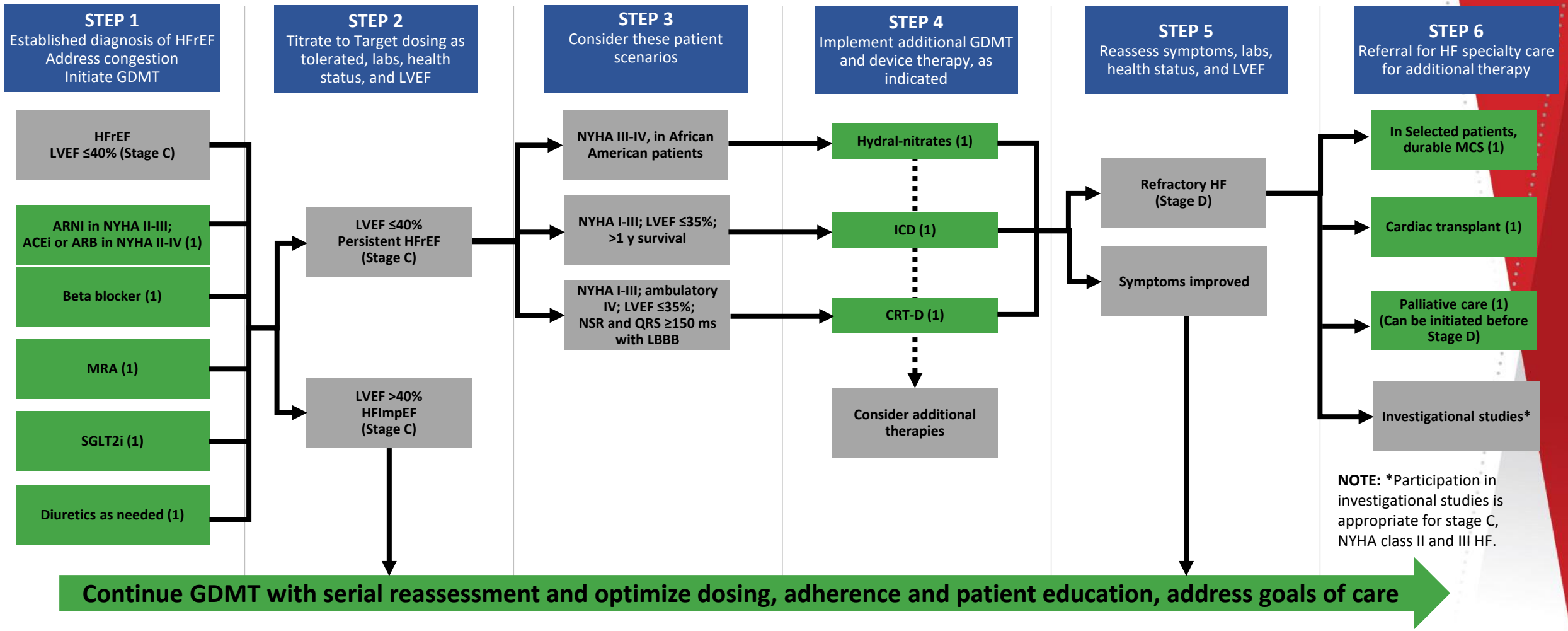
Treatment of HFrEF Stages C and D



Abbreviations: ACEi indicates angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNi, angiotensin receptor-neprilysin inhibitor; CRT, cardiac resynchronization therapy; GDMT, guideline-directed medical therapy; HF, heart failure; HFrEF, heart failure with reduced ejection fraction; hydral-nitrates, hydralazine and isosorbide dinitrate; ICD, implantable cardioverter-defibrillator; LBBB, left bundle branch block; LVEF, left ventricular ejection fraction; MCS, mechanical circulatory support; MRA, mineralocorticoid receptor antagonist; NSR, normal sinus rhythm; NYHA, New York Heart Association; SCD, sudden cardiac death; and SGLT2i, sodium-glucose cotransporter 2 inhibitor.

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Value Statements for GDMT for HFrEF

Take Home Point: An important aspect of HF care, Class 1 recommended medical therapies for HFrEF have very high value (low cost).

In patients:

With previous or current symptoms of chronic HFrEF, in whom ARNi is not feasible, tx with ACEi or ARB provides high economic value.
Value Statement: High Value (A)

With chronic symptomatic HFrEF, tx with an ARNi instead of an ACEi provides high economic value.
Value Statement: High Value (A)

With HFrEF and NYHA class II to IV symptoms, MRA therapy provides high economic value.
Value Statement: High Value (A)

With HFrEF, with current or previous symptoms, beta-blocker therapy provides high economic value.
Value Statement: High Value (A)

With symptomatic chronic HFrEF, SGLT2i therapy provides intermediate economic value.
Value Statement: Intermediate Value (A)

Self-identified as African American with NYHA class III to IV HFrEF who are receiving optimal medical therapy with ACEi or ARB, beta blockers, and MRA, the combination of hydralazine and isosorbide dinitrate provides high economic value.
Value Statement: High Value (B-NR)

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Abbreviations: ACEi indicates angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNi, angiotensin receptor-neprilysin inhibitor; HFrEF, heart failure with reduced ejection fraction; MRA, mineralocorticoid receptor antagonist; SGLT2i, NR, non-randomized; sodium-glucose cotransporter 2 inhibitor; and tx, treatment.

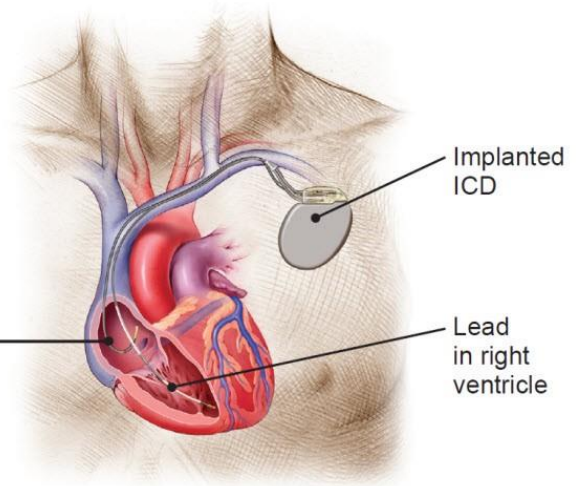
Value Statements for Device Therapy

A transvenous ICD provides high economic value in the primary prevention of SCD particularly when the patient's risk of death caused by ventricular arrythmia is deemed high and the risk of nonarrhythmic death (either cardiac or noncardiac) is deemed low based on the patient's burden of comorbidities & functional status.

Value Statement: High Value (A)

For patients who have LVEF ≤35%, sinus rhythm, LBBB with a QRS duration of ≥150 ms, and NYHA class II, III, or ambulatory IV symptoms on GDMT, CRT implantation provides high economic value.

Value Statement: High Value (B-NR)



Abbreviations: CRT indicates cardiac resynchronization therapy; GDMT, guideline-directed medical therapy; ICD; implantable cardioverte bundle branch block; LVEF, left ventricular ejection fraction; ms; millisecond; NR, nonrandomized; NYHA, New York Heart Association; death.

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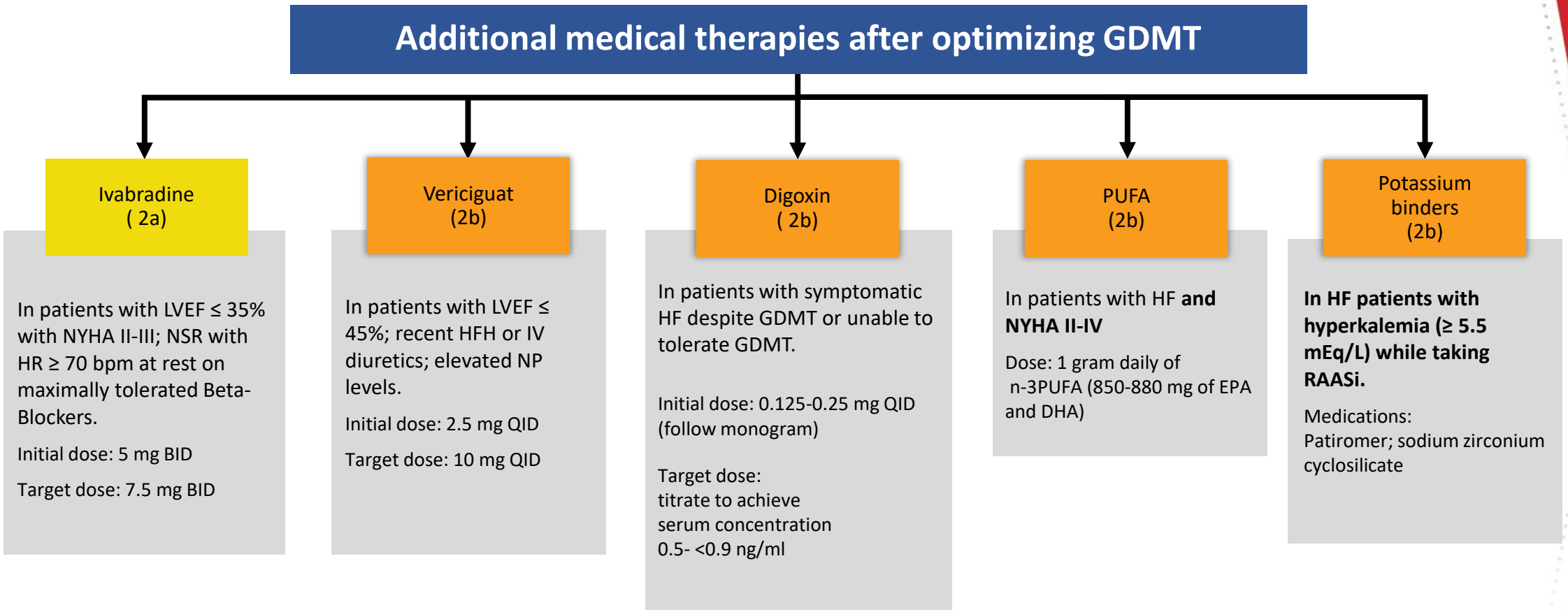
Additional Medical Therapies after GDMT Optimization



Abbreviations: DHA indicates docosaexaenoic acid; EPA, eicosapentaenoic acid; GDMT, guideline-directed medical therapy; HF, heart failure; HFH, heart failure hospitalization; HR, heart rate; IV, intravenous; LVEF, left ventricular ejection fraction; NP, natriuretic peptide; NSR, normal sinus rhythm; NYHA, New York Heart Association; PUFA, polyunsaturated fatty acid; and RAASi, renin-angiotensin-aldosterone system inhibitors.

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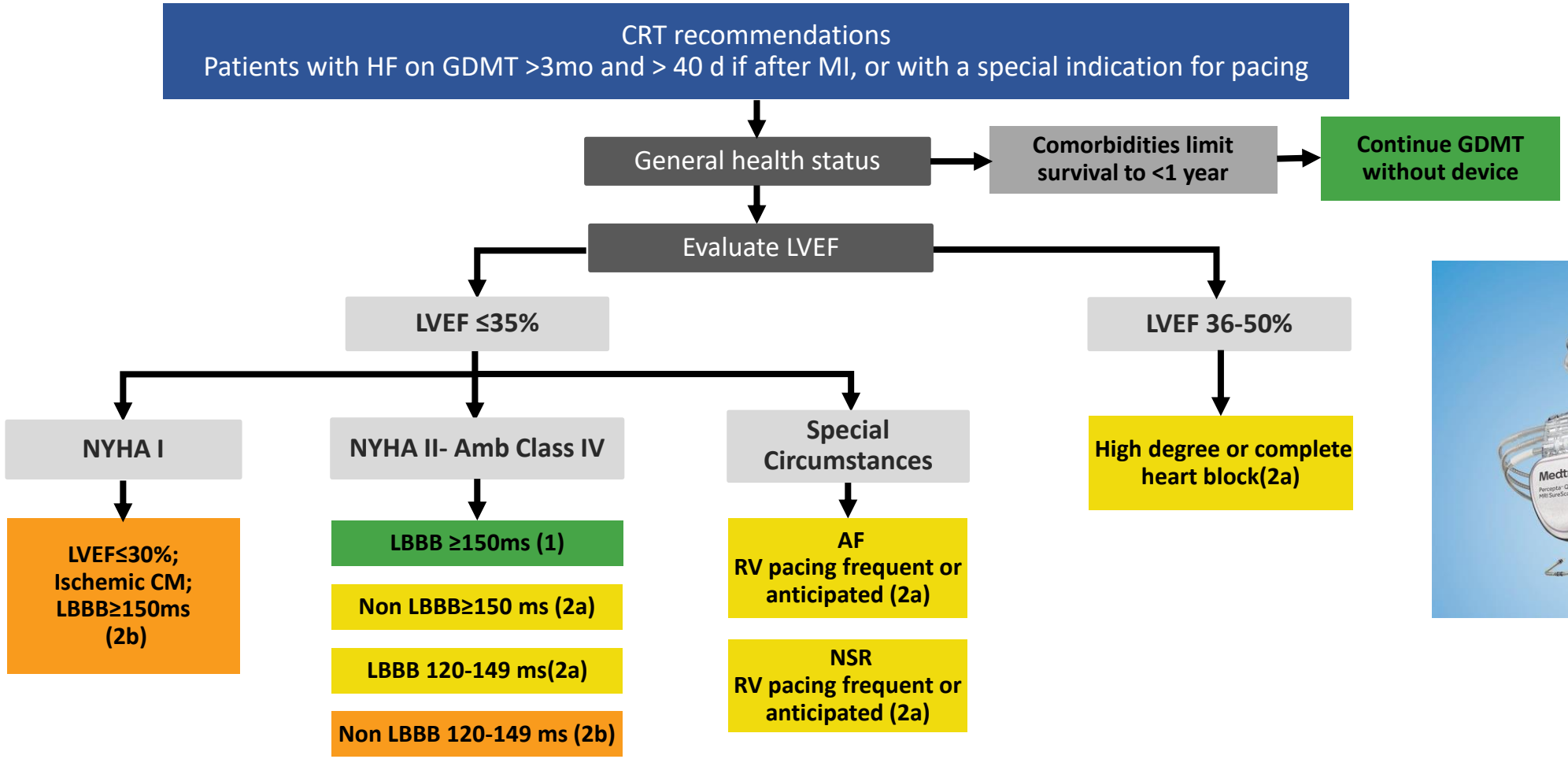
Algorithm for CRT Indications in Patients with Cardiomyopathy or HFrEF



Abbreviations: AF indicates atrial fibrillation; Amb, ambulatory; CM, cardiomyopathy; CRT, cardiac resynchronization therapy; GDMT, guideline-directed medical therapy; HB, heart block; HF, Heart Failure; HFH, heart failure hospitalization; HFrEF, heart failure with reduced ejection fraction; LBBB, left bundle branch block; LVEF, left ventricular ejection fraction; NSR, normal sinus rhythm; NYHA, New York Heart Association; and RV, right ventricle.

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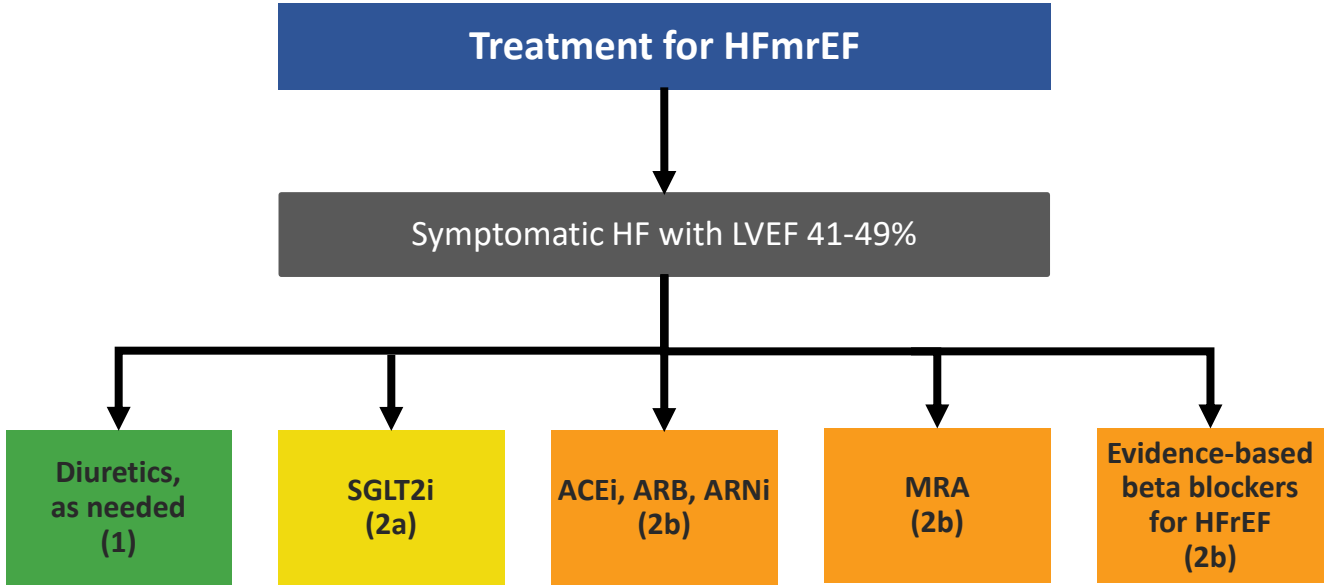
Recommendations for Patients with Mildly Reduced LVEF



Patients With HFimpEF

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)

Abbreviations: ARB indicates angiotensin receptor blocker; ARNi, angiotensin receptor-neprilysin inhibitor; HF, heart failure; HFpEF, heart failure with preserved ejection fraction; LV, left ventricle; LVEF, left ventricular ejection fraction; MRA, mineralocorticoid receptor antagonist; and SGLT2i, sodium-glucose cotransporter-2 inhibitor.

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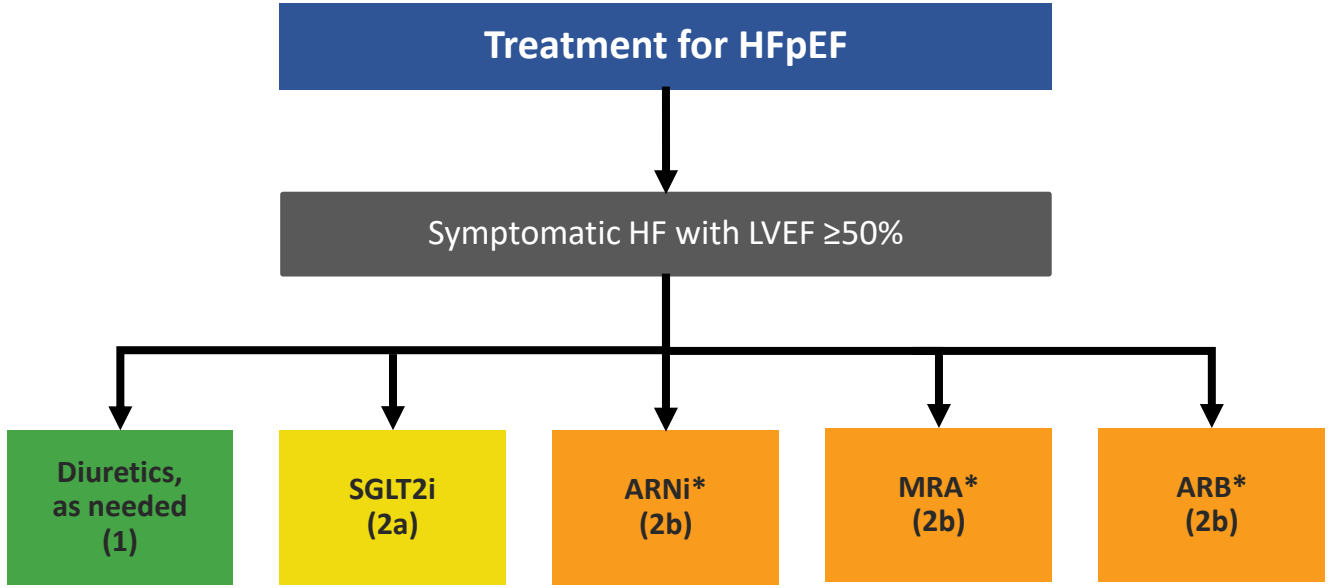
Recommendations for Patients with Preserved LVEF



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

Abbreviations: ACEi indicates angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNi, angiotensin receptor-neprilysin inhibitor; HFimpEF, heart failure with improved ejection fraction; HFmrEF, heart failure with mildly reduced ejection fraction; HFrEF, heart failure with reduced ejection fraction; LVEF, left ventricular ejection fraction; MRA, mineralocorticoid receptor antagonist; and SGLT2i, sodium- glucose cotransporter 2 inhibitor.

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Recommendation for Specialty Referral to Advanced HF

COR	RECOMMENDATIONS
1	1. In patients with advanced HF, when consistent with the patient's goals of care, timely referral for HF specialty care is recommended to review HF management and assess suitability for advanced HF therapies (e.g., LVAD, cardiac transplantation, palliative care, and palliative inotropes).

Consider if "I-Need-Help" to aid with recognition of patients with advanced HF:

- Complete assessment is not required before referral
- After patients develop end-organ dysfunction or cardiogenic shock, they may no longer quality for advanced therapies

I Intravenous inotropes

E EF ≤35%

E Edema despite escalating diuretics

N New York Heart Association class IIIB or IV, or persistently elevated natriuretic peptides

D Defibrillator shocks

L Low systolic BP ≤90mmHg

E End-organ dysfunction

H Hospitalizations >1

P Prognostic medication; intolerance of GDMT

Abbreviations: BP indicates blood pressure; EF, ejection fraction; GDMT, guideline-directed medical therapy; and LVAD, left ventricular assist device.

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Non-pharmacological Management in Advanced HF

Meta-analysis[1] of 6 RCTs comparing liberal and restricted fluid intake

- No difference in mortality or HF hospitalization
- No difference in serum Na+ or Cr
- No difference in duration of IV diuretics

COR	RECOMMENDATIONS
2b	1. For patients with advanced HF and hyponatremia, the benefit of fluid restriction to reduce congestive symptoms is uncertain

Abbreviations: Cr indicates creatinine; HF, heart failure; IV, intravenous; Na^+, sodium; and RCT, randomized clinical trial.

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Inotropic Support

Despite improving hemodynamic compromise, positive inotropic agents have not shown improved survival in patients with HF in either the hospital or outpatient setting.

COR	RECOMMENDATIONS
2a	1. In patients with advanced (stage D) HF refractory to GDMT and device therapy who are eligible for and awaiting MCS or cardiac transplantation, continuous intravenous inotropic support is reasonable as "bridge therapy" (Class 2a)
2b	2. In select patients with stage D HF, despite optimal GDMT and device therapy who are ineligible for either MCS or cardiac transplantation, continuous intravenous inotropic support may be considered as palliative therapy for symptom control and improvement in functional status
3: Harm	3. In patients with HF, long-term use of either continuous or intermittent intravenous inotropic agents, for reasons other than palliative care or as a bridge to advanced therapies, is potentially harmful

Abbreviations: GDMT indicates guideline-directed medical therapy; HF, heart failure; and MCS, mechanical circulatory support.

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Cardiac Transplantation

Median survival of adult transplant recipients is >12 years; versus <2 years for patients with stage D HF without advanced therapies.

COR	RECOMMENDATIONS
1	1. **For selected patients with advanced HF despite GDMT, cardiac transplantation is indicated to improve survival and QOL (1)**

In patients with stage D HF despite GDMT, cardiac transplantation provides intermediate economic value.

Value Statement: Intermediate Value (C-LD)

PATIENT SELECTION

- Minimizing waitlist mortality while maximizing post-transplant outcomes is a priority
- CPET can refine candidate prognosis and selection
- Appropriate patient selection should include integration of comorbidity burden, caretaker status and goals of care

Abbreviations: CPET indicates cardiopulmonary exercise test; GDMT, guideline-directed medical therapy; HF, heart failure; LD, limited data; and QOL, quality of life.

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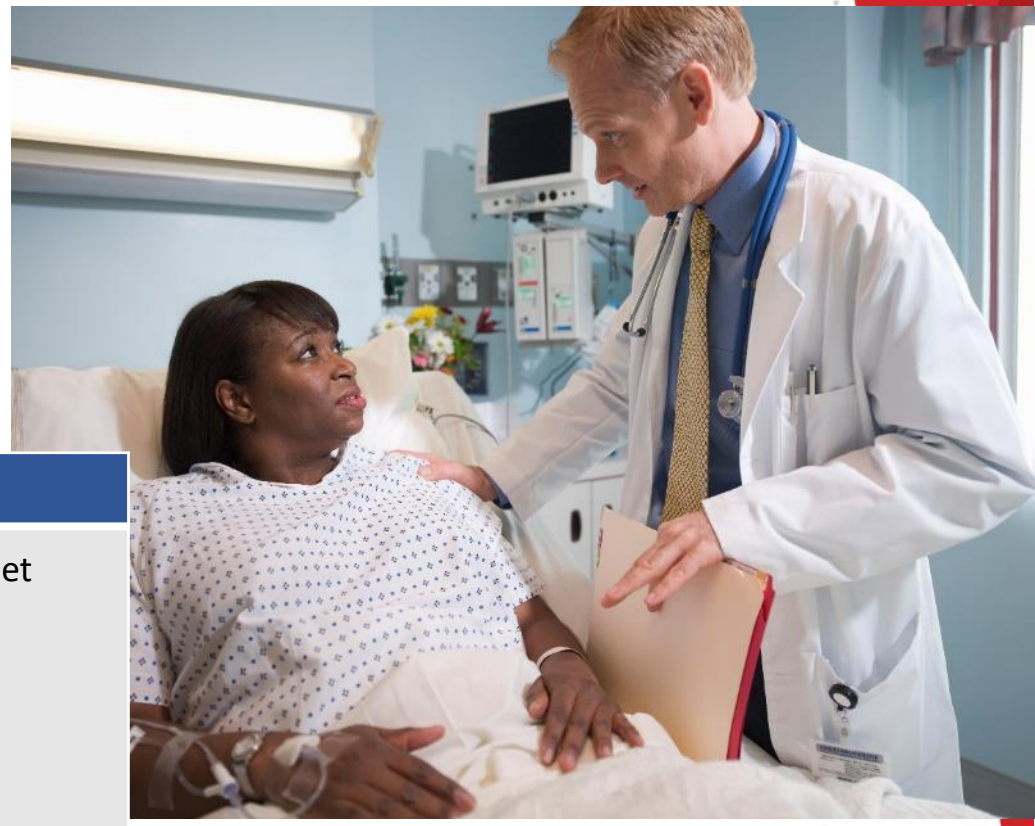
Assessment of Patients Hospitalized With Decompensated HF

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

Abbreviation: GDMT indicates guideline-directed medical therapy.

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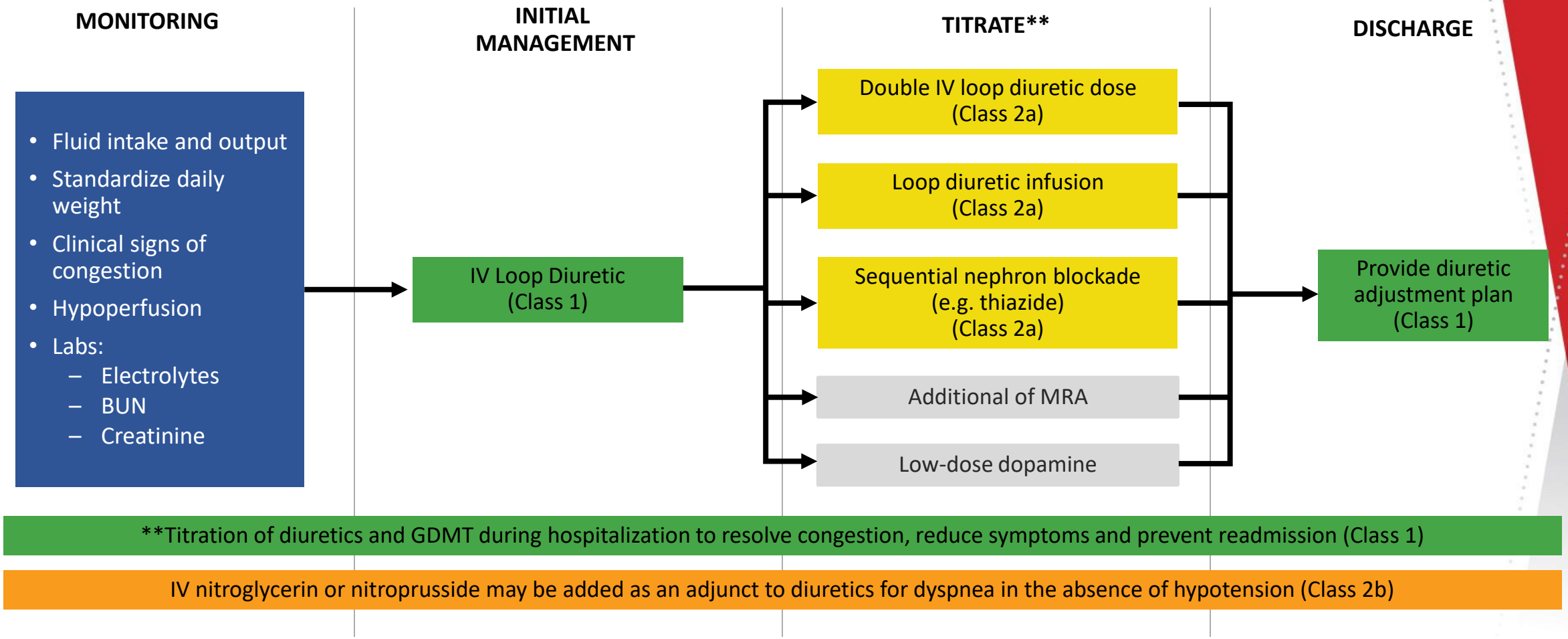
Decongestion Strategy



Abbreviations: BUN indicates blood urea nitrogen; GDMT, guideline-directed medical therapy IV, intravenous; and MRA; mineralocorticoid.

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Transitions of Care

A transition of care plan should be communicated prior to discharge (1)

This should include…

1. Early follow-up, ideally within 7 days (Class 2a)
2. Referrals to multidisciplinary HF management programs (Class 1)
3. Participation in benchmarking programs to improve GDMT and quality of care (Class 2a)
4. Addressing precipitating causes and high-risk factors (e.g. co-morbidities and SDOH)
5. Adjusting diuretics
6. Coordination of safety laboratory checks

Abbreviations: GDMT indicates goal-directed medical therapies; HF, heart failure; and SDOH, social determinates of health.

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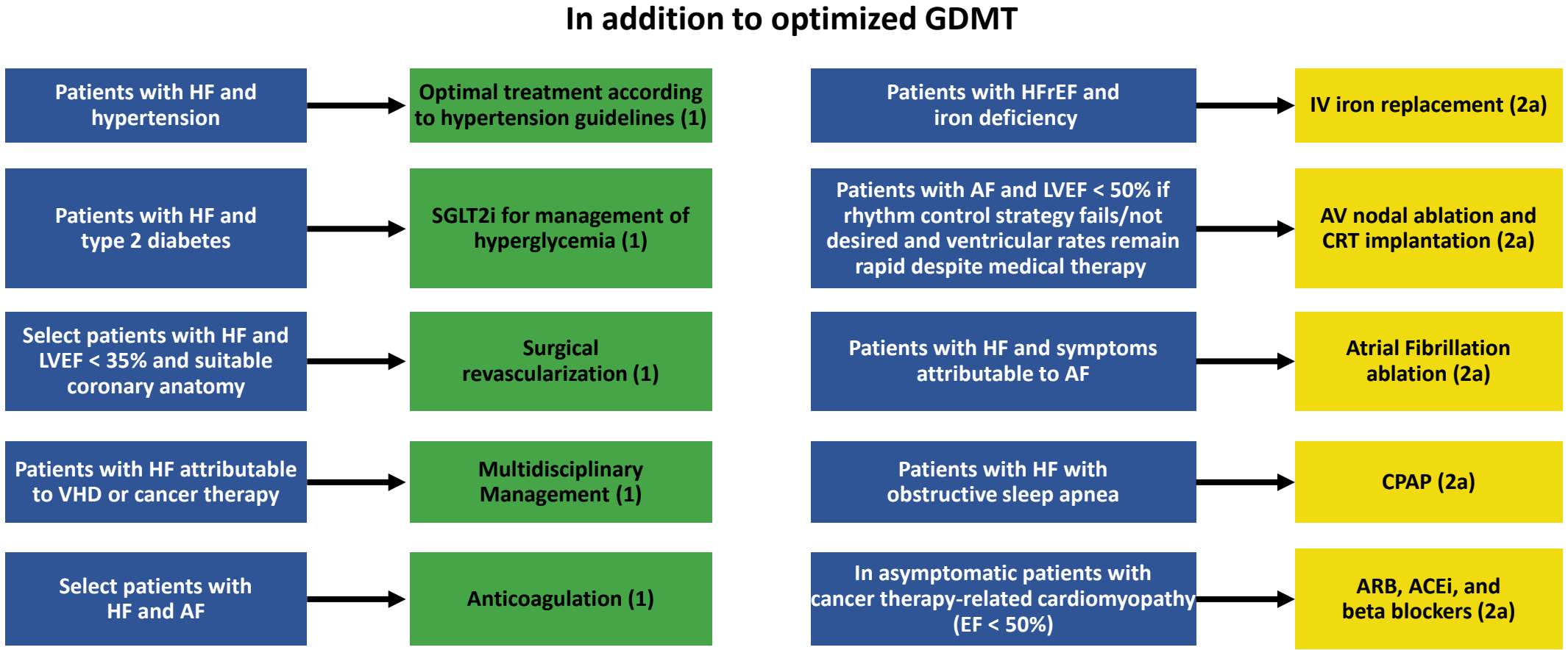
Additional Therapies in Patients with HF and Comorbidities



Abbreviations: ACEi indicates angiotensin-converting enzyme inhibitor; AF, atrial fibrillation; ARB, angiotensin receptor blocker; AV, atrioventricular; CHA2DS2-VASc, congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, stroke or transient ischemic attack [TIA], vascular disease, age 65 to 74 years, sex category; CPAP, continuous positive airway pressure; CRT, cardiac resynchronization therapy; EF, ejection fraction; GDMT, guideline-directed medical therapy; HF, heart failure; HFrEF, heart failure with reduced ejection fraction; IV, intravenous; LVEF, left ventricular ejection fraction; NYHA, New York Heart Association; SGLT2i, sodium-glucose cotransporter-2 inhibitor; and VHD, valvular heart disease.

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Recommendations for Managing Comorbidities in Patients With HF

Management of anemia or iron deficiency

COR	RECOMMENDATIONS
2a	In patients with HFrEF and iron deficiency with or without anemia, intravenous iron replacement is reasonable to improve functional status and QOL
3: Harm	In patients with HF and anemia, erythropoietin-stimulating agents should not be used to improve morbidity and mortality

Management of sleep disorders

COR	RECOMMENDATIONS
2a	In patients with HF and suspicion of sleep-disordered breathing, a formal sleep assessment is reasonable to confirm the diagnosis and differentiate between obstructive and central sleep apnea
2a	In patients with HF and obstructive sleep apnea, continuous positive airway pressure may be reasonable to improve sleep quality and decrease daytime sleepiness
3: Harm	In patients with NYHA class II to IV HFrEF and central sleep apnea, adaptive servo-ventilation causes harm

Management of hypertension

COR	RECOMMENDATIONS
1	In patients with HFrEF and hypertension, uptitration of GDMT to the maximally tolerated target dose is recommended.

Management of diabetes

COR	RECOMMENDATIONS
1	In patients with HF and type 2 diabetes, the use of SGLT2i is recommended for the management of hyperglycemia and to reduce HF-related morbidity and mortality

Abbreviations: GDMT indicates guideline directed medical therapy; HF, heart failure; HFrEF, heart failure with reduced ejection fraction; NYHA, New York Heart Association; QOL, quality of life; and SGLT2i, sodium-glucose cotransporter-2 inhibitor.

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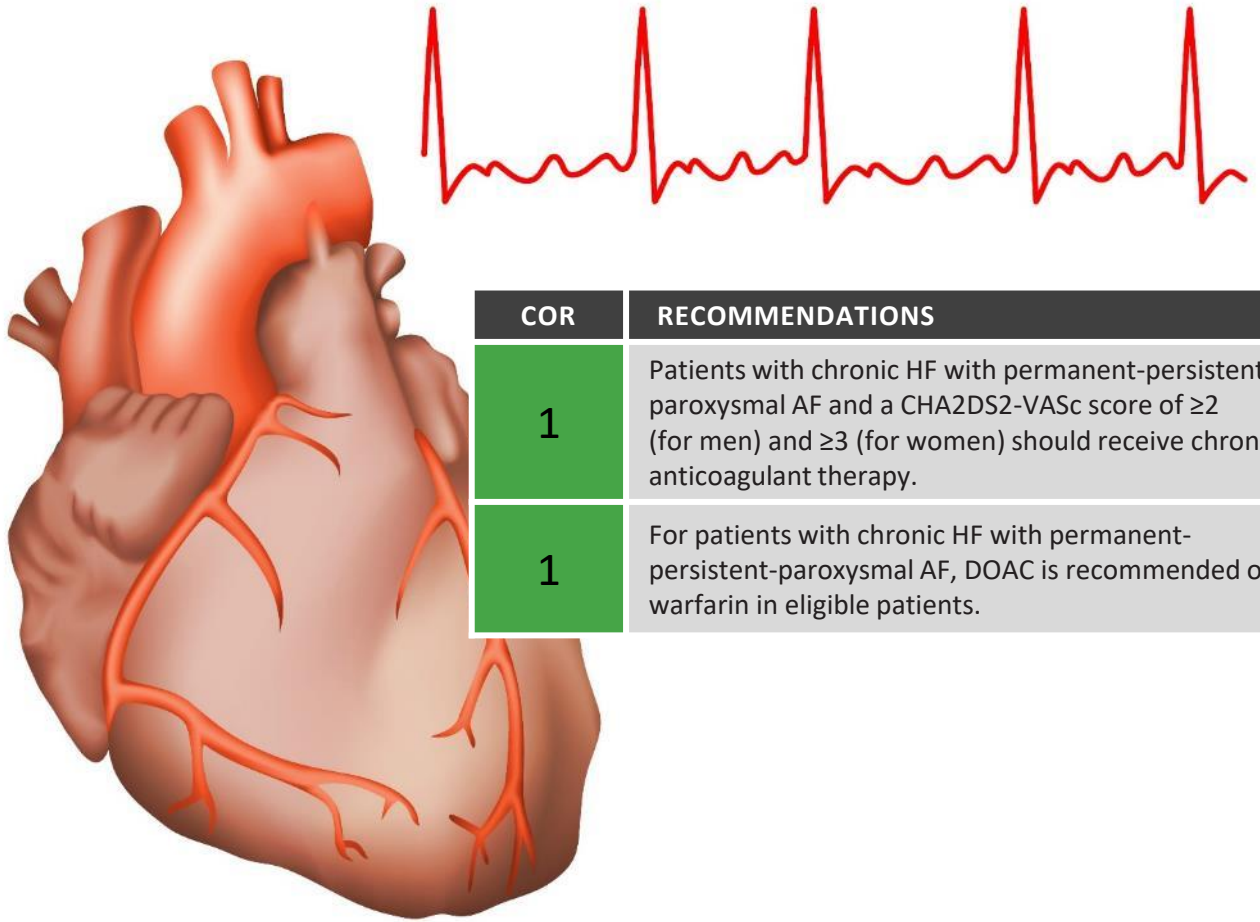
Recommendations for Management of AF in HF



COR	RECOMMENDATIONS
1	Patients with chronic HF with permanent-persistent-paroxysmal AF and a CHA2DS2-VASc score of ≥2 (for men) and ≥3 (for women) should receive chronic anticoagulant therapy.
1	For patients with chronic HF with permanent-persistent-paroxysmal AF, DOAC is recommended over warfarin in eligible patients.

COR	RECOMMENDATIONS
2a	For patients with HF and symptoms caused by AF, AF ablation is reasonable to improve symptoms and QOL.
2a	For patients with AF and LVEF ≤50%, if a rhythm control strategy fails or is not desired, and ventricular rates remain rapid despite medical therapy, AV nodal ablation with implantation of a CRT device is reasonable.
2a	For patients with chronic HF and permanent-persistent-paroxysmal AF, chronic anticoagulant therapy is reasonable for men and women without additional risk factors.

Abbreviations: AF indicates atrial fibrillation; AV, atrioventricular; CHA2DS2-VASc, congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, stroke or transient ischemic attack [TIA], vascular disease, age 65 to 74 years, sex category; CRT, cardiac resynchronization therapy; DOAC, direct oral anticoagulant; LVEF, left ventricular ejection fraction; and QOL, quality of life.

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