Heart Failure Care Guide

December 2023

Information contained in the Care Guide is not a substitute for a health care professional's clinical judgment. Evaluation and treatment should be tailored to the individual patient and the clinical circumstances. Furthermore, using this information will not guarantee a specific outcome for each patient. Refer to "Disclaimer Regarding Care Guides" for further clarification.

https://cchcs.ca.gov/clinical-resources/

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GOALS

- ✓ **Identify and stage patients with heart failure (HF)**
- ✓ **Document left ventricular ejection fraction (LVEF)**
- ✓ **Assess and document New York Heart Association (NYHA) Functional Classification**
- ✓ **Treat patients with HF using guideline-directed medical therapy (GDMT)**
- ✓ **Counsel all patients on healthy lifestyle choices**
- ✓ **Decrease morbidity and mortality related to HF, as well as decreased hospitalizations due to HF**

ALERTS

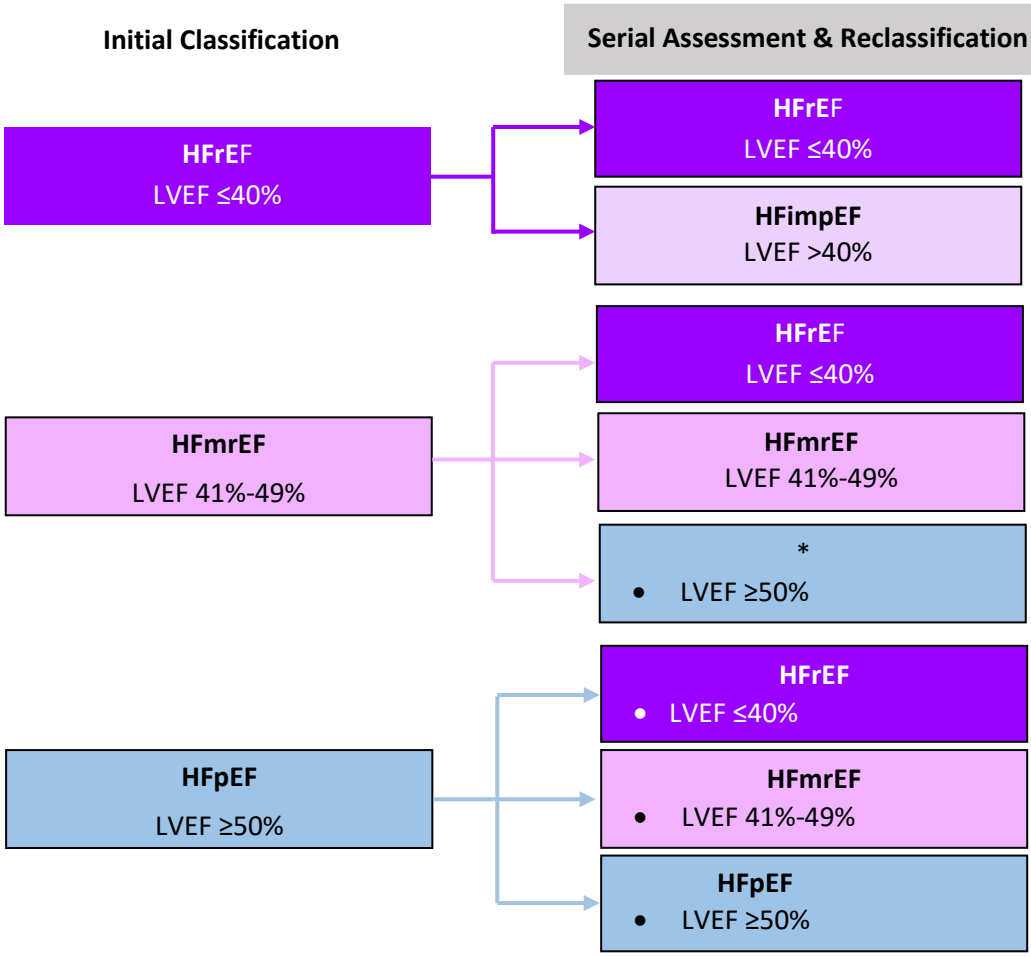
- **Laboratory evaluation monitors GDMT for adverse effects and potential drug-drug interactions (DDI)**
- **Electrocardiography (ECG) and echocardiography (echo) are part of the standard evaluation of HF**
- **Serial LVEF assessment, heart rate, blood pressure, weight, and renal function are vital for prognostication**
- **Cardiovascular complications of cancer therapy include cardiomyopathy and HF**

DEFINITIONS

HEART FAILURE CLASSIFICATIONS

HF results from any structural and/or function impairment of ventricular filling or ejection of blood. Classification of HF by left ventricular ejection fraction (LVEF) affects prognosis and response to treatment.

- **HF with reduced LVEF (HFrEF)**: AHA/ACC definition is LVEF≤40%, also known as systolic dysfunction
- **HF with preserved LVEF (HFpEF)**: AHA/ACC definition is LVEF≥50% with evidence of increased LV filling pressures, also known as diastolic dysfunction
- **HF with mildly reduced LVEF (HFmrEF)**: AHA/ACC definition is LVEF 41%-49% with evidence of increased LV filling pressures
- **HF with improved LVEF (HFimpEF)**: AHA/ACC definition is previous LVEF≤40% and follow up LVEF>40%[1]



*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.[1]

Definitions Cont'd

Since left-sided HF can cause right ventricular dysfunction (RVD), right heart failure (RHF) can result from the inability of the right ventricle (RV) to support optimal circulation in the presence of adequate preload. RVD increases in prevalence with more advanced HF secondary to increased RV afterload from postcapillary pulmonary hypertension, volume overload, arrhythmias, or underlying myocardial disease processes. This care guide will focus on left-sided HF. For patients with suspected or diagnosed RHF, specialty consultation is advised.[2,3]

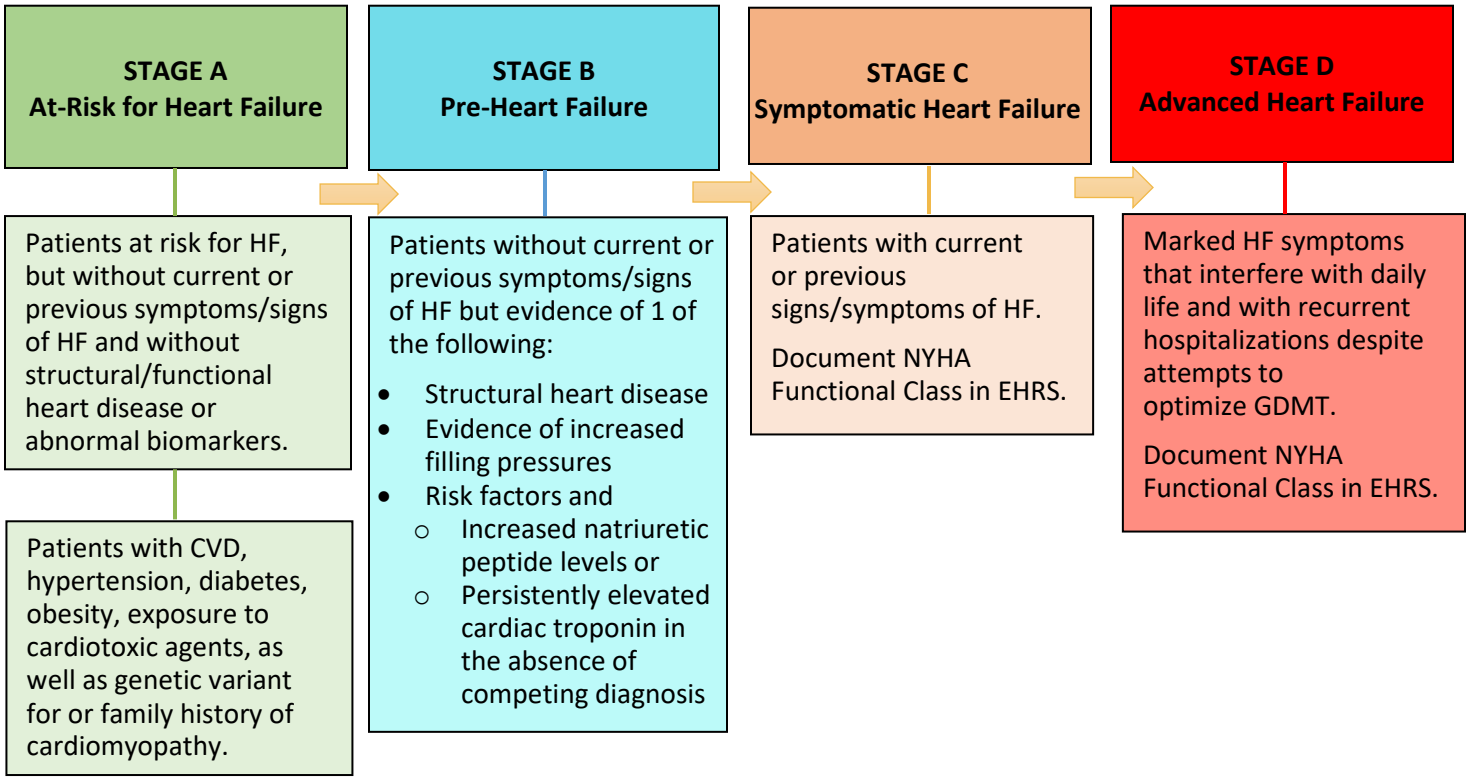
HEART FAILURE STAGES

Patients with HF can be asymptomatic or can present with various symptoms and signs. Given this range, the ACC/AHA stages HF to emphasize its development and progression as it relates to survival. These stages are:

- **Stage A**: At risk for heart failure but do not have symptoms, structural/function heart disease, or abnormal biomarkers due to the following risk factors:

HF Risk Factors[1]
Hypertension
Clinical atherosclerotic cardiovascular disease (ASCVD)
Diabetes
Obesity and metabolic syndrome
Exposure to cardiotoxic agents, such as certain chemotherapeutic agents or radiation therapy
Genetic variants for cardiomyopathy
Family history of cardiomyopathy
Myocarditis (infectious, toxin or medication, immunological, hypersensitivity)
Peripartum cardiomyopathy
Stress cardiomyopathy (Takotsubo)
Substance abuse (e.g., alcohol, cocaine, methamphetamine)

- **Stage B**: Pre-HF without current or previous symptoms but evidence of structural heart disease, increased filling pressures in the heart, or other risk factors with increased natriuretic peptide levels and/or persistently elevated cardiac troponin in the absence of a competing diagnosis
- **Stage C**: Symptomatic HF, current or previous symptoms
- **Stage D**: Advanced HF with marked symptoms that interfere with daily life function or lead to repeated hospitalizations despite attempts to optimize GDMT[1]



Definitions Cont'd

NYHA FUNCTIONAL CLASSIFICATION

In addition to staging, NYHA Functional Classification characterizes patients' symptoms and functional capacity with stage C or stage D HF. It is an independent predictor of mortality and is used to determine the eligibility of patients for treatment strategies. NYHA classification is identified as a baseline at the time of initial diagnosis then reassessed after treatment. This serial monitoring prognosticates patients based on the trajectory of their symptoms.[1]

NYHA Functional Classification for Stage C or Stage D Heart Failure[1]	
NYHA Classification	**Definition By Symptoms**
NYHA Class I	Asymptomatic with treatment with no limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitations, or shortness of breath.
NYHA Class II	Mild symptoms with slight limitation of physical activity. Comfortable at rest. Ordinary physical activity results in fatigues, palpitations, shortness of breath, or chest pain.
NYHA Class III	Marked symptoms with significant limitation of physical activity. Comfortable at rest. Less than ordinary activity causes fatigue, palpitations, shortness of breath, or chest pain.
NYHA Class IV	Profound symptoms with symptoms of HF at rest. Any physical activity causes further discomfort.

EVALUATION

HISTORY AND PHYSICAL EXAMINATION

The history and physical examination remain the cornerstone in the assessment of HF:

- **Clinical history:** Review clinical history. Assess for the cause of an underlying cardiomyopathy, such as prior acute coronary syndrome (ACS)[1], history of cancer[6,7], inherited cardiomyopathy, etc.
- **Physical examination:** Height, weight compared to (known or estimated) dry weight, unintentional weight loss, BMI, blood pressure, heart rate, jugular venous pressure, cardiac evaluation, pulmonary evaluation, and examination of extremities[1]

DIAGNOSTIC TESTING

After a complete history and physical examination, the diagnosis of HF is made in at risk or symptomatic patients by cardiac imaging to look for structural and/or functional heart disease:

- **Electrocardiogram** (ECG)
- **Chest x-ray** (CXR) is a useful initial diagnostic test for symptomatic patients to assess for cardiomegaly, pulmonary congestion, and interstitial or alveolar edema
- Resting **transthoracic echo** (TTE) is the most useful initial diagnostic test that provides diagnostic and prognostic data to guide evidence-based pharmacological and device-based therapy
  - Structural heart disease
    - Reduced left or right ventricular systolic function
    - Reduced ejection fraction
    - Reduced global longitudinal strain
    - Ventricular hypertrophy
    - Chamber enlargement
    - Wall motion abnormalities
    - Valvular heart disease
  - Evidence for increased filling pressures
    - Diastolic dysfunction with echo parameters, such as elevated E/e', elevated E/A, peak tricuspid regurgitation velocity.[1,4,5]

EVALUATION Cont'd

LABORATORY TESTING

In the absence of competing diagnoses (e.g., ACS, chronic kidney disease, pulmonary embolus, myopericarditis) resulting in these biomarker elevations, patients with increased risk factors may present with:

- Increased levels of **B-type natriuretic peptide** (**BNP** ≥ 35 pg/mL or **NT-proBNP** > 125 pg/mL)
  - Clinical uses
    - Supports a diagnosis of HF, if clinical presentation is unclear and physical exam is equivocal (ambulatory or emergency room)
    - Excludes HF as a cause of symptoms (ambulatory or emergency room)
    - Risk stratification in patient with chronic HF, but not all patients may need biomarker measurement, especially if they already have advanced HF with established poor prognosis
    - Prognostication during HF hospitalization, but targeting a certain threshold, value, or relative change in BNP or NT-proBNP prior to discharge has not been shown to improve outcomes
  - Limitations
    - In general BNP and NT-proBNP levels are similar and either can be used, as long as their respective absolute values and cut-points are not used interchangeably
    - Reduction in BNP and NR-proBNP is associated with better clinical outcomes, but guidance on serial measurements remains insufficient
    - Obesity is associated with lower levels of BNP and NT-proBNP

Causes of Elevated Natriuretic Peptide Levels[1]	
Cardiac	Non-Cardiac
HF, including RHF	Advancing age
ACS	Anemia
Left ventricular hypertrophy	Renal failure
Valvular heart disease (VHD)	Obstructive sleep apnea
Pericardial disease	Pulmonary embolism
Atrial fibrillation/flutter (AF/AFL)	Pulmonary arterial hypertension
Myocarditis	Severe pneumonia
Cardiac surgery	Critical illness
Cardioversion	Bacterial sepsis
Toxic-metabolic myocardial injury	Severe burns

- Persistently elevated cardiac **troponin**
- Other labs: complete blood count (**CBC**); urinalysis (**UA**); complete metabolic panel (**CMP**) to check electrolytes (including sodium, potassium, magnesium, and calcium), BUN/creatinine/eGFR, transaminases (AST/ALT), and glucose; **lipid profile**; **iron studies** (serum iron, ferritin, transferrin saturation); thyroid-stimulating hormone (**TSH**)
- Consider genetic screening for patients with a family history of inherited cardiomyopathies or in patients with nonischemic cardiomyopathy without another explanation for HF[1]

Potential Nonischemic Causes of HF[1,6,7]
Chemotherapy and other cardiotoxic medications
Rheumatologic or autoimmune
Endocrine or metabolic (thyroid, acromegaly, pheochromocytoma, diabetes, obesity)
Familial cardiomyopathy or inherited and genetic heart disease
Heart rhythm-related (e.g., tachycardia-medicated, PVCs (premature ventricular contraction), RV pacing)
Hypertension
Infiltrative cardiac disease (e.g., amyloid, sarcoid, hemochromatosis)
Myocarditis (infectious, toxin or medication, immunological, hypersensitivity)
Peripartum cardiomyopathy
Stress cardiomyopathy (Takotsubo)
Substance abuse (e.g., alcohol, cocaine, methamphetamine)

EVALUATION Cont'd

ADVANCED CARDIAC TESTING

- Exercise stress testing with echo evaluation of diastolic parameters to look for evidence for increased filling pressures at rest, exercise, and other provocations, if diagnosis remains uncertain for HFmrEF vs HFpEF
- Advanced cardiac imaging modalities: Cardiac MRI (CMR), single photon emission computed tomography (SPECT) or radionuclide ventriculography, positron emission tomography (PET), cardiac CT, CT coronary angiography, nuclear scintigraphy, invasive diagnostic right heart catheterization, or invasive coronary angiography with hemodynamic measurements
    - Coronary artery disease (CAD) is a leading cause of HF, so myocardial ischemia testing may be considered in patients with newly diagnosed HF of uncertain etiology or ischemic cardiomyopathy causing HF with new or worsening symptoms
        - Noninvasive ischemic testing: exercise stress echo, dobutamine stress echo, nuclear scintigraphy, SPECT, CMR, PET
        - Invasive ischemic testing: invasive coronary angiography with possibility for revascularization
    - Recommend consultation referral
- Cardiopulmonary exercise testing (CPET) can evaluate ambulatory patients with unexplained dyspnea; if exercise capacity is diminished but cardiopulmonary responses are normal, consider other causes of dyspnea, such as metabolic abnormalities or deconditioning
- Endomyocardial biopsy when specific diagnosis is suspected that would influence therapy (rare). Required consultation referral for the following presentations:
    - Rapidly progressive, unexplained clinical HF despite GDMT
    - Unexplained worsening ventricular dysfunction despite GDMT
    - Suspected myocardial infiltrative process (e.g., light chain (AL) amyloidosis)
    - Active myocarditis
    - Suspected acute cardiac rejection status after heart transplantation[1]

For HFpEF, use **H_2FPEF**, a clinical composite score integrating predictive variables, to aid in diagnosis. Scores <2 reflect low likelihood of HFpEF, and scores ≥6 reflect high likelihood. H_2FPEF scores between 2 and 5 may require further hemodynamic evaluation with exercise echo or cardiac catheterization to confirm or negate a diagnosis of HFpEF.

Another, more involved, diagnostic algorithm for HFpEF is **HFA-PEFF**, which includes pretest assessment, echo with natriuretic peptide score, functional testing for advanced evaluation, and final etiology.[1,2,3,4,5]

H_2FPEF		
H_2	**H**eavy (BMI > 30 kg/m^2) On ≥ 2 anti**H**ypertensives	2 1
F	Atrial **F**ibrillation	3
P	**P**ulmonary hypertension	1
E	**E**lder (age > 60 years)	1
F	**F**illing pressure (E/e' ratio > 9)	1

DOCUMENTATION IN ELECTRONIC HEALTH RECORD SYSTEM

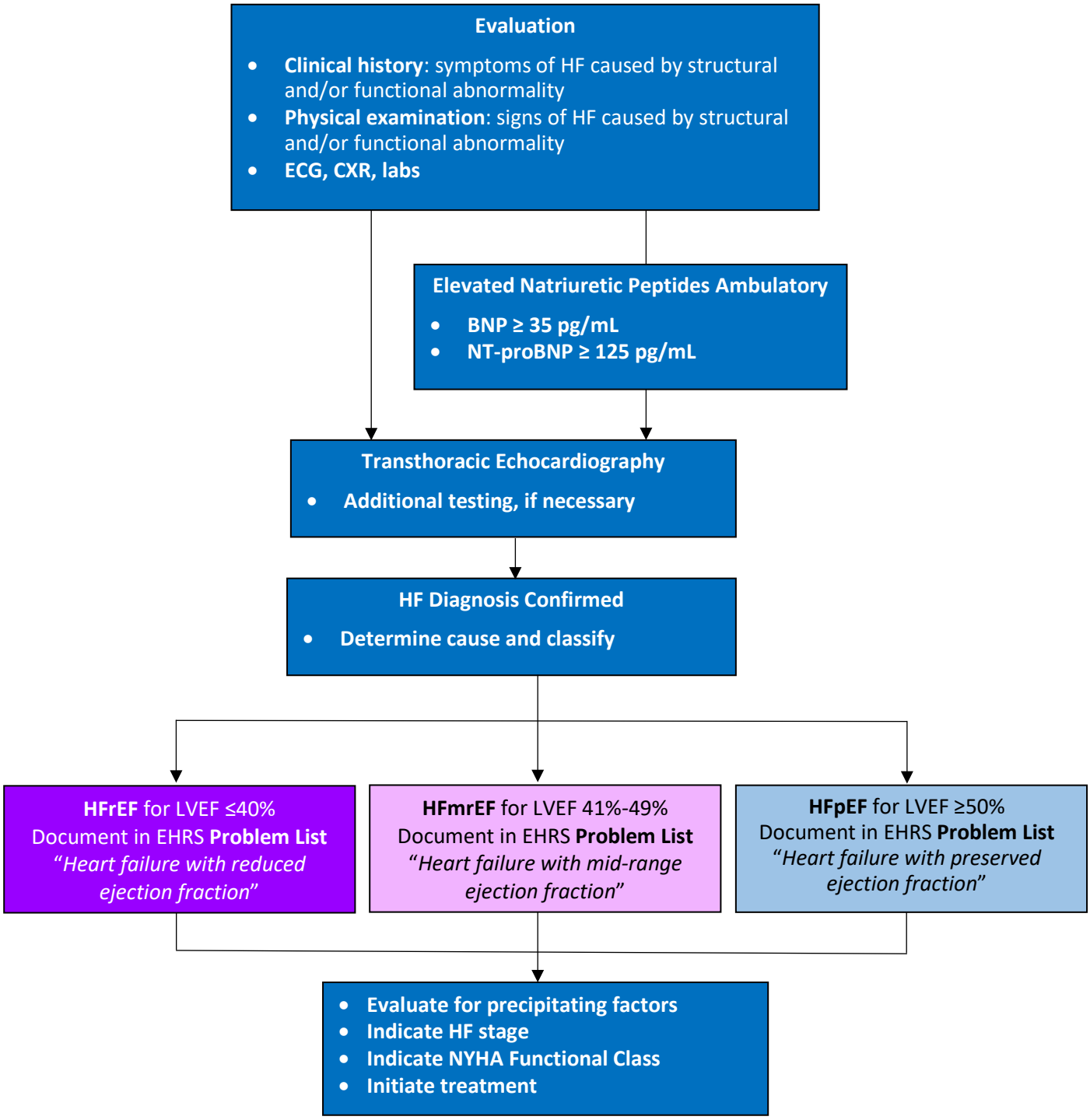
(Refer to HCDOM 1.4.22, Medical Provider Documentation Expectations)[8]

Once the diagnosis of HF is made, document the following in the Electronic Health Record System (EHRS)

- Update **Problem List**
    - HF Classification at the time of diagnosis
        - "*Heart failure with reduced ejection fraction*" for patients with LVEF ≤ 40%
        - "*Heart failure with mid-range ejection fraction*" for patients with LVEF 41-49%
        - "*Heart failure with preserved ejection fraction*" for patients with LVEF ≥ 50%
    - Add HF Stage A, B, C, or D
    - For patients with HF Stage C or HF Stage D, add NYHA Functional Classification 1, 2, 3, or 4

EVALUATION Cont'd

DIAGNOSTIC ALGORITHM FOR PATIENTS WITH SUSPECTED HEART FAILURE



EVALUATION Cont'd

Examples of Factors Implicating Possible Genetic Cardiomyopathy[1]		
Phenotypic Category	Patient of Family Member Phenotypic Finding	Ask Specifically About Family Members*
Cardiac Morphology	• Marked LV hypertrophy • LV noncompaction (LVNC) • Right ventricular thinning or fatty replacement on imaging or biopsy	Any mention of cardiomyopathy, enlarged or weak heart, HF. Document even if attributed to other causes, such as alcohol or peripartum cardiomyopathy
Findings on 12-lead ECG	Abnormal high or low voltage or conduction, and repolarization, altered RV forces	Long QT or Brugada syndrome
Dysrhythmias	• Frequent NSVT or Very frequent PVCs • Sustained ventricular tachycardia or fibrillation • Early onset of AF • Early onset conduction disease	• ICD • Recurrent syncope • Sudden death attributed to "massive heart attack" without known CAD • Unexplained fatal event such as drowning or single-vehicle crash • "Lone" AF before age of 65 • Pacemaker before the age of 65
Extracardiac features	• Skeletal myopathy • Neuropathy • Cutaneous stigmata • Other possible manifestations of systemic syndromes	Any known skeletal muscle disease, including mention of Duchenne and Becker's, Emory-Dreifuss limb-girdle dystrophy Systemic syndromes: • Dysmorphic features • Mental retardation • Congenital deafness • Neurofibromatosis • Renal failure with neuropathy

LV, left ventricular; NSVT, nonsustained ventricular tachycardia

*Note that generic cause is more likely when the person is younger at the onset of events. However, the cardiac morphology and peripheral manifestations of hereditary amyloidosis may present later in life, unlike most other inherited cardiomyopathies.[1]

TREATMENT

Determining stage of HF (stage A to stage D) and NYHA functional classification (NYHA class I to NYHA class IV) is required to determine treatment eligibility. Additionally, validated multivariable risk scores can be useful to estimate risk of adverse outcomes and death, which guides discussions on prognosis, goals of care, and therapeutic shared decision making. Commonly used risk calculators are:

- MAGGIC: estimates 1- and 3-year mortality for patients with chronic HF
- Seattle Heart Failure Model (SHFM): projected survival at baseline and after GDMT with/without device therapy for patients with chronic HF
- AHA "Get with The Guidelines" Score: acutely decompensated HF[1]

TREATMENT CONT'D

GUIDELINE-DIRECTED MEDICAL THERAPY (GDMT)

Healthy lifestyle habits, including heart-healthy food choices, regular physical activity, maintaining normal weight, tobacco free. Keep in mind that the **bold** medications are CCHCS formulary options for GDMT.[1]

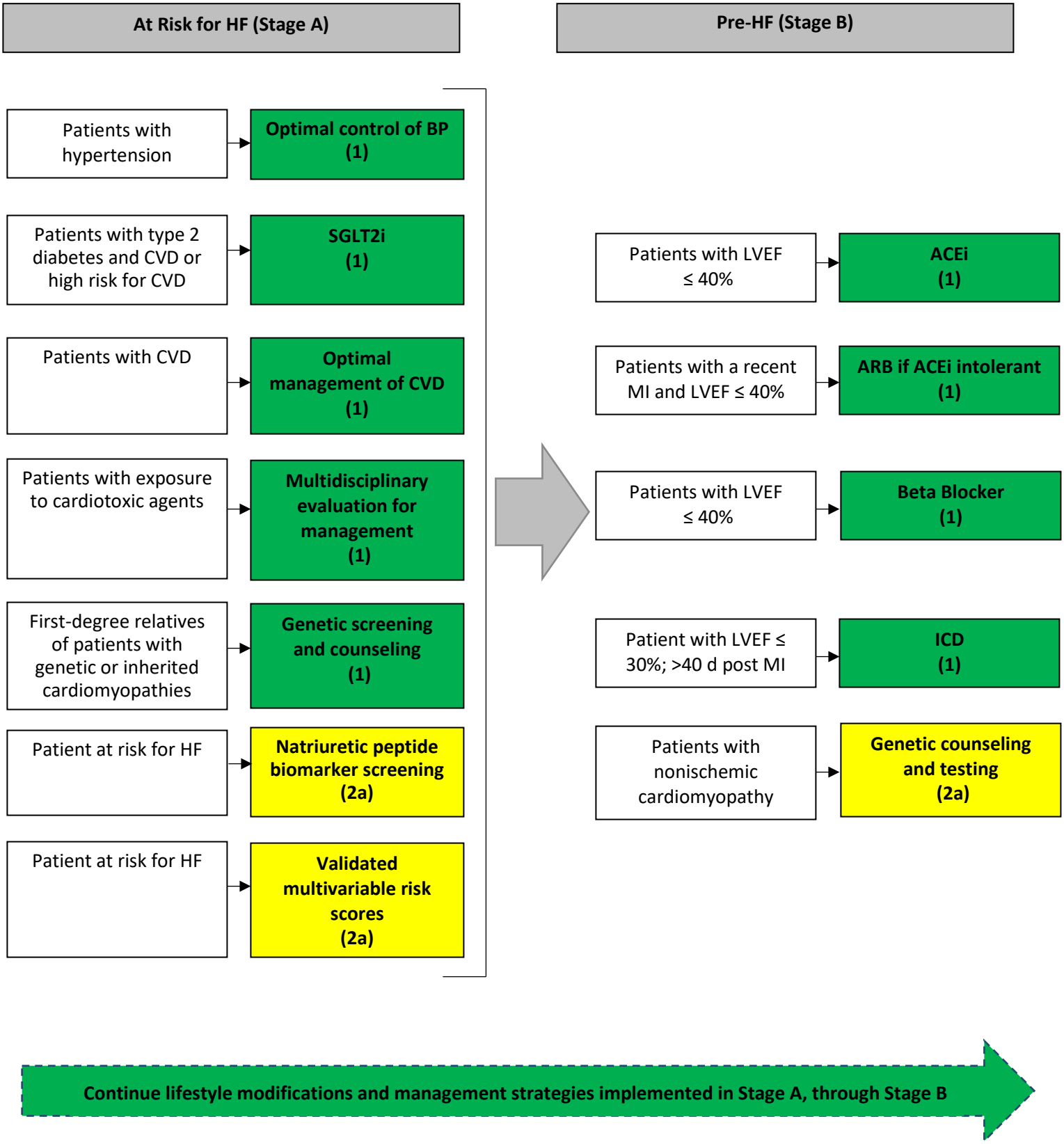
- Control modifiable HF risk factors (all HF stages):
  - Hypertension controlled with blood pressure (BP) goal < 130/80 mm Hg for patients with ASCVD risk ≥ 10%
    - Consider angiotensin-converting enzyme inhibitor (ACEi) or angiotensin receptor blocker (ARB), if clinically appropriate
      - **Enalapril (VASOTEC®)**
      - **Lisinopril (PRINIVIL®, ZESTRIL®)**
      - **Losartan (COZAAR®)**
      - Valsartan (Diovan®) not formulary
        - ACEi are contraindicated in patients who had ACEi-induced angioedema
        - There are other ACEi and ARB medications that are nonformulary at CCHCS and are not included in this list
        - Effectiveness of potassium binders (e.g., patiromer, sodium zirconium cyclosilicate) to facilitate continuation of renin-angiotensin-aldosterone system inhibitor (RAASi) therapy in the setting of serum potassium ≥ 5.5 mEq/L is uncertain
    - Avoid nondihydropyridine calcium channel blockers (diltiazem, verapamil) if LVEF < 50%
  - Secondary prevention as optimal management strategies in patients with clinical ASCVD
    - Statins should be used to prevent symptomatic HF if patient has a history of myocardial infarction (MI) or ACS (See Dyslipidemia Care Guide)
      - **Atorvastatin (LIPITOR®)**
      - **Rosuvastatin (CRESTOR®)**
      - **Pravastatin (PRAVACHOL®)**
      - There are other statin medications that are nonformulary at CCHCS and are not included in this list
    - Omega-3 polyunsaturated fatty acid (PUFA) for NYHA class II to IV may be reasonable as adjunctive therapy for persistent hypertriglyceridemia (See Dyslipidemia Care Guide)
      - Omega-3 ethyl esters (LOVAZA®) not formulary
      - **Icosapent ethyl** (VASCEPA®) generic icosapent ethyl is formulary
  - Diabetes control (See Diabetes Care Guide)
    - Add sodium-glucose cotransporter 2 inhibitor (SGLT2i) for patients who also have clinical ASCVD or high ASCVD risk defined as ≥ 20%
      - **Empagliflozin (JARDIANCE®)**
      - Dapagliflozin (FARXIGA®) not formulary
      - ALERT: At the time of the writing of this Heart Failure Care Guide, sotagliflozin (INPEFA™), which is an inhibitor of SGLT2 and SGLT1, was approved by the U.S. Food and Drug Administration (FDA)on May 2023 for HF, which is not reflected in the 2022 AHA/ACC/HFSA Heart Failure Guidelines
      - ALERT: At the time of the writing of this Heart Failure Care Guide, the other SGLT2i, namely canagliflozin (Invokana®), ertugliflozin (Steglatro®), and bexagliflozin (Brenzavvy™), are not yet FDA approved for HF
    - Avoid thiazolidinediones (pioglitazone, rosiglitazone) if LVEF < 50%
    - Dipeptidyl peptidase-4 (DPP-4) inhibitors increase risk of HF hospitalizations
  - Weight loss for obesity and metabolic syndrome

Keep in mind that the **bold** medications are CCHCS formulary options for GDMT.[1]

- Patients with LVEF ≤ 40% (Stage B or higher) (See algorithm on page 11)
  - Renin-angiotensin-aldosterone system inhibitor (RAASi)
    - ACEi
    - or ARB if ACEi intolerant
  - Beta blocker
    - **Carvedilol (COREG®/COREG CR®)**
    - **Sustained-release metoprolol succinate (TOPROL-XL®)**
    - Bisoprolol not formulary
    - ALERT: Other beta blocker formulations have not been recommended for use in HF by the 2022 AHA/ACC/HFSA Heart Failure Guidelines
    - Contraindicated in advanced atrioventricular (AV) block in the absence of pacemakers[1,4,5]

TREATMENT CONT'D

TREATMENT FOR STAGE A AND STAGE B HEART FAILURE



TREATMENT CONT'D

Keep in mind that the **bold** medications are CCHCS formulary options for GDMT.[1]

- Patients with LVEF ≤ 40% (Stage C or higher) (See algorithms on page 13-14)
  - Avoid excessive sodium intake to 2 to 3 g/d with DASH diet
  - RAASi
    - Angiotensin receptor-neprilysin inhibitor (ARNi) (NYHA II-III) (See Attachment A for mechanism of action)
      - Sacubitril/valsartan (Entresto®) non-formulary with use criteria
      - Contraindicated in patients who had ACEi-induced angioedema
    - ACEi (NYHA II-IV) if ARNi is not feasible
    - ARB if ACEi intolerant (NYHA II-IV)
  - Hydralazine/isosorbide dinitrate (H-ISDN)
    - In patients with chronic kidney disease (CKD) or other drug intolerance to ARNi, ACEi, or ARB therapy, consider H-ISDN use
    - Add H-ISDN to GDMT in self-identified Black patient (NYHA III-IV) (See **Health Equity Alert** box)
    - Fixed dose combination H-ISDN (BiDil®) is nonformulary at CCHCS
    - **Hydralazine (APRESOLINE®)** and **isosorbide dinitrate (ISORDIL®)**
  - Beta blocker
  - Mineralocorticoid receptor antagonist (MRA), which is contraindicated if eGFR ≤ 30 mL/min or serum potassium ≥ 5 mEq/L
    - **Spironolactone (ALDACTONE®)**
    - Eplerenone (Inspra™) not formulary
      Preferred in patients who experience adverse effects of gynecomastia or vaginal bleeding
  - SGLT2i
  - I_f current inhibitor: ivabradine (Corlanor®) not formulary, decreased cardiovascular death and HF hospitalizations
    - Indicated in patients with stable chronic HFrEF (LVEF ≤ 35%) (NYHA II-III) already receiving GDMT, including maximally tolerated beta blocker in sinus rhythm with heart rate ≥ 70 bpm at rest
  - Soluble guanylyl cyclase stimulators: vericiguat (VERQUVO®) not formulary, decreased endpoint of all-cause mortality and HF hospitalizations
    - Indicated in high-risk patients with chronic HFrEF (LVEF < 45%) (NYHA II-IV) with recent worsening HF already receiving GDMT
    - Worsening HF defined as elevated natriuretic peptides, hospitalization for HF within 6 months, or recently treated with intravenous diuretic therapy
  - Diuretics as needed for volume overload in combination with other GDMT; the effects of diuretics on morbidity and mortality are uncertain
    - Loop diuretic
      - **Furosemide (LASIX®)**
      - **Bumetanide (BUMEX®)**
      - Torsemide (Demadex) not formulary
    - Add thiazide to loop diuretic if loop diuretic insufficiency controls congestive symptoms
      - **Metolazone (ZAROXOLYN®)**
      - Chlorothiazide (Diuril®) not formulary
  - **Digoxin (LANOXIN®)** can be considered for patients who cannot tolerate GDMT or have symptomatic HFrEF despite GDMT; digoxin has no effect on mortality, but modesty reduces the risk of hospitalizations
  - Ferric carboxymaltose injection (Injectafer®) not formulary is FDA approved to treat iron deficiency, defined as hemoglobin < 10 g/dL, in HF patients with NYHA class II-III to improve exercise capacity
  - Anticoagulation is NOT recommended in HF patients without a specific indication (See Anticoagulation Care Guide)[1,5]

HEALTH EQUITY ALERT

Race is a crude marker for genetic and physiologic variations, since race is a social construct, not a scientific classification. Secondary analyses of the Vasodilator-Heart Failure Trial (V-HeFT I) demonstrated a survival benefit in Black patients with H-ISDN, but the study was not powered to assess noninferiority among Black patients, which led to the African American Heart Failure Trial (A-HeFT). A-HeFT was flawed because it ONLY enrolled self-identified Black patients. A-HeFT was terminated early because H-ISDN had a 43% relative mortality benefit.

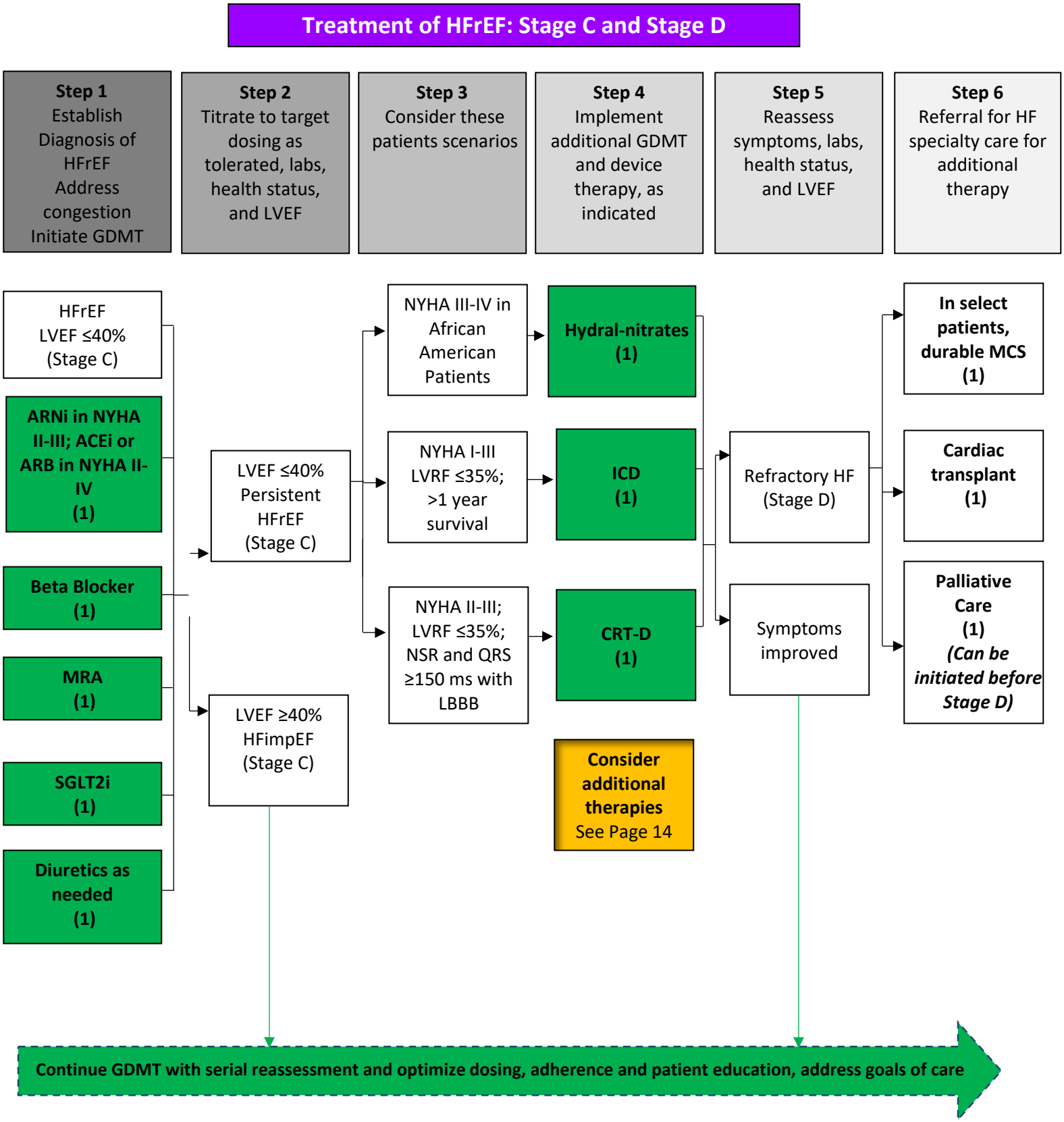
Race refers to an individual's physical appearance, ethnicity refers to one's cultural heritage, language, and geopolitical factors. Neither race nor ethnicity addresses genetic ancestry. Self-reporting Black patients can have drastically different levels of genetic ancestry, more so among patients who identify as more than one race, which accounts for 10.2% of the US population (33.8 million people) based on 2020 US Census data.

Additionally, since no other races were included in A-HeFT, one cannot determine if H-ISDN will provide any benefit for other self-identified racial groups.

Combination of Isosorbide Dinitrate and Hydralazine in Blacks with Heart Failure | NEJM

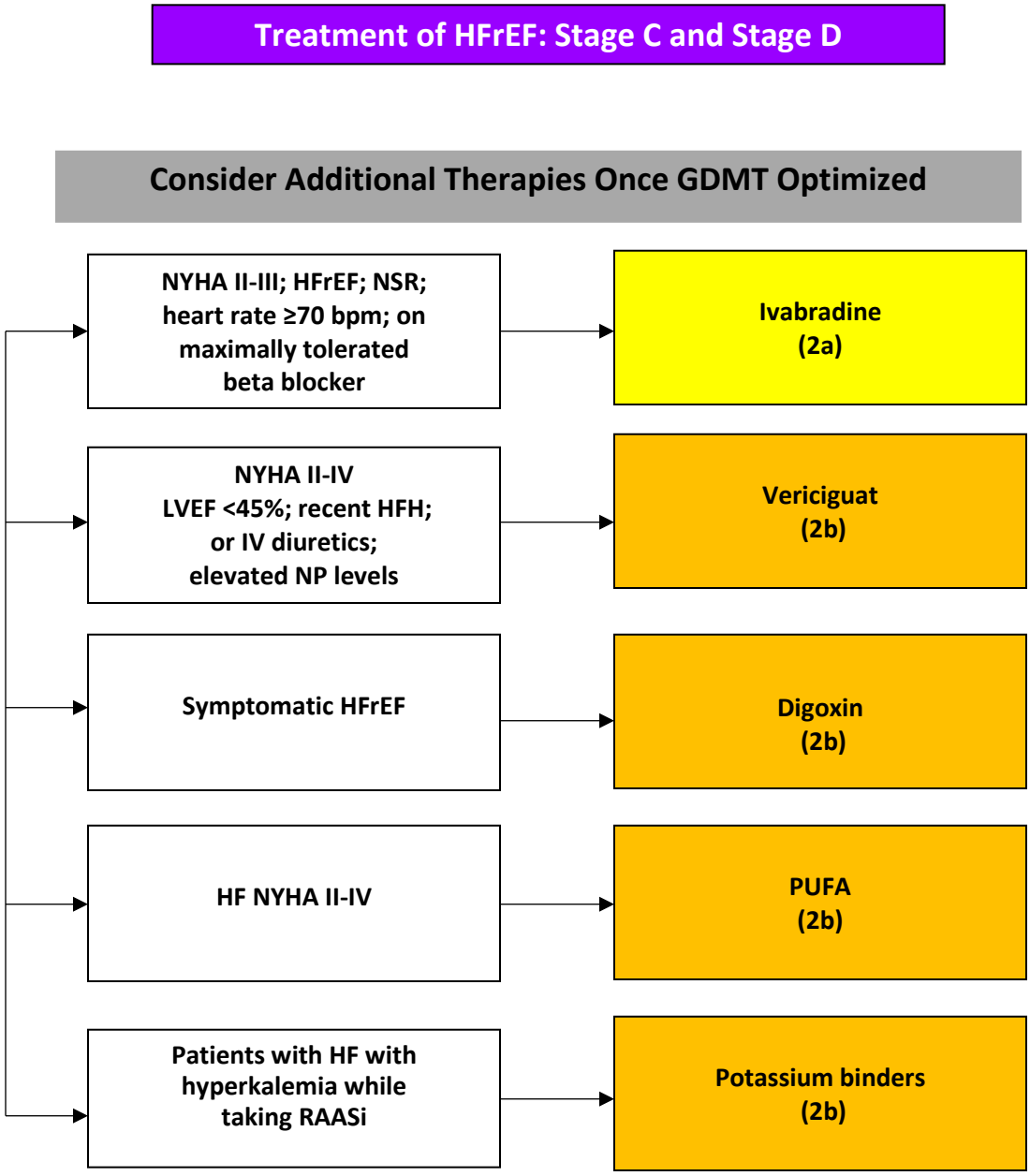
TREATMENT CONT'D

TREATMENT FOR STAGE C AND STAGE D HEART FAILURE



TREATMENT CONT'D

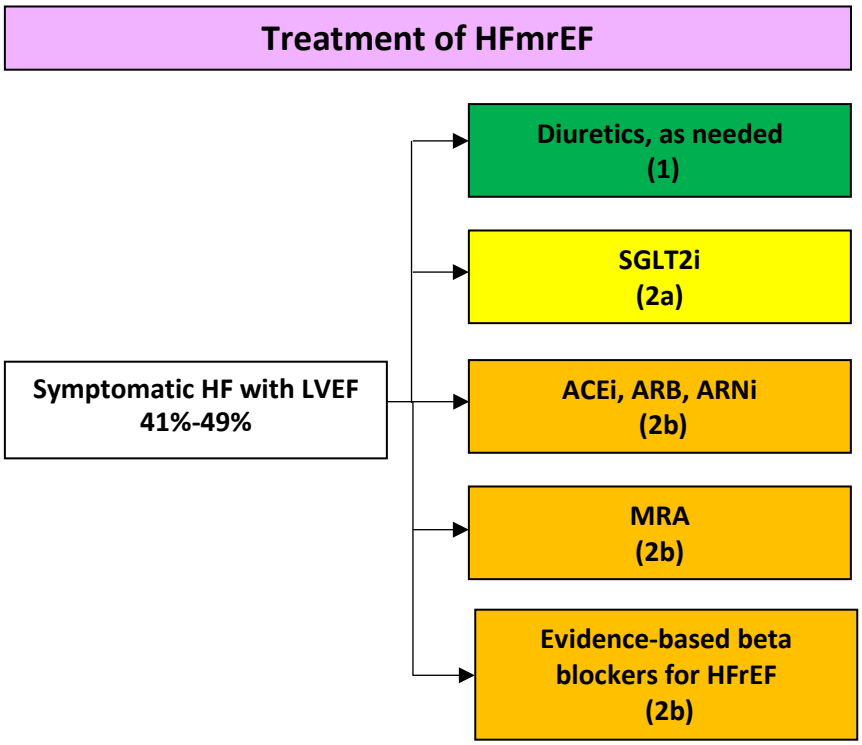
ADDITIONAL TREATMENT FOR STAGE C AND STAGE D HEART FAILURE ONCE GDMT OPTIMIZED



TREATMENT CONT'D

Keep in mind that the **bold** medications are CCHCS formulary options for GDMT.[1]

- Patients with HFmrEF LVEF 41%-49% (See algorithm below)
  - Avoid excessive sodium intake to 2 to 3 g/d with DASH diet
  - RAASi
    - ARNi
    - ARB
  - Beta blocker
  - MRA
  - SGLT2i
    - Empagliflozin was FDA approved for all HF patients (HFrEF and HFpEF) on February 24, 2022
    - Dapagliflozin FDA approved indications were expanded to all HF patients on May 9, 2023
    - Diuretics as needed for volume overload in combination with other GDMT[1,4,5]



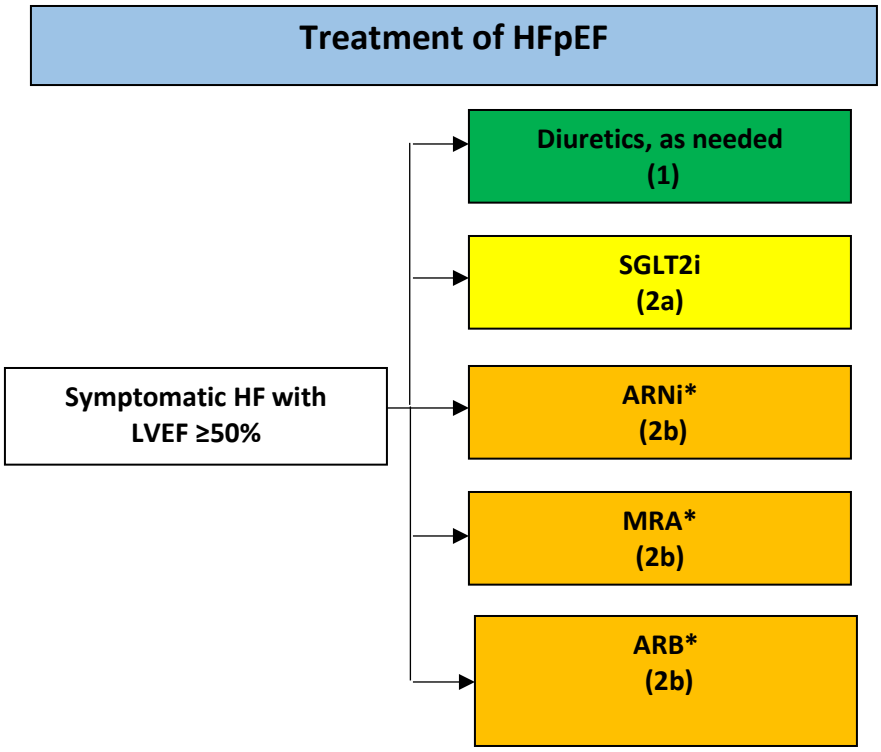
Keep in mind that the **bold** medications are CCHCS formulary options for GDMT.[1]

- Patients with HFimpEF
  - GDMT should be continued to prevent relapse of HF and LVEF, even in asymptomatic patients[1]

TREATMENT CONT'D

Keep in mind that the **bold** medications are CCHCS formulary options for GDMT.[1]

- Patients with HFpEF (See algorithm below)
  - Avoid excessive sodium intake to 2 to 3 g/d with DASH diet
  - Antihypertensive medications should be titrated to attain blood pressure targets, which includes RAASi, beta blockers, and MRA
    - ARNi
    - ARB
  - Beta blocker
    - Continue AF/AFL rate control for improved symptom control, can also consider nondihydropyridine calcium channel blockers
    - Also indicated for patients with a history of MI, symptomatic CAD, or history of percutaneous coronary intervention (PCI)
  - MRA
  - SGLT2i[1,4]



- Specific cardiomyopathies require consultation referral, including but not limited to the following:
  - Valvular heart disease leading to HF
  - Pulmonary hypertension
  - Stage D (advanced) HF who may benefit from
    - Durable mechanical circulatory support (MCS), such as ventricular assist device (VAD) or total artificial heart (TAH)
    - Cardiac transplantation
    - Palliative care
  - Genetic cardiomyopathies
  - Congenital heart diseases
  - Cardiac amyloidosis[1]
  - Cardio-oncology from cancer-related cardiomyopathy[6,7]
  - HF during pregnancy of history of peripartum cardiomyopathy[1]

TREATMENT CONT'D

DEVICE AND INTERVENTIONAL THERAPY

On top of GDMT, specialist referral is required when considering treatment with cardiac implantable devices, such as implantable cardioverter-defibrillator (ICD) and cardiac resynchronization therapy (CRT), for the following patient populations.[1]

Indications for ICD and CRT Therapy[1]		
Population	**ICD**	**CRT**
If comorbidities or frailty limit expected survival to less than a year, continue GDMT without device therapy		
Ischemic Cardiomyopathy		
LVEF ≤ 35% at least 40 days post-MI, NYHA class II-III, on chronic GDMT	✓	
LVEF ≤ 30% at least 40 days post-MI, NYHA class I, on chronic GDMT	✓	
Sinus rhythm, left bundle branch block (LBBB) with QRS duration ≥ 150 ms, LVEF ≤ 30%, NYHA class I, on chronic GDMT		✓
Nonischemic Cardiomyopathy		
LVEF ≤ 35%, NYHA class II-III, on chronic GDMT	✓	
ECG Criteria		
High risk of ventricular arrhythmia for primary prevention of sudden cardiac death (SCD)	✓	
Genetic arrhythmogenic cardiomyopathy, LVEF ≤ 45%,	✓	
High-degree or complete heart block, LVEF 36-50%		✓
Atrial fibrillation/flutter (AF/AFL), LVEF ≤ 35%, on chronic GDMT, if • Patient requires ventricular pacing • Patient meets other CRT criteria • Rate control therapy will allow near 100% ventricular pacing		✓
Sinus rhythm, LBBB with QRS duration ≥ 120 ms, LVEF ≤ 35%, NYHA class II-ambulatory IV, on chronic GDMT		✓
Sinus rhythm, non-LBBB with QRS duration ≥ 150 ms, LVEF ≤ 35%, NYHA class II-ambulatory IV, on chronic GDMT		✓
Sinus rhythm, non-LBBB with QRS duration between 120-149 ms, LVEF ≤ 35%, NYHA class III-ambulatory IV, on chronic GDMT		✓
LVEF ≤ 35% on chronic GDMT with an anticipated requirement for significant ventricular pacing		✓

Wearable cardioverter-defibrillators (WCDs) are external devices capable of automatic detection and defibrillation of malignant arrhythmias (ventricular tachycardia [VT], ventricular fibrillation [VF]) that can lead to sudden cardiac death (SCD). Unlike ICDs, WCDs do not have pacing capabilities. There are two FDA approved WCDs: LifeVest® and ASSURE®. The indications for WCD therapy are:

- Temporary bridge therapy for indicated or interrupted ICD therapy
- Early post-MI (within 40 days) with LVEF ≤ 35%
- LVEF ≤ 35% early after coronary revascularization (e.g. PCI, coronary artery bypass graft [CABG]) within 90 days
- Potentially recoverable newly diagnosed nonischemic cardiomyopathy LVEF ≤ 35% who has been on GDMT <3 months or not yet on target doses of GDMT; reassess LVEF ≥3 months to determine if ICD is indicated
- Peripartum cardiomyopathy while awaiting repeat assessment of recovery of ventricular function
- Bridge to heart transplant

For patients in whom WCD is recommended by their specialist or after discharge from HLOC, providers would need to submit a Request For Services form (RFS) to obtain approval.[9]

TREATMENT CONT'D

Additional intervention therapy

- Ischemic cardiomyopathy with LVEF ≤ 35% with suitable coronary anatomy
  - Surgical revascularization (CABG) plus GDMT
- HFrEF with severe secondary mitral regurgitation (MR) NYHA II-IV
  - Optimize GDMT before intervention with secondary MR
  - If suitable anatomy, transcatheter edge-to-edge mitral valve repair or mitral valve surgery
- NYHA III with history of HF hospitalization and elevated natriuretic peptide levels
  - Wireless monitoring of pulmonary artery (PA) pressure with implanted hemodynamic monitor
- Patients with refractory HF despite GDMT and appropriate device therapy (Stage D)
  - Durable MCS, such as VAD or TAH
  - Cardiac transplantation
  - Palliative care, which can be initiated before HF Stage D[1]

SUPPORT SERVICES

Timely referral for review and consideration of advanced HF therapies is crucial to achieve optimal patient outcomes. Think "I-NEED-HELP" to identify patients with advanced HF and assist in decision-making for referral to specialists:

Intravenous inotropes
NYHA class IIIB to IV or persistently elevated natriuretic peptides
End-organ dysfunction
LV**E**F ≤ 35%
Defibrillator shocks
Hospitalizations > 1
Edema despite escalating diuretics
Low systolic blood pressure (SBP) ≤ 90 mmHg and high heart rate
Progressive intolerance or down-titration of GDMT

Clinical Indicators of Advanced HF
Repeated hospitalizations or emergency department visits for HF in the past 12 months.
Need for intravenous inotropic therapy.
Persistent NYHA functional class III to IV symptoms, despite therapy.
Severely reduced exercise capacity (peak VO_{21} <14 mL/kg/min or <50% predicted, 6 min walk test distance <300 m, or inability to walk 1 block on level ground because of dyspnea or fatigue).
Intolerance to RAASi because of hypotension or worsening renal function.
Intolerance to beta blockers as a result of worsening HF or hypotension.
Recent need to escalate diuretics to maintain volume status, often reaching daily furosemide equivalent dose >160 mg/d or use of supplemental metolazone therapy.
Refractory clinical congestion.
Progressive deterioration in renal or hepatic function.
Worsening right HF or secondary pulmonary hypertension.
Frequent SBP ≤90 mm Hg.
Cardiac cachexia
Persistent hyponatremia (serum sodium, <134 mEq/L)
Refractory or recurrent ventricular arrhythmias; frequent ICD shocks.
Increased predicted 1-year mortality (eg, >20%) according to HF survival models (e.g., MAGGIC[21], SHFM[22]).

MAG-GIC, Meta-analysis Global Group in Chronic Heart Failure; SBP, systolic blood pressure; SHFM, Seattle Heart Failure model; and VO_{21} oxygen consumption/oxygen uptake.

TREATMENT CONT'D

- Patients with stage C or D
  - Advised specialty consultation with multidisciplinary team
    - Guide GDMT
    - Specific patient education and support for self-care
  - Up to date vaccinations
    - Respiratory illnesses (e.g., influenza, pneumococcal, coronavirus)
  - Additional screening
    - Depression and social isolation
    - Frailty
    - Low health literacy[1]

MONITORING

When a patient returns to clinic, the following steps should be taken:

- Assess patient adherence to diet and medications.
- Check blood pressure and heart rate. Initiate or adjust GDMT accordingly.
- Check patient's current weight and compare to their estimated or known dry weight. Initiate or adjust diuretic therapy accordingly.
- Check jugular venous pressure and examine the extremities to further assess for volume overload. Initiate or adjust diuretic therapy accordingly.
- Perform cardiac evaluation. Recheck ECG, if clinically indicated.
- Perform pulmonary evaluation. Recheck CXR, if clinically indicated.
- Consider rechecking the following labs, if clinically indicated:
  - CBC, if concern for anemia, increased bleeding risk, and/or infection
  - CMP, if on GDMT and/or diuretics
  - Other labs as clinically indicated: UA, lipid profile; iron studies; TSH
  - Do not order serial measurements of natriuretic peptides (BNP or NT-proBNP) because evidence for treatment guidance remains insufficient
- Patients that present with concerning signs or symptoms warrant transfer to a higher level of care (HLOC)

Repeat TTE in the follow patients:

- Significant clinical change (improvement or worsening despite GDMT)
- Receiving GDMT to reassess for invasive procedure or device therapy
  - >40 days after MI
  - >90 days after revascularization
  - >90 days after GDMT to optimize dosing[1,5]
- Patients with lifelong risk of cardiomyopathy, such as at-risk childhood cancer survivors, in whom cardiotoxicity may not manifest until decades after cancer treatment[6,7]

Point-of-care cardiac ultrasound (POCUS), if available, may be used to assess cardiac function, volume status and pulmonary congestion.

For advanced cardiac imaging (e.g., CMR) or invasive procedure, required consultation referral.

In select ambulatory patients with HF, CPET is recommended to determine appropriateness of advanced treatments (e.g., MCS such VAD or TAH, heart transplantation) in addition to GDMT. Required consultation referral to advanced heart failure program.[1,5]

MONITORING CONT'D

In patients with HFrEF, titrate GDMT to achieve target doses every 1-2 weeks depending on patient's symptoms, vital signs, volume status, and laboratory findings. Reaching target doses of all GDMT drug classes has been estimated to reduce all-cause mortality by 73% compared to no treatment. See GDMT Dosing below.[1]

GDMT Dosing[1]		
Drug	**Initial Dose**	**Target Dose**
ARNi		
Sacubitril/valsartan	49/51 mg BID (24/26 mg BID)	97/103 mg BID
ACEi		
Enalapril	2.5 mg BID	10-20 mg BID
Lisinopril	2.5-5 mg once daily	20-40 mg once daily
ARB		
Losartan	25-50 mg once daily	50-150 mg once daily
Valsartan	20-40 mg once daily	160 mg BID
H-ISDN		
Isosorbide dinitrate	20-30 mg every 6-8 hours	120 mg total daily in divided doses
Hydralazine	25-50 mg every 6-8 hours	300 mg total daily in divided doses
Beta Blockers		
Carvedilol	3.125 mg BID	25-50 mg BID
Carvedilol CR	10 mg once daily	80 mg once daily
Metoprolol succinate XL	25 mg once daily	200 mg once daily
Bisoprolol	1.25 mg once daily	10 mg once daily
MRA		
Spironolactone	25 mg once daily	25-50 mg once daily
Eplerenone	25 mg once daily	50 mg once daily
SGLT2i		
Empagliflozin	10 mg once daily	10 mg once daily
Dapagliflozin	10 mg once daily	10 mg once daily
I_f Channel Inhibitor		
Ivabradine	5 mg BID	7.5 mg BID
Soluble Guanylate Cyclase Stimulator		
Vericiguat	2.5 mg once daily	10 mg once daily
Cardiac Glycoside		
Digoxin	0.125-0.25 mg daily	Titrate to achieve serum digoxin level between 0.5-0.9 ng/mL

Bold = formulary medication

Co-management with specialists is recommended for patients who:

- Cannot reach target doses of GDMT because of limitations with blood pressure, heart rate, renal function, electrolytes, or other issues
- Have frequent episodes/hospitalization due to HF decompensation
- Have comorbidities that affect HF management, such as valvular heart disease, arrhythmias, cardiac ischemia, or other issues
- Require cardiovascular surgery or other cardiac interventions like catheterization, ablation, or biopsy
- Require device therapy, such as ICD or CRT
- Have Stage D (advanced) HF

HEART FAILURE DECOMPENSATION

Most HF hospitalizations for decompensation are not truly "acute" but follow a gradual increase in cardiac filling pressures on preexisting structural heart disease, often with precipitating factors as listed in the table. Patients may present with unintentional weight gain or weight loss over several days or weeks, worsening or sudden onset shortness of breath/dyspnea on exertion, orthopnea, paroxysmal nocturnal dyspnea, fatigue, chest pain, and peripheral edema.

Factors Precipitating HF Hospitalizations
ACS
Uncontrolled hypertension
AF/AFL or other arrhythmias
Additional cardiac disease (e.g., endocarditis)
Acute infection (e.g., pneumonia, urinary tract infection)
Nonadherence to medication or dietary intake
Anemia
Hyperthyroidism/hypothyroidism
Medications that increase sodium retention (e.g., NSAIDs)
Medications with negative inotropic effect (e.g., verapamil)

Initial triage includes clinical assessment of

- Blood pressure
- Heart rate
- Current weight compared to their known or estimated dry weight
- Jugular venous pressure
- Cardiac evaluation
- Pulmonary evaluation
- Examination of extremities

Some patients present with pulmonary congestion/edema and severe hypertension. Others present with hypoperfusion or cardiogenic shock, conduction block, malignant arrhythmias, or cardiac ischemia. Patients that present with concerning signs or symptoms warrant transfer to HLOC.

RETURN FROM HIGHER LEVEL OF CARE CLINIC FOLLOW-UP

Hospitalizations due to HF decompensation signal worse prognosis and the need to restore hemodynamic compensation, so early **follow-up within 5 days** of hospital discharge is required. When a patient returns from a recent hospitalization to their clinic follow-up, this is an opportunity to redirect the disease trajectory. Reassess and educate the patient on precipitating factors, comorbidities, optimal volume status as determine by their dry weight, and the importance of medication and dietary adherence. Goals of care should also be addressed. Patients who present with residual congestion and/or weight that is still above their dry weight merit close follow-up because they face a higher risk of rehospitalization and death. These patients warrant adjustment of their diuretic regimen to manage fluid retention and to decrease the risk of rehospitalizations. Finally, GDMT should be optimized toward target doses to decrease the risk of rehospitalizations and death.
(See GDMT Dosing on page 20)

Clinic Follow-Up After HF Hospitalization
Adjust diuretics based on volume status and electrolytes
Optimize GDMT Plan to resume medications held during hospitalization Plan to initiate new medications Plan to titrate GDMT to target doses
Coordinate labs (e.g., CMP with medication adjustments)
Reinforce patient adherence to diet and medication
Address precipitating factors
Address high-risk comorbid conditions Renal dysfunction (acute and/or chronic) Pulmonary disease DM Mental health/substance use disorder Cognitive impairment
Refer for GDMT co-management, if indicated
Refer for intervention or device therapy, if indicated
Discuss goals of care and promote shared decision-making

HOSPITALIZATIONS DUE TO HEART FAILURE CONT'D

When a patient returns from HLOC for HF, consider using the following discharge checklist to optimize management.

Hospital Discharge Checklist		
LVEF	Document recent LVEF % and recent assessment	Order repeat TTE, if clinically indicated
ARNi or ACEi/ARB	Document name of medication, current/target dose	If not prescribed, document reason
H-ISDN	Document name of medication, current/target dose	If not prescribed, document reason
Beta blocker	Document name of medication, current/target dose	If not prescribed, document reason
MRA	Document name of medication, current/target dose	If not prescribed, document reason
SGLT2i	Document name of medication, current/target dose	If not prescribed, document reason
Ivabradine	Document ivabradine current/target dose	
Vericiguat	Document vericiguat current/target dose	
Digoxin	Document digoxin dose	Document serum digoxin level
Anticoagulation	Document indication, such as comorbid AF/AFL	Document name of medication/dose
Antiplatelet(s)	Document indication, such as clinical ASCVD	Document name of medication/dose
Lipid lowering	Document indication, such as clinical ASCVD	Document name of medication/dose
Lab monitoring	Document recent labs/labs upon discharge	Order next set of labs/date
SCD prevention	Document indication for ICD and/or bridge WCD	Order referral to specialist, if indicated
BP control	Document BP at discharge and at follow up	Titrate GDMT for BP <130/80

Co-management with specialists is recommended for patients who:

- Cannot reach target doses of GDMT because of limitations with blood pressure, heart rate, renal function, electrolytes, or other issues
- Have frequent hospitalization due to HF decompensation
- Have comorbidities that affect HF management, such as VHD, arrhythmias, cardiac ischemia, or other issues
- Require cardiovascular surgery or other cardiac interventions like catheterization, ablation, or biopsy
- Require device therapy, such as ICD or CRT
- Have Stage D (advanced) HF

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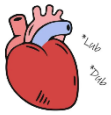
Reference articles available upon request to m_CDADS@cdcr.ca.gov

PATIENT EDUCATION

Heart Failure: What you Should Know

What is Heart Failure?

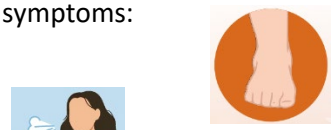


- Heart "failure" does not mean your heart has failed or stopped beating. It means that your heart is not pumping blood through your body as well as it should.
- This can result in fluid backing up in your body because your organs do not get as much blood as they need.

How do I know if I have Heart Failure?

If you have heart failure you may have any of the following symptoms:

- Swelling in your belly or feet, ankles, and legs
- Feeling short of breath
- Feeling tired, weak, lightheaded, or dizzy
- Racing heart, even when resting
- Gaining weight



Is There a Test for Heart Failure?

If your health care team thinks you may have heart failure, they may order some of these tests:

- Electrocardiogram (ECG): This test measures the electrical pulses made by your heart. This is measured by soft pads placed on your skin.
- Chest X-ray: This can show if there is fluid in your lungs and shows the general shape of your heart and large blood vessels.
- Echocardiogram: This test uses sound waves to create a picture of your heart as it is beating.
- Stress test: You may be asked to walk or run on a treadmill while you have an ECG or other heart tests. Exercise makes the heart beat harder and helps the doctor see what the heart is doing under stress.
  If you cannot run or walk, you might get medicine to make your heart beat harder.
- Blood tests: There are blood tests to measure levels of certain elements in your blood. People with heart failure may have high levels.

Source: Shutterstock

How is Heart Failure Treated?

- The first treatment is healthy lifestyle, which includes heart-healthy food choices and exercise.
- Heart failure is usually treated with several medications prescribed by your health care provider. Some of these medications can cause increased urination, dry mouth (xerostomia), rash, or other side effects. Please notify your doctor if you experience a potential side effect.
- Other treatments can include a device placed in your chest to protect the heart from abnormal rhythms.
- In some cases, heart failure can be managed with procedures done by heart specialists.

What Can I do if I Have Heart Failure?

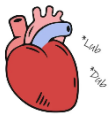
- Take all your medicines every day, even if you feel well.
- Tell your health care team if you feel sick or suddenly gain weight. This could mean there is fluid backing up in your body.
- Complete lab tests and heart tests as ordered by your health care provider.
- Eat less salt. Follow heart-healthy food choices.
- Lose weight if you are overweight or obese
- Don't smoke or drink alcohol
- Exercise as recommended by your health care team
- Do not take over the counter medications purchased at the canteen. Some common medicines like Aleve and Advil can make heart failure worse.
- Follow up with your health care provider and any heart specialists as scheduled.

EDUCACIÓN PARA EL PACIENTE

Insuficiencia Cardíaca: Lo que Debe Saber

¿Qué es la Insuficiencia Cardíaca?

- La "insuficiencia" cardíaca no significa que el corazón haya fallado o haya dejado de latir. Significa que su corazón no está bombeando la sangre a través de su cuerpo tan bien como debería.
- Esto puede provocar una acumulación de líquido en su cuerpo porque sus órganos no reciben tanta sangre como necesitan.



¿Cómo sé si sufro de Insuficiencia Cardíaca?

Si sufre de insuficiencia cardíaca, puede presentar alguno de los siguientes síntomas:

- Hinchazón en el vientre o en los pies, tobillos y piernas.
- Sensación de falta de aire
- Sensación de cansancio, debilidad, mareo o vértigo
- Corazón acelerado, incluso estando en reposo
- Aumento de peso

¿Existe una Prueba para Detectar la Insuficiencia Cardíaca?

Si su equipo de atención médica considera que usted puede sufrir de insuficiencia cardíaca, es posible que soliciten algunas de estas pruebas:

- Electrocardiograma (ECG, por sus siglas en inglés): Esta prueba mide los impulsos eléctricos emite el corazón.
  Se mide mediante la colocación de almohadillas blandas sobre la piel.
- Radiografía de Tórax: Puede revelar si hay líquido en los pulmones y muestra el perfil general de su corazón y los principales vasos sanguíneos.
- Ecocardiograma: Esta prueba utiliza ondas sonoras para crear una imagen de su corazón mientras late.
- Prueba de Esfuerzo: Es posible que le pidan que camine o corra en una cinta caminadora mientras le practican un ECG u otras pruebas cardíacas. El ejercicio hace que el corazón lata con más intensidad y ayuda al médico a ver lo que hace el corazón en situaciones de esfuerzo.
  Si no puede correr ni caminar, es posible que le administren medicamentos para que su corazón lata con más fuerza.
- Análisis de sangre: Existen análisis de sangre para medir los niveles de determinados elementos en la sangre. Las personas con insuficiencia cardíaca pueden tener niveles elevados.

¿Cómo se Trata la Insuficiencia Cardíaca?

- El primer tratamiento es un estilo de vida saludable, que incluye elección de vida saludables para el corazón y ejercicio.
- La insuficiencia cardíaca suele tratarse con varios medicamentos recetados por su proveedor de atención médica. Algunos de estos medicamentos pueden provocar aumento de la orina, sequedad de boca (xerostomía), sarpullido u otros efectos secundarios. Notifique a su médico si experimenta un posible efecto secundario.

- Otros tratamientos pueden incluir la colocación de un dispositivo en el pecho para proteger el corazón de ritmos anormales.
- En algunos casos, la insuficiencia cardíaca puede tratarse con procedimientos realizados por especialistas del corazón.

¿Qué puedo hacer si sufro de insuficiencia cardíaca?

- Tome todos sus medicamentos a diario, aunque se sienta bien.
- Informe a su equipo de atención médica si se siente mal o aumenta de peso repentinamente. Esto podría significar que hay líquido acumulado en su cuerpo.
- Complete los análisis de laboratorio y las pruebas cardiológicas que le indique su proveedor de atención médica.
- Consuma menores cantidades de sal. Elija alimentos saludables para el corazón.
- Pierda peso si tiene sobrepeso u obesidad
- No fume ni consuma alcohol
- Haga ejercicio tal como se lo recomiende su equipo de atención médica
- No tome medicamentos de venta libre comprados en la cantina. Algunos medicamentos comunes como Aleve y Advil pueden empeorar la insuficiencia cardíaca.
- Haga el seguimiento programado con su proveedor de atención médica y cualquier especialista del corazón.