

Background

There are approximately 6.2 million adults living in the United States with heart failure (HF) and the prevalence of HF is increasing. The number of people with HF is expected to rise 46% by 2030.¹ The overall prognosis of HF is poor. Half of people who develop HF die within 5 years of diagnosis. One in 9 deaths include HF as contributing cause.² A recent study showed that HF has a higher mortality rate than some types of cancer.³ The cost of HF is also high. The current annual cost of HF in the United States is \$30.7 billion, which is projected to more than double by 2030 to \$69.8 billion.¹ Fortunately HF outcomes can be improved. For example, appropriately treating blood pressure can prevent the development of HF by approximately 50%.⁴ Mortality due to HF can be substantially decreased with the use of guideline directed medical therapy (GDMT).² Effectively providing best-practice clinical care for patients with HF is a high priority at Sutter Health and aligns with the key Sutter Health goals. It helps improve clinical outcomes, patient quality of life, and affordability of health care.

Clinical Practice Guidelines Benefit

A clinical practice guideline improves consistency of best-practice evidence-based care in a health care organization. It allows all members of a care team to screen, diagnosis, monitor, treat and educate patients using standard recommendations consistently across care environments, specialties, and affiliates. It helps ensure outcome metrics are consistent with recommended patient care. It helps translate best practice care into electronic health record tools and standards, patient education materials, and staff training resources. And it provides a means to adjust care efficiently and consistently across the organization when new evidence emerges. Implementation of clinical practice guidelines is a key recommendation of national campaigns to improve clinical outcomes of chronic conditions.

Guideline Committee Process

The following Sutter Health Adult Heart Failure Clinical Practice Guideline was written by a 40-person multi-disciplinary team from across Sutter Health. The team was carefully crafted to represent the wide spectrum of Sutter Health's clinical community: geography (both Bay and Valley geographic regions), types of providers (cardiologists, family physicians, internists, advanced practice clinicians, registered nurses,

registered dietitians, pharmacists, educators), type of practice (foundation and independent affiliates), type of department (local office and system office), and type of work (in-person patient care, case management, quality and population health). A patient representative was included in the writing team. Writing this guideline was a multi-step process. Major sources of standards for HF were identified which rely on clinical outcome trials and report the level of evidence for their recommendations – such as the American Heart Association (AHA) and the American College of Cardiologists (ACC). The key recommendations from each source were carefully reviewed by the committee, and those recommendations with the strongest evidence and those most consistent with best practice care for the Sutter Health population were included.

Guideline Recommendations

This guideline is intended for the care of adults with HF in an ambulatory setting. It is not intended for pregnant patients, hospitalized patients, children or adolescents. It is intended to help clinicians, educators, case managers and patients make decisions according to standard clinical practice and to improve the care and management of patients with HF at Sutter Health. However, it should not replace individual clinical judgment nor specialty consultation when indicated. All clinical decisions should be made within the context of the specific situation for each patient, including current health, medications, risk of treatment side effects, quality of life, life expectancy, and patient preference.

The guideline is divided into the following major topics:
([click on the topic to jump to that section](#))

[I. Definition and Classification](#)

[II. Diagnosis, Evaluation, and Monitoring](#)

[III. Prevention and Treatment](#)

[IV. Comorbidities](#)

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Ambulatory Heart Failure Guideline

I. Definitions and Classification of Heart Failure

Definition

“Heart Failure (HF) is a complex clinical syndrome that results from structural or functional impairment of ventricular filling or ejection of blood.”⁴

- In general, the term “heart failure” (not “congestive heart failure”) should be used to describe the syndrome since not all HF is associated with symptoms of congestion ⁴

Categories of Heart Failure

- **Ejection Fraction (EF)*: Heart Failure preserved EF (HFpEF) to Heart Failure reduced EF (HFrEF)**⁴

Note: Preserved or reduced EF should be used to categorize HF because EF is the most strongly associated with choice of therapy and prognosis⁴:

- Dysfunction: systolic, diastolic, or both
- Ventricles affected: left (most common), right, or both
- Size of ventricle: normal to hypertrophied to dilatation

* Measurement of EF is affected by technique and operator⁴

Table 1. Categories of Heart Failure Based on Ejection Fraction

EF (%)	Categories of HF ⁴	
	Acronym	Name
EF ≤ 40%	HFrEF	Heart Failure with reduced Ejection Fraction
EF 41%-49%	HFmrEF	Heart Failure with mildly reduced (midrange) Ejection Fraction
EF ≥ 50%	HFpEF	Heart Failure with preserved Ejection Fraction
EF is now ≥ 40% but previously was < 40%		Heart Failure with improved (recovered) Ejection Fraction

Stage and Class of Heart Failure

- **Stage of HF** emphasize the development and progression of disease – defined by The American College of Cardiology Foundation (ACCF) and American Heart Association (AHA) ⁴
- **Functional Class of HF** describes the current symptoms and exercise capacity of the person with HF – defined by The New York Heart Association (NYHA).⁴
- Notes:
 - By definition patients with Stage A and Stage B have had no current or past symptoms of heart failure. So nearly all patients with the clinical syndrome of HF are Stage C or above.
 - Once a patient reaches as stage of HF they do not move back (ie once a patient has stage C they always have at least stage C).
 - Patients can move back and forth between classes based on current symptoms.
 - Stage and class of HF are complimentary and should be used together (such as “Stage C, class III” for example)
 - Consider use of standardized questionnaire to assess symptomatology.

Table 2: Association ACCF/AHA Stages of HF and NYHA Functional Classifications.⁴

Stage of HF ⁴	NYHA Functional Class of HF ^{4*}
A At high risk for HF but without structural heart disease or symptoms of HF	None
B Structural heart disease but without signs or symptoms of HF	I No limitation of physical activity. Ordinary physical activity does not cause symptoms of HF.
C Structural heart disease with prior or current symptoms of HF	I No limitation of physical activity. Ordinary physical activity does not cause symptoms of HF.
	II Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in symptoms of HF.
	III Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes symptoms of HF.
D Refractory HF requiring specialized interventions	IV Unable to carry on any physical activity without symptoms of HF, or symptoms of HF at rest.

Cardiomyopathy

- Cardiomyopathy is a major cause of HF – consider diagnostic evaluation for cardiomyopathy when clinical suspicion.
 - Categories: dilated, hypertrophic, restrictive, survivors of congenital heart disease, or others.
 - Causes: Ischemic or Non-ischemic. There are a variety of causes of non-ischemic cardiomyopathy noted on the table below.

Table 3: Causes of Non-Ischemic Cardiomyopathy⁴

Causes of Non-ischemic Cardiomyopathy ⁴		
Obesity*	Cancer Therapies	Hypersensitivity Myocarditis
Diabetes	Nutritional Causes	Peripartum
Thyroid Disease	Tachycardia	Iron Overload
Acromegaly and GH Deficiency	Myocarditis and Inflammation	Amyloidosis
Myocardial Toxins	Acquired Immunodeficiency Syndrome	Cardiac Sarcoidosis
Alcohol	Chagas Disease	Stress (Takotsubo)
Cocaine and methamphetamines	Rheumatological/Connective Tissue Disorders	Familial

* Obesity cardiomyopathy is defined as cardiomyopathy due entirely or predominantly to obesity⁴

Risk Factors for Heart Failure (see treatment of Stage A HF for prevention)

Table 4: Risk Factors for Heart Failure ^{4, 5, 6}

Risk Factors for Heart Failure		
Hypertension ^{4, 5}	↑ neurohormonal levels ⁵	Microalbuminuria ⁵
Atherosclerotic Disease ^{4, 5}	Diabetes ^{4, 5}	Alcohol ⁵
Valvular heart disease ⁶	Obesity ^{4, 5}	Tobacco ⁵
Arrhythmias	Sedentary behavior ⁵	Street drugs (i.e. cocaine, methamphetamines, etc.)
Men (vs women) ⁵	Lipids ⁵	Abnormal ECG ⁵
Increased resting pulse ⁵	Older age ⁵	Increased cardiothoracic ratio on CXR ⁵

Coding and Documentation for Heart Failure

- Accurate coding and documentation is critical for patients to receive coordinated best-practice HF care across the journey of their condition and by all members of the care team.
- Always update the problem list with the correct ICD-10 code.
- Note EF is the key HF criteria that drives treatment decisions that improve outcome and mortality – so should be used as the first step when identifying and documenting the HF diagnosis.
- Follow the three steps below

3 Steps to Document a HF Diagnosis

1. Review the patient’s EFs. Use the table below (regardless of current symptoms of congestion).

EF Heart Failure Category	ICD10 code**
EF ≤ 40%* HF with reduced EF (HFrEF) EF 40%- 49%* HF with mildly reduced EF (HFmrEF)	→ I50.2x (“systolic”) ^{***}
EF ≥ 50% Heart Failure with preserved EF (HFpEF)	→ I50.3x (“diastolic”)

*Use I50.2 or I50.4 if the EF is reduced at any time in the past or present (unless underlying cause is resolved and EF is now normal)

**Use other ICD10s – such as LV failure unspecified I50.1x, other HF I50.8x, right HF I50.81, biventricular HF I50.83, HF unspecified I50.9x etc. – in addition to or in place of the codes above when appropriate. For more details, click here.

***Or consider use I50.4x “systolic and diastolic” (less commonly used)

2. Add a subtype (5th digit) based on below
 - Unspecified (xxx.x0)
 - Acute (xxx.x1)
 - Chronic (xxx.x2)
 - Acute on chronic (xxx.x3)
3. Write the following information below in the progress note when the patient is seen
 - Reduced or preserved EF
 - Current HF symptoms
 - Contributors to HF if known (include whether “associated with,” “due to,” etc.).
 - Hypertension
 - Valvular disease
 - Arrhythmia
 - Ischemic cardiomyopathy
 - Etc.

II. Diagnosis, Evaluation and Monitoring of Heart Failure

Signs and symptoms⁴

Diagnosis

- Key symptoms due to congestion
 - Shortness of breath/dyspnea, cough, orthopnea, paroxysmal nocturnal dyspnea (PND), bendopnea (shortness of breath when leaning forward)
 - Note: these symptoms are sometimes incorrectly thought to be COPD or asthma
 - Edema
 - Abdominal fullness, pain and discomfort from hepatic congestion and ascites
 - Rapid weight gain
- Key symptoms due to decreased cardiac output
 - Fatigue
 - Weakness
 - Decreased/limited exercise tolerance
- Key signs on physical examination
 - Elevated jugular venous pressure (neck veins may appear distended)
 - Displaced apex pulse, S3 Gallop, Tachycardia
 - Note: if loud murmur, irregular heart rate or chest pain refer urgently to cardiology
 - Pulmonary rales, decreased breath sounds at the lung bases, orthopnea
 - Distended or swollen abdomen, enlarged liver
 - Peripheral edema (usually starts in the feet and legs, but may include hand, arms and trunk)
 - Increased weight

Monitoring

Patient should check themselves daily for evidence of worsening status, esp. if they have had previous congestion or hospitalization. Care teams should monitor the patient frequently to determine if the patient develops symptoms:

- Blood pressure (BP) and heart rate (HR)
- Use of Continuous Positive Airway Pressure (CPAP), Bilevel Positive Airway Pressure (BiPAP), Oxygen
- Weights:
 - Patient identified weight gain at home such as⁷
 - » 2-3 lbs. in 2-3 days
 - » 5 pounds in 1 week
 - Individualize exact amount based on patient characteristics and baseline weight (use lower weight threshold for lower weight individuals, and vice versa).
 - » Fatigue and exercise intolerance⁷
 - » Respiratory symptoms (shortness of breath, orthopnea, number of pillows)⁷
 - » Edema⁷
 - » Quality of Life (QOL)

- Standardized questionnaire to assess symptomatology
 - Sutter Heart Failure Stoplight tool http://mysutter/Clinical/Health-Literacy-Stoplight-Tools/Documents/Heart%20Failure_SH.pdf
 - American Heart Association Symptom Tracker <https://www.heart.org/en/health-topics/heart-failure/warning-signs-of-heart-failure>
 - Kansas City Cardiomyopathy Questionnaire (KCCQ 12)

Laboratory tests

Diagnosis

- Complete blood count (CBC), urinalysis (UA), comprehensive metabolic panel, magnesium (Mg), A1C⁸, fasting lipid profile, liver function tests (LFTs), thyroid-stimulating hormone (TSH), ^{(Class I, LOE C) 4, 8} NT-proBNP (or BNP)

Specific circumstances:

- Iron studies/Screening for hemochromatosis or HIV ^{(Class IIa, LOE C)4}
- Tests for Amyloid cardiomyopathy (particularly ATTR amyloidosis) ^{(Class IIa, LOE C)4}
- Tests for rheumatologic diseases or pheochromocytoma ^{(Class IIa, LOE C)4}

Monitoring

- Check a basic metabolic panel annually, before initiating medications, and 1-2 weeks after medication changes.

Biomarkers

Plasma brain natriuretic peptide (BNP) and N-terminal pro-BNP (NT-proBNP)

- Use NT-proBNP instead of BNP when possible (as BNP is artificially increased in patients on ARNIs)²¹
- Check NT-proBNP in the following circumstances:
 - Diagnosis
 - » Risk for HF – to screen for early intervention and prevention of HF ^{(Class IIa, LOE B-R)9, 21}
 - » Dyspnea of clinical uncertainty – to evaluate for the diagnosis of HF ^{(Class I, LOE A)4, 9}
 - » New onset HF – to help confirm the diagnosis of HF ^{(Class I, LOE A)4, 8}
 - Monitoring
 - » Chronic HF – to evaluate symptoms, to determine severity and prognosis,^{(Class I, LOE A) 21} to determine optimal dosing of medications,^(Class IIa, LOE B) to evaluate clinical responsiveness to GDMT (non-responders are thought to have a worse prognosis)²¹ and to make decisions about referral for advanced HF therapies^{4, 8, 9, 10}
 - Note: the specific frequency of monitoring is individualized by patient and provider.
 - » Acute decompensated HF – to support clinical judgment for the diagnosis, severity, and prognosis ^{(Class I, LOE A) 4, 9, 10}
 - » Discharge from hospital – to establish a post discharge prognosis ^{(Class IIa, LOE B-NR) 9}

Notes about BNP and NT-proBNP

- Cannot distinguish between HF_{rEF} and HF_{pEF}¹⁰ but levels are generally lower in HF_{pEF}¹¹
- NT-proBNP concentration is about 4x higher than BNP in left ventricular (LV) dysfunction¹⁰
- Low levels help exclude HF⁴ and high levels help confirm HF ^{4, 11}
- ARNIs artificially increases BNP but not NT-proBNP ^{9, 8}

Table 5: BNP and NT-proBNP Levels and Heart Failure Diagnosis^{5,11}

Decision	BNP level ^{5,11}	NT-proBNP level ^{5,11}
HF unlikely (“rule-out”)	Chronic HF < 35 pg/mL Acute HF < 50 pg/mL	Chronic HF < 125 pg/mL Acute HF < 300 pg/mL
HF likely (“rule-in”)	> 400 pg/mL**	< 50 years old: > 50 pg/mL** 50-75 years old: > 900 pg/mL** 75 years old: > 1800 pg/mL**

**ambulatory setting **acute setting*

Table 6: Characteristics That Affect BNP and NT-proBNP

BNP and NT-proBNP level increased by	BNP and NT-proBNP decreased by
ARNIs (artificially increases BNP but not NT-proBNP) ^{9,8}	Obesity (less sensitive) ^{8,10}
Beta blocker initiation (↑ levels should not preclude up-titration) ⁸	Pericardial constriction ^{JAMA 2020}
Increasing age ¹⁰	
Woman (vs men) ¹⁰	
Renal dysfunction ^{8,10}	
Atrial fibrillation (AF) or other arrhythmia ^{10 JAMA 2020}	

Other Biomarkers⁸

- May consider for further risk stratification and prognosis in specific situations
 - Troponins I and T (Myocardial injury)
 - Soluble ST2 receptor, high-sensitivity cardiac troponin, galectin-3⁹

Other tests

- 12-lead electrocardiogram (ECG)
 - New onset HF (Class I, LOE C) 4, 8
 - First degree relatives of patients with cardiomyopathy¹²
- Chest X-ray (CXR)
 - New onset HF (Class I, LOE C) 8
 - Acute decompensated HF (Class I, LOE C) 4
- 2-Dimensional echocardiogram (Echo) with continuous-wave (CW) and color Doppler
 - New onset HF (Class I, LOE C) 4, 8, 21
 - Change in clinical status or treatment (Class I, LOE C) 4, 21
 - Note: providers reading echos should include EF in numeric 5 point increments (such as 30-35%, 35-40%, etc) in all echo reports – including stress echos and transesophageal echos.
- Monitoring
 - » 3 months after optimal GDMT to determine need for device therapy and referral for advanced therapies^{4, 8, 21}
 - » Individualize by patient²¹ (if HFrEF consider every 1-3 years⁵)

- Radionuclide ventriculography
 - If echo is inadequate (Class IIa, LOE C)4, 8
- Magnetic resonance imaging (MRI)
 - If echo is inadequate (Class IIa, LOE C)4, 8
- Noninvasive myocardial ischemia imaging (nuclear imaging or echo)
 - Evaluate for ischemia (Class IIa, LOE C)4
- CT Coronary Angiogram
 - Use for ischemic disease, if can't exercise, diagnosis is confusing, or to diagnose intermediate disease (such as in diabetes)
- Coronary arteriography
 - Evaluate for ischemia if patient eligible for revascularization (Class IIa, LOE C) 4, 8
- Endomyocardial biopsy
 - Suspect specific diagnosis that would influence therapy (Class IIa, LOE C) (Not used in the routine evaluation of HF (Class III, LOE C) 4, 8)

Invasive Monitoring

- CardioMEMS (ambulatory pressure measuring device that is implanted into the pulmonary artery to help adjust therapy)
 - May consider for high risk patients or those with poor response to GDMT. ²¹ Implementation is individualized and is in collaboration with HF specialists.
 - Reduces HF hospitalization ²¹ and improves quality of life in HFrEF and HFpEF. Reduced mortality in HFrEF.^{13, 14}

Table 7: Summary of Tests New Diagnosis and Routine Monitoring

Initial Evaluation of New Diagnosis	Routine Monitoring
CBC, UA, Mg, A1C, Lipid panel, LFTs, TSH	Basic Metabolic Panel:* annually** and after medication changes**
NT-proBNP (BNP)	BNP or NT-proBNP: individualized
Echo	Echo: 3 months after target GDMT and Individualize by patient (if HFrEF consider every 1-3 years)
EKG	
CXR	
Ischemia work-up as indicated	

*May order either individual tests (Na, K, Cr) or BMP (preference varies by provider and affiliate)

**If on Diuretic, ACE inhibitor or ARB, Aldosterone Antagonist, ARNi and/or digoxin

III. Prevention and Treatment of Heart Failure

General Prevention and Treatment

- Goals of Treatment⁵
 - Improve survival
 - Reduce morbidity
 - Reduce hospitalizations
 - Reduce symptoms
 - Increase functional capacity
 - Increase quality of life
- Treatment variation
 - Varies according to Stage (A-D)
 - Varies according to category of EF (HFrEF vs. HFpEF) within Stage C
 - Treatment improves progression and outcomes in HFrEF⁵
 - Treatment less effective in HFpEF⁵
 - Varies based on comorbidities and risk factors
- General principles of treatment
 - Document a clear, detailed, and evidence-based plan of care that is regularly updated and made available to the whole health care team^{(Class 1, LOE C) 4}
 - Provide regular, ongoing, and repeated discussions with patients and family regarding patient goals and advance care planning⁵
 - Provide team-based HF care which improves mortality, hospitalization rate, LOS and quality of life²¹ Team based care is particularly important if recurrent HF hospitalizations^{(Class 1, LOE B) 4, 5, 15}
 - HF care should include^{8, 21}
 - » Health literate education and self-management strategies based on patients individual skills²¹
 - » Patient-centered shared decision making²¹
 - » Effective and target doses of GDMT^{(Class 1, LOE B) 4}
 - » Best-practice strategies to increase medication adherence²¹
 - » Monitoring, early recognition and early treatment of HF signs and symptoms
 - » Care coordination and effective communication between care teams²¹
 - » Palliative and supportive care for persistent symptomatic HF^{(Class 1, LOE B) 4}
 - Multidisciplinary team includes cardiologists, primary care physicians, other physician specialists, advanced practice clinicians, nurses, pharmacists, dietitians, social workers, and palliative care managers.^{5, 8, 15}
- Quality Improvement
 - Focus on improving metrics related to HF which improve the quality of HF care.^{(Class IIa, LOE B) 4}
 - HF quality metrics should include HF mortality, hospital admission rates for people living with HF, HF readmission rates, use of GDMT, measurement of LV function before/during hospitalization or planned after discharge, follow-up appointment with provider made at time of discharge, and others.^{(Class 1, LOE B) 4}
 - Encourage the recording EF as a discrete field in the Sutter EHR (Epic) to facilitate measuring and improving HF quality metrics and outcomes

Treatment and Prevention of Heart Failure by Stage

TREATMENT OF STAGE A

(i.e. patients at risk of HF but no structural heart disease)

Definition

At high risk for HF but without structural heart disease or symptoms of HF⁴

Goals⁴

- Heart healthy lifestyle
- Prevent vascular, coronary disease
- Prevent LV structural abnormalities

Nonpharmacologic (lifestyle and behavior)

Who: all patients at risk to prevent HF and to help manage those diagnosed with HF

- Increase physical activity (Class I LOE: A) 4, 5
- Lose weight for those who are overweight or obese (Class I LOE: C) 4, 5
- Treat tobacco use (Class I LOE: C) 4, 5
- Treat drug abuse (especially cocaine and methamphetamines which cause cardiomyopathy and HF)
- Avoid excess alcohol use⁴
- Avoid cardiotoxic agents (Class I LOE: C) 4
- Look at 3 generational family history of HF⁴

Pharmacologic

Who: all patients at risk to prevent HF and to help manage those diagnosed with HF

- **Treat hypertension**^{4,5}
 - See the [Sutter Health Hypertension Guidelines](#)
 - Target: Treat BP to target of **< 130/80** to optimize risk reduction (individualize based on risks and side effects) (Class I, LOE: B-R) 9
 - Note: HF increases with ↑ BP (esp. SBP), ↑ age, and longer duration of hypertension. Long term treatment of hypertension lowers the risk of HF by approx. 50%⁴
- **Treat lipids**^{4,5}
 - See the AHA Lipid Guidelines
 - Note: Statins should be used as indicated for patients with a history of MI or ACS^{(Class I, LOE: A)⁴}, vascular ischemic disease or high ASCVD risk.⁴
 - Statins have no independent benefit when used solely for HF (Class III, LOE: A) 4

Treat diabetes^{4,5}

- See the [Sutter Health Adults Diabetes Guidelines](#)
- Note: Diabetes causes HF independent of CAD⁵. 12% of all diabetes patients and 22% of diabetes patients 65 and older have HF⁵

Device/Procedure Therapy

- Only as recommended for comorbidities

TREATMENT OF STAGE B

(i.e. patients with structural disease but no past or present HF symptoms)

Definition

Any structural heart disease but without signs or symptoms of HF⁴ (Note: Some are considering the term “Pre-heart failure”)

Goals⁴

- Prevent HF symptoms
- Prevent further cardiac remodeling

Nonpharmacological – see recommendations from stage A

Pharmacologic Treatment – See recommendations from stage A and those recommendations below. See the medication tables for more detail.

• Renin-Angiotensin Medications (ACE inhibitor/ARB)

Who: Indicated for HFrEF or post MI even if no previous or current symptoms of HF

Why: Prevent symptomatic HF and prevent mortality. (Class I, LOE: A)⁴

• Beta blocker (bisoprolol, carvedilol, and sustained-release metoprolol succinate)

Who: Indicated for HFrEF or post MI even if no previous or current symptoms of HF

Why: Prevent mortality. (Class I, LOE: B)⁴

• Sodium Glucose Cotransporter-2 (SGLT2) Inhibitors

Who: If type 2 diabetes

Why: Reduces mortality and HF hospitalizations and prevents CKD (in patients with established CVD and those with risk factors for CVD)¹⁷

NOTE: Avoid Nondihydropyridine Calcium Channel Blockers (CCBs)*

- **Who:** HF with reduced EF
- **Why:** May cause harm. (Class III, LOE: C)⁴ (* i.e. only use amlodipine and felodipine)

Device/Procedure Therapy

• Implantable Cardioverter Defibrillator (ICD)

Who: Cardiomyopathy EF < 35% 40 days post-MI (and on GDMT and expected survival with good function > 1 year) (Class IIa, LOE: B)⁴

Why: To prevent sudden death

TREATMENT OF STAGE C

(ie. patients with any previous or current HF symptoms) in HFpEF

Heart Failure with Preserved or Borderline Ejection Fraction (HFpEF)

Definition

Structural heart disease with prior or current symptoms of HF and EF \geq 50%

Goals⁴

- Control symptoms
- Improve Quality of Life
- Prevent hospitalization
- Prevent mortality

Nonpharmacological – see recommendations from stage A

Pharmacological Treatment – see recommendations from stage A and those recommendations below. See the medication tables for more detail.

• Diuretics

Who: If symptoms of congestion

Why: Relieves symptoms (Class I LOE: C) 4, 9, 5

Notes: Use the lowest possible dose of diuretic to avoid decrease cardiac output and compromising renal function⁵

• Aldosterone receptor antagonists

Who: May consider if EF \geq 45% (eGFR $>$ 30, Cr $<$ 2.5, K $<$ 5.0) and one of below

- Elevated BNP⁹
- HF admission within last year⁹

Why: Decreases hospitalizations (Class IIb LOE: B-R)^{9, 5}

• SGLT2 Inhibitors

Who: If type 2 diabetes¹⁷

Why: Reduces mortality and HF hospitalizations and prevents progression of CKD in patients with HFmrEF and HFpEF¹⁷

• Below are not effective

- Nutritional supplements are not effective (Class III, LOE B-R) 4, 9
- Nitrates are not effective (Class III, LOE B-R) 9
- Phosphodiesterase-5 inhibitors are not effective (Class III, LOE B-R) 9

Device/Procedure

• Coronary revascularization

Who: If patient has ischemia contributing to or causing reduced ejection fraction.⁹

Why: Improves mortality (Class IIa LOE: C) 4

TREATMENT OF STAGE C

(ie. patients with any previous or current HF symptoms) in HFrEF Definition

Structural heart disease with prior or current symptoms of HF with EF \leq 40%⁴

Goals⁴

- Control Symptoms
- Patient education
- Prevent hospitalization
- Prevent mortality

Nonpharmacological Treatment – see recommendations from stage A and those recommendations below. See the medication tables for more detail.

- **Health Literate Education about Self Care and Self-Management** (Class I LOE: B) 4

- **Increase Physical Activity**

Why: Decreases admissions, improves symptoms and improves quality of life (Class I LOE: A) 4, 5

- **Cardiac Rehabilitation**

Who: Medicare pays for cardiac rehab in the following patients:

- LVEF \leq 35% NYHA class II to IV symptoms and
- On optimal GDMT for \geq 6 weeks and
- Does not have recent (within last 6 weeks) or planned (within next 6 months) major CVD hospitalizations or procedures.²⁰

Other potential indications:

- Treated/vascularized ischemic disease and valve disease.

Why: Improves functional capacity, exercise tolerance, quality of life and mortality (Class IIa LOE: B) 4

- **Sodium restriction** – generally < 2000 mg/day

Why: Improve symptoms of congestion (Class IIa LOE: C) 4, 5

Note: Still a subject of debate. Individualize based on symptoms and baseline consumption⁵

- **Fluid restriction** – generally < 2 liters/day

Who: If congestion symptoms not easily controlled with diuretics or if hyponatremia

Why: May improve symptoms of congestion^{4, 5}

Note: Based on clinical experience. Implement with weight and symptom monitoring⁴

- **Daily Weight Monitoring**

Who: Most people with stage C HF (may individualize based on patient characteristics).

Why: To predict and prevent exacerbations and to help adjust diuretic dose^{4, 5}

Note: Weigh daily at same time with same or no clothing. Determine baseline (“dry”) weight during period that patient is clinically stable. Tell patient to contact provider or care team if more than 2-3 lbs. weight gain in 2-3 days or more than 5 lbs. weight gain in a week (individualize based on patients characteristics, baseline weight, etc.)⁷

- **Continuous positive airway pressure (CPAP)**

Who: If sleep apnea.

Why: Improves LVEF and functional status (Class IIa LOE: B) 4

- **Avoid alcohol**

Who: If alcohol is precipitating or a contributing factor⁵

• Provide patients with Health Literate Patient Engagement Materials

- Sutter Health 2018 HF booklet
[http://mysutter/Resources/SystemDepartments/ope/QCE_ClinicalHandouts/17-CPMC-0009961_My%20Heart%20Health%20Plan%20Heart%20Failure%20BOOKLET%20\(2\).pdf](http://mysutter/Resources/SystemDepartments/ope/QCE_ClinicalHandouts/17-CPMC-0009961_My%20Heart%20Health%20Plan%20Heart%20Failure%20BOOKLET%20(2).pdf)
- Sutter Health lower literacy HF booklet
http://mysutter/Resources/SystemDepartments/ope/QCE_ClinicalHandouts/19-SHSO-0015351-OPE_Caring_for_Your_Heart_Cover_BKLT_v1%202019.pdf
- Sutter Health HF Stop Light Tools
<http://mysutter/Clinical/Health-Literacy-Stoplight-Tools>
- AHA HF resources
<https://www.heart.org/en/health-topics/heart-failure/heart-failure-tools-resources>
- Heart Failure Society of America Education Modules
<https://www.hfsa.org/patient/patient-tools/educational-modules/>
- Information about Home Blood Pressure Monitors: validatebp.org for selection of home blood pressure monitor (source: AMA)

Pharmacological Treatment – see recommendations from stage A and those recommendations below. See the medication tables for more detail.

General Principals

- Guideline Directed Medical Therapy (GDMT) is recommended in patients with HFrEF and current or prior symptoms to reduce morbidity and mortality. ^{(Class I LOE: A) 4}
- Four GDMT medication classes have strong evidence of improving outcomes and should be used to treat patients with HFrEF: ARNis/ACEs/ARBs, Beta Blockers, Aldosterone Receptor Antagonists, and SGLT2s.²¹
- Begin GDMT immediately after the HFrEF diagnosis.²¹
- Titrate GDMT to target dose (or maximally tolerated doses) to achieve the full benefits even in patients who are stable or who have improved symptoms and EF.^{21, 8, 5} (Note: Doses higher than target doses are not known to provide additional benefit)⁸.
- Start GDMT at low doses and titrate every 1-2 weeks.²¹ See the medication table for specific titration and monitoring recommendations. Offer frequent visits, education and phone contact.^{8, 21}
- After initial diagnosis may start with either ACE inhibitor/ARB/ARNi or beta blocker first based on below: ^{8, 21}
 - » Initiate ACE inhibitor/ARB/ARNi first if the patient is congested at the time of initiation (often prescribed along with diuretic if needed). ^{8, 21} Note: This is a common situation.
 - » Initiate beta blockers first if the patient does not have signs or symptoms of congestion at the time of initiation, does not have a slow HR (has a HR > 60)⁸ and does not have hypotension.²¹
- Aim to achieve optimal GDMT as rapidly as tolerated (within 3 months or sooner after initial diagnoses).²¹
- If symptomatic hypotension with GDMT, adjust diuretics and consider separating the administration of the dose from the timing of other medications that could also lower BP. ⁵
- If patient cannot tolerate all GDMT, try to optimize fluid status, adjusting other medications that may cause hypotension, adjusting the timing of medication, and/or referring to a HF specialist in order to prevent reducing doses or stopping GDMT medications.⁸
- If needed, using smaller than recommended doses of GDMT is better than stopping.⁸
- Once stable most patients should be followed every 3-6 months.²¹
- In patients with improved EF (EF improves to > 40% after previous reduced < 40%) generally should stay on GDMT in the absence of a previously defined and now resolved cause of the low EF.²¹

Renin-Angiotensin Medications (ARNi, ACE Inhibitors, or ARBs)

- **ACE inhibitors** (Class I LoE: A) 4, 9, 15,

Who: HFrEF with any current or prior HF symptoms^{21, 4}

Why: Reduces morbidity and mortality (Class I LoE: A) and risk of hospitalization^{4, 9, 5}

- **ARBs, in place of ACE inhibitor, if below**

Who: HFrEF with any current or prior HF symptoms.

- If ACE inhibitor intolerant (Class I LoE: A) 4

- If on ARB anyway for other indications (Class IIa LoE: A) 4

Why: Reduces morbidity and mortality (Class I LoE: A) and risk of hospitalization^{4, 9, 5}

Notes: Do not combine ACE inhibitors and ARBs (Class III LoE: C) 4

- **ARNi, in place of ACE inhibitor or ARB, if below**

Who: HFrEF with any current or prior HF symptoms.

Consider using an ARNi (instead of an ACE or ARB) when able and appropriate, including in the situations below:

- At initiation of this class (instead of ACE/ARB) if patient is having HF symptoms at the time of initiation.²¹
- As a replacement of ACE inhibitor or ARB in patients who develop persistent symptoms of HF symptoms. (Class I LoE: B-R) 4, 8, 9, 21

Why: Reduces morbidity and mortality (Class I LoE: A) and risk of hospitalization.^{9, 5}

Notes: May require lowering of diuretic dose to prevent hypotension because of BP lowering effect.²¹

Beta Blocker (bisoprolol, carvedilol, and sustained-release metoprolol succinate)

Who: HFrEF patients with current or prior symptoms of HFrEF

Why: reduces morbidity and mortality (Class I LoE: A) and risk of hospitalization^{4, 5, 15}

Notes:

- Use beta blockers specifically proven to reduce mortality (ie bisoprolol, carvedilol, and sustained-release metoprolol succinate)²¹
- Warn patients there may be a transient worsening of symptoms after dose adjustments.²¹

Aldosterone receptor antagonists

Who: HFrEF with current or prior HF symptoms (Class I LoE: A) 4

Only initiate if eGFR \geq 30 (or Cr $<$ 2.5 men; $<$ 2.0 women) and K $<$ 5.0 mEq/L. 4 (Class III LoE: B) 4

Why: Reduces morbidity and mortality (Class I LoE: A) and risk of hospitalization^{4, 5}

Notes: The dose that is effective often doesn't significantly affect BP.^{8, 21}

Don't need to achieve target of other drugs before adding aldosterone antagonists.^{8, 21}

SGLT2 Inhibitors

Who: Patients with HFrEF – regardless of whether the patient has diabetes or not.²¹

Why: Reduces morbidity, mortality and risk of CVD hospitalizations (regardless of diabetes)^{21, 17} and reduces the progression of kidney disease.^{21, 17}

Notes:

- Use SGLTs with proven benefit in HF
 - Dapagliflozin
 - Empagliflozin

- SGLTs do not independently cause hypoglycemia, but may worsen it if the patient is on anti-diabetes medications that do have hypoglycemia as a side effect.
- If the patient is currently on other anti-diabetes medications.²¹
 - Monitor blood glucose levels when starting SGLT2s and as indicated
 - Coordinate care through with the current provider managing the diabetes (primary care provider or Endo) to minimize the risk of hypoglycemia.²¹
- Order Cr and K before initiation, periodically during treatment, and annually.
- eGFR should be > 25 before initiating Dapagliflozin²¹ and ≥ 20 before initiating Empagliflozin.
- Monitor for signs and symptoms of volume depletion (e.g., BP, renal function, weight, and lightheadedness) and adjust other diuretics as needed

Diuretics

Who: if current or prior symptoms of fluid retention (Class I LoE: C) 4

Why: improves symptoms if fluid retention (Class I LoE: C) 4

Notes:

- Consider providing diuretic dosing contingency instructions. Consider increasing diuretic dose by 50-100% for 3 days when there is evidence of exacerbation and check Cr, K and Na after 3-7 days.
- Consider writing the instructions for this adjustment directly in the medication order itself, so it is available for use by the extended care team at times of exacerbation.

Hydralazine and Isosorbide Dinitrate

Who: the following situations:

- HFrEF patients intolerant to ACE/ARB/ARNi because of drug intolerance, elevated creatinine, angioedema or other reasons. (Class IIa LoE: B) 4 (Note: patients' needs might vary over time based on renal function)
- Self-identified Black (African-Americans) HFrEF patients with current HF or HTN symptoms (Class I LoE: A) 4 and receiving optimal therapy with ACE inhibitors/ARBs/ARNis, beta blockers and aldosterone receptor blockers (plus/minus SGLT2s)

Why: reduces morbidity and mortality (Class I LoE: A) and risk of hospitalization⁴

Notes: this treatment is often neglected but should be used when appropriate (43% relative reduction in mortality and 33% relative reduction in HF hospitalization in black patients (esp. class III/IV).⁸

Ivabradine (Corlanor®)

Who: Titrate if the following situations:

- HFrEF with persistent HF symptoms after maximally tolerated beta blocker (Class IIa LoE B-R) 9
- Sinus rhythm with resting HR ≥ 70⁹
- Not if Afib, 100% atrial paced, or unstable patients.⁹

Why: Reduce hospitalizations (Class IIa LoE: B-R) 9

Note: side effects include bradycardia, elevated BP, Afib, and transient blurring of vision⁸

Device/Procedure Therapy

Consider device therapy for HFrEF patients with a persistently reduced EF after 3 to 6 months on optimal GDMT²¹

Implantable Cardioverter Defibrillator (ICD)

Who: Primary prevention in Cardiomyopathy⁴

- EF \leq 35%, NYHA Class II-III
- EF \leq 30%, NYHA Class I, ischemic etiology
- EF \leq 40%, non-sustained ventricular tachycardia (NSVT), ischemic cardiomyopathy, inducible at electrophysiology studies (EPS)
- Secondary prevention if previous sudden cardiac death (SCD) or ventricular arrhythmia

Notes:

- Document shared decision about procedure before proceeding
- There is uncertain benefit in key situations: if high risk of non-sudden death as predicted by frequent hospitalizations, advanced frailty, or comorbidities such as systemic malignancy or severe renal dysfunction. (Class IIb LoE: B)⁴
- Medicare will not approve if <40 days post MI or <3 months after revascularization or optimal GDMT

Why: To reduce sudden cardiac death (SCD) (Class I LoE: A)⁴

Cardiac resynchronization therapy (CRT)

Who:

- May consider use if on GDMT and one of below⁴:
 - » EF <35%, Class II, LBBB and QRS >120 (Class IIa LoE: B)⁴
 - » EF <35%, Class II, non-LBBB and QRS >150 (Class IIb LoE: B)⁴
 - » EF <30%, Class I, ischemic cardiomyopathy, LBBB, QRS >150 (Class IIb LoE: C)⁴
- Not recommended if:
 - » Non-LBBB pattern with a QRS < 150 ms and class I-II (Class III LoE: B)⁴
 - » Comorbidities and/or frailty limit survival with good functional capacity < 1 year. (Class III LoE: C)⁴

Why: To improve symptoms, improve survival, and reduce sudden cardiac death (Class I LoE: A)⁴

TREATMENT STAGE D (i.e. patients with refractory HF)

Definition

Refractory HF requiring specialized interventions⁴

Goals⁴

- Establish patient own end-of-life goals
- Improve Quality of Life
- Control symptoms
- Reduce hospital admissions and readmissions
- Improve Survival

Treatment

Cardiac Transplant

Who: Carefully selected patients with persistent symptoms despite GDMT Indications:¹⁵

- End-stage HF with severe symptoms. A poor prognosis and no remaining alternative treatment options.
- Motivated, well informed, and emotionally stable.
- Capable of complying with the intensive treatment required postoperatively.

Why: Definitive treatment option ^{(Class I, LOE C) 4}

Continuous intravenous inotropic support

Who: Persistent symptoms despite GDMT

Why: Definitive treatment, part of palliative care or as bridge to other treatment options ^{(Class IIa/b, LOE B) 4}

Mechanical Circulatory Support

Who: Persistent symptoms despite GDMT

Why: Definitive treatment, part of palliative care or as bridge to other treatment options ^{(Class IIa, LOE B) 4}

Notes:

- Goal is to improve quality of life, control symptoms and to relieve suffering.^{8,4}
- Providers should initiate regular, ongoing, and repeated discussions with patients and family regarding advance care planning⁵. Providers should work together to coordinate communication with the patient and family.
- Provide information about clinical trajectory to help the patient make timely decisions (reminding patient of uncertainty).⁸
- Offer support and shared decision making as patient and family consider complex decisions and increasingly weigh benefit vs burden of treatment.⁸
- Consider offering palliative care and hospice based on needs and symptoms, not just based on estimated remaining life expectancy.^{5,4}
- Optimizing and facilitating referral process is key to achieving goals.
- May continue to manage HF with evidence-based disease modifying interventions during palliative care and hospice.^{8,4}
- Include focus on psychosocial distress and caregiver support.⁴
- Make decisions about deactivation of ICD and other therapies (such as dialysis), resuscitation plans, and desired location of death.¹⁵

IV. Comorbidities

Common Comorbidities

Atrial fibrillation (AF)

- AF is common in HF and the prevalence increases as HF worsens. AF is a risk factor for HF and it worsens HF prognosis.^{5,4}
- Main goals of therapy are to prevent thromboembolism (including anticoagulation) and control symptoms.^{4,5}
- If AF with rapid ventricular rate (RVR) is the cause of HF, the goal should be to treat the underlying rhythm.^{4,5}
- If AF is contributing to HF symptoms, rhythm restoration with ablation (esp if HFrEF) or amiodarone or AF can be considered.^{4,5}
- Rate control to less < 100 beats/min average and anticoagulation is also acceptable.
- For HFrEF, beta blockers and digoxin are the preferred^{4,5} treatment. For HFpEF, nondihydropyridine CCB could be used. Rarely, atrioventricular node ablation with permanent pacemaker is indicated.
- Manage according to the current ACC/AHA/HRS Guideline for the Management of Patients with AF⁸

Anemia

- Anemia (Hg < 13 in men, < 12 in women) is common in HF (both HFrEF and HFpEF). The prevalence increases as HF becomes more severe. It is more common in women.^{4,5,15}
- Anemia is associated with increased symptoms of HF and worse outcomes HF.^{4,5,15}
- Investigate the cause of anemia and treat reversible causes (such as iron deficiency anemia)^{(Class IIb LOE B-R) 9, 5, 15}
- Possible Harm: Do not use erythropoietin-stimulating agents as they do not have benefit and may increase the risk of thromboembolic events and strokes.^{(Class IIb LOE B-R) 9, 5, 15}

Sleep Apnea

- Sleep apnea (both obstructive and central) is common in HF.^{5,9,15}
- Offer symptomatic HF patient with sleep-disordered breathing or day time sleepiness a sleep study.^{(Class IIa LOE C-LD) 5, 9}
- CPAP for obstructive sleep apnea has been show to improve sleep quality (and possibly AF progressions) but not CV events.^{(Class IIb LOE B-R) 9, 5, 15}
- Possible Harm: Do not use adaptive servo-ventilation for central sleep apnea in HF NYHA II-IV.^{(Class III LOE B-R) 9, 5}

Chronic Kidney Disease (CKD)¹⁵

- CKD is common in HF, shares many risk factors with HF (diabetes, hypertension, hyperlipidemia) and worsens HF prognosis.¹⁵
- Patients with severe renal dysfunction (eGFR <30 mL/min/1.73m) have been excluded from most clinical trials, so there is lack of evidence about treatment for these patients.¹⁵
- Worsening renal function with low cardiac output (cardiorenal syndrome) worsens the prognosis of HF.¹⁵
- Intermittent worsening renal failure (especially during initiation and up-titration of ACE inhibitor/ARB/ARNi therapy) should not lead to treatment discontinuation unless there is a marked decrease.¹⁵
- Diuretics (loop and especially thiazides) are less effective in patients with a very low eGFR, and should be dosed appropriately (ie need higher doses to achieve similar effects).¹⁵

Depression

- Depression is common in HF.⁴
- Patients with depression have lower QOL and self-care skills, worse outcomes, readmission risk, and use more services.⁴
- Treating depression can help patients with self-care.

Diabetes

- Diabetes is strongly associated with HF (increases the risk of developing HF, worsens HF outcomes, and is associated with an increase in HF comorbidities such as HTN, CAD, CKD, etc).²¹
- SGLT2 inhibitors have multiple benefits in patients with diabetes who have HF or are at risk for HF, and should be considered part of standard care for these patients.²¹
 - Improves diabetes management.²¹
 - Prevents CV death, worsening HF outcomes, and admissions for HF in patients both with HF and at risk for HF.²¹
 - Decreases the risk of progression of kidney disease.²¹
- Use SGLT2 inhibitors with evidence of HF benefit (ie dapagliflozin and empagliflozin).²¹

COVID

- HF worsens the outcomes of COVID ^{JACC 2021} and patients with HF should follow heightened precautions to avoid the disease.
- Patients with COVID infection generally should continue guideline-directed treatment for HF, including RAS inhibitors, whenever hemodynamically possible.²¹

V. Referrals

Ambulatory Care Management (ie. Integrative Care Management ICM)

General Information

- ICM is a virtual telephone support program utilizing registered nurse care managers and their teams (the virtual HF ICM team works remotely and do not conduct any in-person meetings with the patient).
- The registered nurse collaborates with the patient's primary care physician and/or cardiologist via the EHR to help implement an individualized patient-centered plan of care.
- Goals:
 - Enhance quality of life for individuals living with HF by understanding their goals, providing support, and promoting autonomy in the management of their medical condition.
 - Navigate individuals to the right level of care, at the right time and right place/service-coordinating care and determining appropriate utilization of resources when providing care.
 - Note: This is not a physician run HF clinic – see the section below about HF specialty referrals for that detail.

Criteria for referral

- Population Criteria:
 - HF patients who have a value-based insurance product (ie capitated insurance like Medicare Advantage, an ACO, or the Medicare DCE).
- Clinical Criteria:
 - HF patients with current HF symptoms (ie class II-IV).
 - Patients with a new HF diagnosis.
 - Chronic HF without recent symptoms that would benefit from education and support.
 - Note: In particular consider referring patients with the following type of characteristics:
 - » Acute/chronic symptoms of fluid overload
 - » Recent HF related ED visit or hospital discharge
 - » Multiple ED visits/admits in last year
 - » Poly-pharmacologic/complex HF regimen and/or recent changes in HF medications
 - » Patient with multiple gaps in knowledge related to HF or may benefit from support with self-management
 - » HF with multiple chronic conditions

Pharmacist Management

General Information

- Clinical pharmacists support patients with HF by optimizing treatment of Guideline-Directed Medical Therapy (GDMT).

Refer patients to Clinical Pharmacists for HF if the following key indications are met:

- Population Criteria:
 - HF patients who have a value-based insurance product (ie capitated insurance like Medicare Advantage, an ACO, or the Sutter Medicare Direct).
- Clinical Criteria
 - Left ventricular ejection fraction (LVEF) <40% (ie HFrEF)
 - Not on optimal GDMT

Cardiac Rehabilitation

- Cardiac Rehabilitation is a medically supervised program designed to improve a patient's cardiovascular health.
- **Refer patients to Cardiac Rehabilitation for HF if the following key indications are met:**
 - LVEF < 35%, and;
 - NYHA class II to IV symptoms, and;
 - On optimal GDMT > 6 weeks, and;
 - Has not had recent (within last 6 weeks) or planned (within next 6 months) major cardiovascular hospitalizations or procedures.

Cardiologists

Refer the following patients to a cardiologist:

- New onset HF for ⁸
 - Evaluation of etiology (such as: ischemia, invasive testing like cardiac catheterization or endomyocardial biopsy, advanced imaging like cardiac MRI, genetic counseling and testing, etc.).
 - Management and treatment recommendations
 - Note: refer urgently to cardiology for significant murmur, irregular or fast heart rate or chest pain at time of diagnosis
- Ongoing evaluation and management
 - Individualize ongoing cardiology care based on the recommendations of the cardiologist.
 - Most HF patients with Stage C or D or HFrEF should see a cardiologist at least once per year.

Specialized Heart Failure Cardiologists or Heart Failure Clinic

Refer patients to a specialized HF Cardiologist or specialized HF Clinic or Program for:

- Advanced consultation about HF etiology (such as evaluation of right sided HF or infiltrative cardiomyopathies).
- Review current and potential therapies, HF disease trajectory and prognosis, patient preferences, and advance care planning.
- Assistance with choice of medications (including replacement of ACE or ARB therapy with ARNi, consideration of SGLT2 inhibitor use), management of side effects of medications (such as hypotension, bradycardia, hyponatremia or renal dysfunction), and evaluation for alternate treatment options.
- Treatment of Stage D HF or difficult to manage HF.
- Potential evaluation for a clinical trial.

Patient meeting one or more of the I NEED HELP* criteria.

- I IV Inotropes:** Requirement of IV inotropes, either chronic or within the past 12 months.
- N NYCA Class:** Persistent NYHA class III-IV symptoms, fatigue with activities of daily living, six-minute walk distance <300 meters, or persistently elevated natriuretic peptides (BNP > 500 pg/mL or NT-proBNP > 1500 pg/mL in ambulatory, non-decompensated patients).
- E Ejection Fraction (EF):** ≤ 35% despite GDMT for ≥ 3 months for consideration of device therapy in those patients without prior placement of ICD or CRT, unless device therapy is contraindicated.
- E End Organ Dysfunction:** Worsening renal (Cr ≥ 1.8 mg/dL or BUN ≥ 43 mg/dL) or hepatic function, persistent hyponatremia (Na < 134 mEq/L), cachexia (loss of 5% or more body weight in the previous 12 months), and/or worsening right HF with secondary pulmonary hypertension.
- D Defibrillator shocks:** Onset of AF or ventricular arrhythmias, or ICD shocks.
- H Hospitalization:** Two or more emergency department visits or hospitalizations for worsening HF in prior 12 months or **high mortality risk** using validated risk model.
- E Edema:** Clinical deterioration as indicated by worsening edema, **Escalating Diuretic** requirement, increasing BNP or NT-proBNP levels, worsening cardiopulmonary exercise testing, decompensated invasive cardiac hemodynamics, or evidence of progressive LV dilation or decrease in the LVEF on imaging.
- L Low Systolic BP:** SBP ≤ 100 mm Hg or symptomatic hypotension or elevated heart rate (>100 bpm).
- P Progressive Intolerance GDMT:** Unable to tolerate target-dose concordant GDMT, or need to down-titrate GDMT due to fatigue, hypotension, or renal dysfunction.

***The same I NEED HELP criteria organized by category as an alternate way to review**

Category	Detail
Vitals	SBP < 100 mm Hg or symptomatic hypotension; Elevated HR (>100) Cachexia
Labs	BNP or NT-proBNP persistently high (BNP > 500pg/mL or NT-proBNP > 1500pg/mL) or increasing in an ambulatory, non-decompensated patient. CR≥1.8 or BUN ≥43, NA<134.
Symptoms	Persistent edema; persistent NYHA class III-IV symptoms, profound fatigue, or 6-minute walk distance <300 m.
Medication	Unable to tolerate target-dose concordant GDMT; progressive intolerance of GDMT; alternate treatment options for GDMT; replacement of ACE or ARB therapy with ARNi; addition of SGLT2 inhibitors, management of side effects of medications (such as BP, HR, K, Na or Cr).
Comorbidity	A Fib, ventricular arrhythmias, or ICD shocks. Worsening renal or hepatic function.
ED and Hospital visits	Two or more ED visits or hospitalizations for worsening HF in prior 12 months.
Mortality	High mortality risk score.
Advancing Disease	Worsened exercise testing; progressive remodeling on imaging; decompensated hemodynamics; Need for past (previous 12 months) or chronic IV inotropes

Palliative Care

General Information

- Palliative care is an important component of core best practice HF care as most HF is progressive without a cure.²¹ Treatment will likely transition through three phases: “do everything” to “quality survival” to “comfort only” (hospice). Early palliative care helps navigate patients through those phases.²¹
- Palliative care helps elicit patient’s personal goals of care, focus on holistic symptom management and quality of life especially in patients with multiple comorbidities, and helps patients make complex decisions as their disease advances.²¹
- Palliative care is provided along with – not instead of – specialized advanced HF care (as advanced HF care helps control HF symptoms).²¹
- Regular discussions about clinical trajectory from all members of the patients care team helps guide patient expectations – despite the substantial unpredictability of HF outcomes. Key events (such as multiple recurrent hospitalizations and progressive intolerance of GDMT due to low BP or elevated Cr) should trigger additional conversations about changing prognosis.²¹
- Over time some treatment decisions may be made to discontinue recommended therapies (such as turning off implanted defibrillators) and starting non-standard therapies (such as opioids for dyspnea) as the disease progresses.²¹

At Sutter Health palliative care is provided as either

- **Advanced Illness Management (AIM):** AIM provides nurse-led, multi-disciplinary wrap around care in the home and community setting and palliative telehealth care (in both the Medicare-certified home health setting, as well as via the home-based AIM Transitions team). AIM delivers emotional and psychosocial support, advance care planning/POLST, discussions about goals of care, support of social determinants of health (SDOH), chaplaincy, and caregiver support.
- **Specialized Palliative Care:** Specialized-palliative care is a physician-led, interdisciplinary team that helps with symptom management, emotional and psychosocial support, and advance care planning (through clinic, facility, and/or home visits).

Consider referral to AIM or specialized-palliative care in the following circumstances (all members of the care team should engage in care planning and referral discussions):

- 1) Persistent HF symptoms such as dyspnea, limitations of physical activity, fatigue, edema, palpitations, angina, or other (ie NYHA class III-IV), or;
- 2) Not able to optimize ideal guideline-directed medical treatment or advanced treatment options (VAD or transplant for example) due to intolerance or contraindication or other individualized reason , or;
- 3) High acuity or quantity of comorbidities (such as diabetes, COPD, etc.), or;
- 4) Overall life expectancy of patient is less than 12 months

Note: Order palliative care along with specialized cardiology care whenever either are appropriate for the patient. They are not mutually exclusive. Patients benefit from both.

Multidisciplinary Programs

General Information

- Consider multi-disciplinary geriatric programs for patient who has complex medical and social needs, multiple comorbidities, geriatric syndromes, special needs or frailty.

Sutter Health has two geriatric programs listed below.

- For patients in other geographic regions or with other payers, consider review and refer/transfer care to similar local programs when available.

Grove by Sutter Health

- Grove is a wrap-around care program that integrates social services into primary medical care for adults with serious illness. The Grove team delivers care in a hybrid model (in-person, by video, or at home) and prioritized care coordination, person-centered care planning and ensures 24/7 access to team. A Grove team consists of a geriatrician, geriatric nurse-practitioner, licensed clinical social worker, and care coordinator.
- Patients with a HF diagnosis can be referred to Grove who meet the following criteria:
 - » Over 60 years old
 - » Lives in Sonoma County and belongs to the United Healthcare HMO or Alignment Medicare Advantage Plans
 - » Complex medical needs
 - » Lives safely in the community and is accepting of team-based care

PACE (Program of All-Inclusive Care for the Elderly)

- PACE provides high quality comprehensive home and community-based healthcare services to participants, anticipating problems to help avoid hospitalizations and premature nursing home placement.
- Patients with a HF diagnosis can be referred to PACE who meet the following criteria:
 - » Over 55 years old
 - » Lives in Sacramento County (determined by PACE's zip code service areas)
 - » Eligible for nursing home level of care as determined by the State of California
 - » Able to live at home or in a community setting without jeopardizing their health or safety

Hospice

Consider referral to Hospice if a patient:

- Has symptoms of HF even at rest (NYHA Class IV) and
- Is expected to survive less than 6 months.

Note: This clinical situation is often accompanied by characteristics such as below, so have a heightened index of suspicion in these situations

- Multiple recurring unplanned hospitalizations
- Worsening renal failure
- EF of less than 20%
- Need for cardiac inotropes
- History of cardiac arrest

• Transitions of Care

Transitions of Care from acute settings should include the following:

Before Discharge

- Volume status, BP, and renal function are stable or on a trajectory of clinical improvement and comorbid conditions are managed^{4,15}
- Referral to palliative care or hospice before discharge when appropriate.
- Minimum symptoms with the ambulation needed for daily living (such as assessment of 60 foot ambulation test).
- Medication Reconciliation.

- Underlying causes of HF exacerbation, barriers to care, and limitations in support addressed.⁴
- Discharge coordinator to ensure HF needs are being addressed.
- Education about HF, self-care, emergency care using the teach back method.^{4,15}
- Easily-understood culturally sensitive, health literate educational materials (such as the Sutter Health “stop light tools” and the Sutter Health HF handouts and/or booklet).

At Discharge

- A comprehensive structured, individualized and evidence-based care plan created in collaboration between different members of the patients care team (hospitalist, cardiologist, etc.).⁴
- Detailed plan to optimize GDMT before and after discharge.⁴
- Discharge summary available with easy to identify information about volume status, response to diuretics in the hospital, BP, renal status, most recent echo results (including EF, RV systolic pressure, valvular dysfunction and wall motion abnormalities) and exit BNP at discharge. Consider using a structured cardiologist note to document a plan of care at discharge. Ensure discharge summary and plan of care is available to providers seeing patient after discharge.
- Risk predictor tool to determine plan of care (and to determine type of post-discharge management such as case management, palliative care, hospice, etc.).
- Prescriptions for new or changed medication reviewed with the patient and family and filled at or before discharge if able. Plan in place to address barriers to medication (such as cost).⁴
- Post-discharge follow-up appointments booked before discharge.
- Referrals to home health care and ensure level of care is appropriate for needs. (Note:order skilled nursing and physical therapy “to evaluate” to collaborate about appropriate needs).
- Detailed plan of care, discharge summary, and follow-up orders (such as orders for lab tests at appropriate intervals) provided to home health and discharge care team.

After Discharge

- Post discharge care management and frequent follow-up contact to manage issues around medications, symptoms, barriers of care and need for support.
- Early follow-up with cardiologists (within 1 week or earlier depending on risk) and/or with primary care physician (within 1 week).¹⁵ Book appointments before discharge (as noted above).
- Assistance with appointment needs such as transportation to ensure patient is able to keep the appointment.
- Referral to cardiac rehab when appropriate.
- Discharge from home health tracked so other support services can be provided as needed once complete.
- Psychosocial, behavioral, and socioeconomic issues that patients and their caregivers face addressed, including access to care, risk of depression, healthcare disparities and social determinants of health.⁴

VII. Heart Failure Medications

- This table is a summary of the most common classes and brands of HF medications including key considerations in terms of class, name, generic status, dose and titration, general notes, monitoring, dose adjustments, black box warnings if relevant, contraindications, and cautions/adverse reactions/side effects.
- This table is not meant to be a comprehensive inclusion of all information about each medication. In particular drug-drug interactions are not included in this table.
- Information for this table was mostly obtained from Lexicomp and the 2013, 2017 and 2018 ACC and AHA HF Guidelines.^{4,8,9} Please refer to the references, each medications’ package insert, and electronic health record prescribing details and alerts for full information.

Beta Blockers

Generic Name (Brand)	Initial Daily Dose	Target Doses
Metoprolol Succinate Extended Release (Toprol XL)	12.5 mg-25 mg daily	200 mg daily
Carvedilol (Coreg)	3.125 mg BID	25 mg BID
Bisoprolol (<i>not commonly used</i>)	1.25 mg daily (Note: smallest tab is 5 mg)	10 mg daily

Notes

AHA Class 1 Indications:

- The beta blockers bisoprolol, carvedilol, and metoprolol succinate extended release reduce morbidity and mortality for patients with current or prior symptoms of HFrEF^(Class I, LOE A) 4

General Notes:

- Only use GDMT-recommended beta blocker (bisoprolol, carvedilol, or metoprolol succinate ER)
- Notes about types of medications:
 - Use metoprolol succinate ER (studies provide evidence of benefit). Do not use metoprolol tartrate (no studies have been done to provide evidence of benefit).
 - Generally, use carvedilol instead of carvedilol CR/ER due to cost and ease of titration.
- Titrate approximately every 1-2 weeks to reach the target doses (the dose with proof of mortality benefit in clinical trials).
- HF Status:
 - Use with caution in patients with patients with pulse < 60 beats per minute⁸, low blood pressure, or has evidence of low cardiac output.
 - Do not start if the patient is unstable due to HF symptoms. Use diuretic first to control HF symptoms before starting beta blocker.
 - May start beta blockers in a stable HF patient (then adjust diuretics if needed afterwards).
- Carvedilol (both alpha- and beta- effects) is more potent for BP lowering compared to metoprolol or bisoprolol (since both are more beta- selective esp. at lower doses). This fact can be helpful in some clinical circumstances, examples below:
 - If BP too low on carvedilol, may consider switching to metoprolol succinate ER.
 - If BP too high on metoprolol succinate ER, may consider switching to carvedilol.
- If a patient has significant asthma/bronchospastic disease, may prefer metoprolol succinate ER or bisoprolol.
- Do not withdraw beta blocker abruptly.

Monitoring:

- HR (for bradycardia), BP, and for signs and symptoms of congestion after initiation and during titration.

Titration:

- Initiate beta blockers at a low dose, followed by gradual increments every 1-2 weeks in dose if previous doses have been well tolerated until target does achieved. Note: May cause transient worsening of HF symptoms (dyspnea, fatigue, or dizziness).

Dosage Adjustment:

- To discontinue, taper dose over 1-2 weeks, consider renal dosing, metoprolol succinate ER can be cut in half, do not crush/chew.

Black Box Warning:

- **Abruptly discontinuation can exacerbate angina pectoris and MI. Particularly in patients with ischemic heart disease, reduce dosage over 1-2 weeks and monitor (metoprolol).**

Contraindications:

- Sinus bradycardia, sinus node dysfunction, second- or third-degree heart block, cardiogenic shock, cardiac failure severe peripheral arterial circulatory disease (metoprolol). Severe hepatic impairment (carvedilol). Bronchial asthma/ bronchospastic disease (relative contraindication for carvedilol).

Cautions/Adverse Reactions/Side Effects:

- Dizziness, bradycardia, fatigue, insomnia, lethargy, confusion, depression, dyspnea, headache, nightmares, constipation, diarrhea, nausea, sexual dysfunction/impotence, syncope (carvedilol), masked signs of hypoglycemia.

Angiotensin-Converting Enzyme (ACE) Inhibitors

Generic Name (Brand)	Initial Daily Dose	Target Doses
Single daily dosing (more preferred)		
Lisinopril (Prinivil, Zestril®)	2.5-5 mg daily	20-40 mg daily
Benazapril (Lotensin®)	5 mg BID or 10 mg daily	20 mg BID or 40 mg daily
Ramipril (Altace®)	1.25 mg to 5 mg daily	10 mg daily
Multiple daily dosing (less preferred)		
Enalapril (Vasotec®)	2.5 mg BID	10-20 mg BID

Notes

AHA Class 1 Indications:

- ACE inhibitors (Class I LOE: A) ARBs (Class I LOE: A) or ARNi (Class I LOE: B-R) reduce morbidity and mortality in patients with HFrEF⁹

General Notes:

- Monitor for supplemental and/or dietary potassium.
- Beneficial outcomes are considered a class effect.
- Titrate to target doses that has proven mortality benefit in clinical trials.
- Start a low dose and titrate every 1-2 weeks till at target dose.
- Do not use in combination with ARB or direct renin inhibitor.
- May see a slight rise in Cr (0.1-0.3 or < 30%) which is to be expected and not a reason alone to stop the medication.

Monitoring:

- BP, K, Cr (before initiation, 1-2 weeks after titration and each dose change, and annually).
- Consider modify treatment if persistent hyperkalemia or Cr increases > 30% (such as adjust dose or treat hyperkalemia).
- Refer to HF specialist if patient unable to tolerate ACE inhibitor, ARB or ARNi (see "I NEED HELP" algorithm in referral section of guideline) for treatment recommendations, strategies to increase tolerance, and/or alternate GDMT options with similar evidence-based outcome benefits.

Dosage Adjustment:

- Consider renal dosing

Black Box Warning:

- **Fetal injury and death. Discontinue as soon as possible when pregnancy detected.**

Contraindications:

- Angioedema.
- Use with aliskiren in patients with diabetes.
- Co-administration within 36 hours of ARNi (ie, sacubitril).

Cautions/Adverse Reactions/Side Effects:

- Cough (occurs in 5-20% and is an indication for trial of alternate class like ARB), dizziness, angioedema (0.3% risk) (risk increased in black patients), anemia (especially if CKD), hyperkalemia, worsening renal function.

Angiotensin II Receptor Blockers (ARB)

Recommended for use

Name (Brand)	Initial Daily Dose	Target Dose
Losartan (Cozaar®)	25-50 mg daily	150 mg daily
Valsartan (Diovan®)	40 mg BID	160 mg BID
Candesartan (Atacand®)	4-8 mg daily	32 mg daily

Notes

AHA Class 1 Indications:

- ACE inhibitors (Class I LOE: A) **ARBs** (Class I LOE: A) or ARNi (Class I LOE: B-R) to reduce morbidity and mortality in patients with HFrEF⁹

General Notes:

- Beneficial effects are based on individual medications (benefit is not a class effect) so use one of the ARBs above (candesartan, losartan, valsartan).
- Titrate to target doses that has proven mortality benefit in clinical trials.
- Start a low dose and titrate every 1-2 weeks till target dose.
- Patients with a history of angioedema with an ACE inhibitor can receive an ARB beginning 6 weeks after ACE inhibitor discontinued.¹⁶ Do not use if history of angioedema with ARBs.

Monitoring:

- BP, K, Cr (before initiation, 1-2 weeks after initiation and each dose change, and annually).
- Consider modify treatment if persistent hyperkalemia or Cr increases > 30% (such as adjust dose or treat hyperkalemia).
- Refer to HF specialist if patient unable to tolerate ACE inhibitors, ARBs or ARNis (see "I NEED HELP" algorithm in referral section of guideline) for treatment recommendations, strategies to increase tolerance, and/or alternate GDMT options with similar evidence-based outcome benefits.

Dosage Adjustment:

- No renal adjustment.
- Use with caution in severe renal impairment.
- Consider dose adjustment in hepatic impairment.

Black Box Warning:

- **Fetal injury and death. Discontinue as soon as possible when pregnancy detected.**

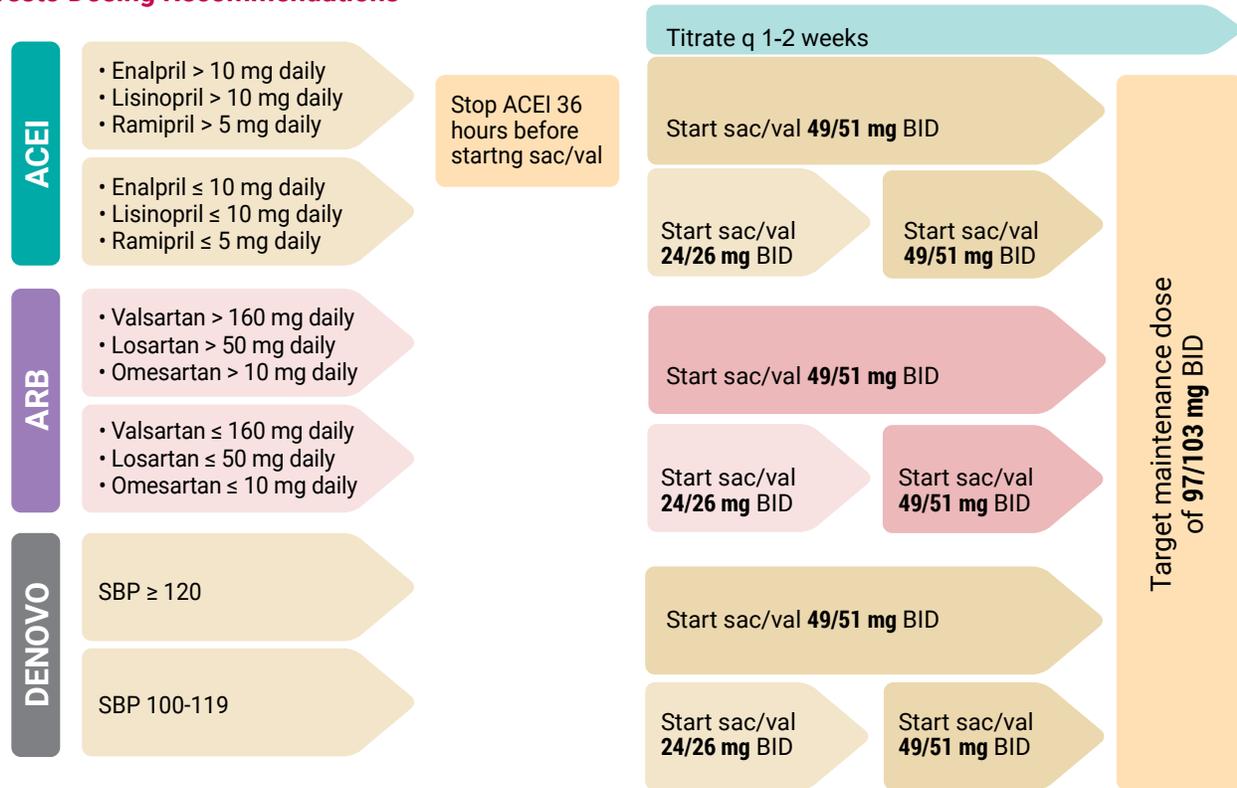
Cautions/Adverse Reactions/Side Effects:

- Severe renal impairment, hyperkalemia, renal artery stenosis, dizziness, angioedema (risk increased in black patients), diarrhea, upper respiratory infections, congestion, cough (less common than in ACE inhibitors), hypotension (more pronounced than ACE inhibitors).

Angiotensin Receptor-Neprilysin Inhibitors (ARNi)

Name (Brand)	Initial Daily Dose	Maximum Total Daily Dose
Sacubiril/valsartan (Entresto®)	49/51 mg BID (therapy may be initiated at 24/26 mg BID as per below)	97/103 mg BID

Entresto Dosing Recommendations



Notes

AHA Class 1 Indications:

- ACE inhibitors (Class I LOE: A) ARBs (Class I LOE: A) or ARNi (Class I LOE: B-R) to reduce morbidity and mortality in patients with HFrEF⁹

General Notes:

- Do not use if history of angioedema with ARBs or ACE inhibitors.
- Titrate to target doses that showed mortality benefit.
- Start a low dose and titrate every 1-2 weeks til target dose.
- Monitor BP closely. ARNi generally lowers BP more than either ACE inhibitors or ARB.
- Modify treatment if persistent hyperkalemia or Cr increases > 30% (similar to ACE inhibitors/ARB).

Monitoring:

- K, Cr (before initiation, 1-2 weeks after initiation and each dose change, and annually).

Dosage Adjustment:

- Adjust dosing with moderate hepatic impairment (Child-Pugh class B) or severe renal impairment (eGFR < 30mL/min/1.73m²) to 24/26 mg twice daily. Double the dose every 2-4 weeks till reach the target dose of 97/103 mg BID.

Black Box Warning:

- **Fetal injury and death. Discontinue as soon as possible when pregnancy detected.**

Contraindications:

- Within 36 hours of ACE inhibitor use history of angioedema with or without an ACE inhibitor or ARB.
- Pregnancy or Lactation.
- Severe hepatic impairment (Child-Pugh C).
- Known hypersensitivity to either ARBs or ARNi.

Cautions/Adverse Reactions/Side Effects:

- Hypotension (SBP < 100), volume depletion, dry cough, hyperkalemia, dizziness, angioedema (more predominant in black patients), renal impairment (reduce starting dose to 24/26 mg twice daily if eGFR < 30), hepatic impairment (reduce starting dose to 24/26 mg twice daily if Child-Pugh B), renal artery stenosis.

Aldosterone Receptor Antagonists

Name (Brand)	Initial Daily Dose (only if K+ <5 mEq/L)	Target Dose
Spirolactone		
eGFR > 50	12.5-25 mg daily	25-50 mg daily
eGFR: 30-50	12.5 mg daily-QOD	12.5-25 mg daily
Eplerenone		
eGFR ≥ 50	25 mg daily	50 mg daily
eGFR: 30-49	25 mg QOD	25 mg daily

Notes

AHA Class 1 Indications:

- Aldosterone receptor antagonists reduce morbidity and mortality in patients with HFrEF.^{(Class I, LOE A) 4}

General Notes:

- Do not start in patients if eGFR <30, Cr >2.5 in men/Cr >2 in women, or with K >5.0.
- Titrate to target doses that showed mortality benefit. Start a low dose and titrate every 2 weeks till target dose.
- Check K & Cr: 3 days and 1-2 weeks after dose changes, then monthly for 3 months and then every 3 months²¹
- After dose initiation if K+ increases significantly or is > 5.5 or has worsening renal function, hold until K+ <5.0 mEq/L. Consider restarting reduced dose after confirming resolution of hyperkalemia/renal insufficiency for at least 72 hours.
- Use caution with K+ supplements, other K+-sparing diuretics or significant renal dysfunction. Closely monitor need for K supplement. Avoid high K diet.
- Instruct patient to hold dose during episode of diarrhea or dehydration or if loop diuretic therapy is interrupted.
- Greater incidence of gynecomastia or breast pain (10% in RALES study) and impotence with spironolactone than with eplerenone.

Monitoring:

- K, Cr (baseline, 2-3 days following initiation and then 7 days after titration, then monthly for 3 months and every 3 months once stable²¹).

Dosage Adjustment:

- Consider increasing dose at least every 2 weeks (every 4 weeks if eGFR 30-50) until maximum tolerated or target dose is achieved. Adjust dose in renal insufficiency, elderly and HF.

Contraindications:

- Contraindicated in patients if eGFR <30, or Cr >Cr >2.5 in men/Cr >2 in women, or with K >5.0
- Addison's disease
- Concurrent use of strong CPY3A4 inhibitors

Cautions/Adverse Reactions/Side Effects:

- Hyperkalemia, electrolyte abnormalities, dizziness, fatigue, somnolence, sexual dysfunction, rash, diarrhea, cough, flu like syndrome, amenorrhea, gynecomastia, gout, glucose levels.
- Caution in hepatic impairment, Monitor K closely in renal insufficiency.
- Risk of hyperkalemia increases with worsening renal function, ACE inhibitor, ARB, non-steroidal anti-inflammatory drugs (NSAIDS), potassium supplements or potassium-sparing diuretics.

Sodium-glucose Cotransporter-2 (SGLT2) Inhibitors

Name (Brand)	Initial Daily Dose	Target Dose
Dapagliflozin (Farxiga®) (Sutter preferred product)	10 mg daily	10 mg daily
Empagliflozin (Jardiance®)	10 mg daily	10 mg daily

Note: There is no evidence that Canagliflozin has the same benefit in HF

Notes

Indication:

- Dapagliflozin and empagliflozin improve HF outcomes, hospitalizations, and mortality in HFrEF patients both with and without type 2 diabetes.²¹

General Notes:

- Benefit: Studies have shown that dapagliflozin and empagliflozin improve HF outcomes, hospitalizations, and mortality in HFrEF patients both with and without type 2 diabetes.²¹
- Achieving target or maximally tolerated doses of other drugs is not necessary before adding SGLT2 inhibitors.
- Promotes weight loss.
- Low risk of hypoglycemia.
- Correct volume depletion prior to initiation.

Monitor:

- Cr, K (before initiation, periodically during treatment, and annually), LDL, signs and symptoms of ketoacidosis (e.g., difficulty breathing, nausea, vomiting, abdominal pain, confusion, unusual fatigue or sleepiness).

Dosage Adjustment:

- Adjust for renal function
 - For Dapagliflozin eGFR > 25 before initiation (however note patients previously on Dapagliflozin whose Cr drops below 25 may continue 10 mg once daily).²¹
 - For Empagliflozin eGFR ≥ 20 before initiation (however note patients previously on empagliflozin whose Cr drops below 20 may continue 10 mg once daily).²¹

Contraindications:

- Dialysis
- Diabetic ketoacidosis
- Type 1 diabetes

Cautions/Adverse Reactions/Side Effects:

- Ketoacidosis including in situations where the glucose was normal or only minimally elevated. Consider holding SGLT2 inhibitors at least 24 hours before situations at increased risk of ketoacidosis (such as surgery).
- Female and male genital fungal infections, increased urination, urinary tract infection, urosepsis and pyelonephritis.
- Hypotension, hyperkalemia, renal impairment, thirst, constipation and nausea, bone fractures and bone mineral loss (dapagliflozin), lower limb amputations (canagliflozin), lipid abnormality, bladder cancer (dapagliflozin).

Diuretics

Generic Name (Brand)	Initial Daily Dose	Maximum Total Daily Dose	Duration of Action
Loop Diuretic			
Furosemide (Lasix®)	20-40 mg daily-BID	600 mg	6-8 hours
Bumetanide (Bumex®)	0.5-1.0 mg daily-BID	10 mg	4-6 hours
Torsemide (Demadex®)	10-20 mg daily	200 mg	12-16 hours
Ethacrynic acid (Edecrin®) (if severe Sulfa allergy – rarely used)	50mg daily	400 mg	12 hours
Thiazide Diuretic			
Metolazone	2.5 mg daily	20 mg	12-24 hours
Hydrochlorothiazide	25 mg daily-BID	200 mg	6-12 hours
Chlorthalidone	12.5-25 mg daily	100 mg	24-72 hours

Notes

AHA Class 1 Indications:

Diuretics improve symptoms patients with HFrEF who have evidence of fluid retention.^{(Class I LOE C)4}

General Notes:

- Loop diuretics are the preferred diuretics in patients with symptomatic HF.
- May need to consider potassium supplementation when patient is taking loop diuretics.
- Have a high index of suspicion for HF exacerbation when a patient has SOB, edema, weight gain or other signs of congestion. (Note: respiratory symptoms (cough and/or SOB) should be considered HF related until proven otherwise even in the absence of weight gain or edema).
- If signs of fluid overload, start furosemide 20 mg and adjust based on symptoms, weight change and kidney function (individualize based on patient characteristics, baseline dose, and response). May need to further increase dose or frequency (ie, twice-daily dosing) to maintain an active diuresis and sustain weight loss. (AHA 2013)
- Consider increase diuretic by 50-100% for 3 days when evidence of exacerbation. Check creatinine and K after 3-7 days. Consider an order for this adjustment available for use by the extended care team. Consider providing contingency instructions about adjusting diuretics.
- Usually start with furosemide (since less potent and less expensive). If the patient does not have adequate response on high dose furosemide (80 mg BID) then use the alternative loop diuretic (either bumetanide or torsemide) which have higher bioavailability (for example absorption may be hindered by bowel edema from congestion).
- If patient is not responding to oral loop diuretic, may consider adding a thiazide diuretic (usually metolazone) to loop diuretic with caution (increased risk of effect on kidney function and electrolytes) or home IV loop diuretics.
- Refer to HF specialist if diuretic is ineffective or the patient is unable to tolerate diuretic due to electrolyte abnormalities or other side effects (see I NEED HELP algorithm in referral section of guideline).

Monitoring:

- Na, K, Cr (before initiation, 3-7 days after initiation and each dose change, and annually).

Dosage Adjustment:

- Consider renal dosing

Black Box Warning:

- **Fluid/electrolyte loss. Careful medical supervision and patient-specific dosing required.**

Contraindications:

- Anuria Hepatic coma (bumetanide) Patients in severe electrolyte depletion.

Cautions/Adverse Reactions/Side Effects:

- Hypotension, electrolyte disturbances (hypokalemia, hyponatremia, hyperuricemia, hypomagnesium, hypercalcemia, hypochloremia [bumetanide]), hyperlipidemia, nephrotoxicity (e.g., azotemia), polyuria, photosensitivity, hypersensitivity reactions, rash, muscle cramps, elevated blood sugars, gout, ototoxicity, SLE exacerbation, low likelihood of sulfonamide allergy cross-reactivity, caution in patients with cirrhosis, diabetes, or benign prostatic hypertrophy (BPH) Sulfonamide-derived drug allergy (thiazide), sexual dysfunction.

Vasodilators

Name (Brand)	Initial Daily Dose	Maximum Total Daily Dose
Hydralazine	25 mg total, TID	75 mg TID
Isosorbide dinitrate	20 mg TID	40 mg TID
Fixed-dose combination isosorbide dinitrate/ hydralazine	20 mg/37.5 mg (1 tab) TID	2 tabs TID

Notes

AHA Class 1 Indications:

- Hydralazine and isosorbide dinitrate combination reduces morbidity and mortality for patients self-described as African Americans with NYHA class III–IV HFrEF receiving optimal GDMT^{(Class IIa LoE: B) 4}

General Notes:

- Reduce symptoms and mortality.
- Isosorbide dinitrate is indicated for
 - Self-identified Black/AA patients with HFrEF class III–IV (in addition to ACE inhibitors and beta blockers) esp. if BP remains elevated
 - Patients who cannot tolerate ACE inhibitor or ARB, such as due to renal failure.^{(Class IIa LoE: B) 4}
- Isosorbide mononitrate is not recommended by the ACC/AHA/HFSA guideline.

Monitoring:

- BP, HR
- CBC, ANA (with SLE symptoms)

Dosage Adjustment:

- May consider dose reduction with toxicity.
- No hepatic or renal dose adjustments recommended.

Contraindications:

- Hydralazine use is contraindicated in patients with coronary artery disease and mitral valve rheumatic heart disease.
- Isosorbide is contraindicated with concomitant use with phosphodiesterase inhibitors (PDE inhibitors) (i.e., sildenafil).

Cautions/Adverse Reactions/Side Effects:

- Postural hypotension, headache, dizziness, peripheral neuritis, Lupus-like syndrome, fluid/sodium retention, blood dyscrasias (hydralazine).
- Use with caution in patients 65 years and older due to its potential to exacerbate episodes of syncope (Beers criteria) increase in intracranial pressure (nitrates).

I_f Channel Inhibitor

Name (Brand)	Initial Daily Dose	Maximum Total Daily Dose
Ivabradine (Corlanor)	5 mg BID with meals (HR > 70 BPM) 2.5 mg BID (Hx of conduction defects)	7.5mg BID (Titrate to heart rate 50–60 beats/min)

Notes

Indication:

Ivabradine can reduce HF hospitalizations in stable HFrEF patients (LVEF ≤35%) with NYHA class II-III who are receiving GDMT (including a beta blocker at maximum tolerated dose), and who are in sinus rhythm with a resting heart rate ≥ 70 bpm ^{(Class IIa LOE: B-R) 9}

General Notes:

- Mortality and hospitalization benefit for patients with pulse ≥ 70

Monitoring:

- HR (prior to initiation, increasing dose or after decreasing dose)
- BP

Dosage Adjustment:

- No renal or hepatic dose adjustments.
- Titrate q 2 weeks until if HR > 70 bpm on target or maximally tolerated beta blockers.
- If pulse < 50 at rest, or patient symptomatic, may consider 2.5 mg dose reductions to minimum dose of 2.5 mg bid.

Contraindications:

- HFpEF
- Presence of angina with normal EF
- Persistent AF or flutter
- Acute decompensated HF
- BP < 90/50 mmHg
- Resting pulse < 60 prior to treatment
- Sick sinus syndrome, sinoatrial block, 3rd degree AV block or pacemaker dependence
- Severe hepatic impairment
- Strong Cyp3A4 inhibitors (e.g., clarithromycin, diltiazem, verapamil)

Cautions/Adverse Reactions/Side Effects:

- Hypertension, symptomatic bradycardia, reversible visual effects (lphosphenes), AF, sinus node disease, cardiac conduction defects, prolonged QT.

VIII. AHA/ACC Class of Recommendation and Level of Evidence to Clinical Strategies, Interventions, Treatments, or Diagnostic Testing in Patient Care

		SIZE OF TREATMENT EFFECT				
		CLASS I <i>Benefit >>> Risk</i> Procedure/Treatment SHOULD be performed/administered	CLASS IIa <i>Benefit >> Risk</i> Additional studies with <i>focused objectives needed</i> IT IS REASONABLE to perform procedure/administer treatment	CLASS IIb <i>Benefit ≥ Risk</i> Additional studies with <i>broad objectives needed; additional registry data would be helpful</i> Procedure/Treatment MAY BE CONSIDERED	CLASS III <i>No Benefit or CLASS III Harm</i>	
ESTIMATE OF CERTAINTY (PRECISION) OF TREATMENT EFFECT	LEVEL A Multiple populations evaluated* Data derived from multiple randomized clinical trials or meta-analyses	<ul style="list-style-type: none"> Recommendation that procedure or treatment is useful/effective Sufficient evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> Recommendation in favor of treatment or procedure being useful/effective Some conflicting evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> Recommendation's usefulness/efficacy less well established Greater conflicting evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> Recommendation that procedure or treatment is not useful/effective and may be harmful Sufficient evidence from multiple randomized trials or meta-analyses 	
	LEVEL B Limited populations evaluated* Data derived from a single randomized trial or nonrandomized studies	<ul style="list-style-type: none"> Recommendation that procedure or treatment is useful/effective Evidence from single randomized trial or nonrandomized studies 	<ul style="list-style-type: none"> Recommendation in favor of treatment or procedure being useful/effective Some conflicting evidence from single randomized trial or nonrandomized studies 	<ul style="list-style-type: none"> Recommendation's usefulness/efficacy less well established Greater conflicting evidence from single randomized trial or nonrandomized studies 	<ul style="list-style-type: none"> Recommendation that procedure or treatment is not useful/effective and may be harmful Evidence from single randomized trial or nonrandomized studies 	
	LEVEL C Very limited populations evaluated* Only consensus opinion of experts, case studies, or standard of care	<ul style="list-style-type: none"> Recommendation that procedure or treatment is useful/effective Only expert opinion, case studies, or standard of care 	<ul style="list-style-type: none"> Recommendation in favor of treatment or procedure being useful/effective Only diverging expert opinion, case studies, or standard of care 	<ul style="list-style-type: none"> Recommendation's usefulness/efficacy less well established Only diverging expert opinion, case studies, or standard of care 	<ul style="list-style-type: none"> Recommendation that procedure or treatment is not useful/effective and may be harmful Only expert opinion, case studies, or standard of care 	
Suggested phrases for writing recommendations		should is recommended is indicated is useful/effective/beneficial	is reasonable can be useful/effective/beneficial is probably recommended or indicated	may/might be considered may/might be reasonable usefulness/effectiveness is unknown/unclear/uncertain or not well established	COR III: No Benefit is not recommended is not indicated should not be performed/administered/other is not useful/beneficial/effective	COR III: Harm potentially harmful causes harm associated with excess morbidity/mortality should not be performed/administered/other
Comparative effectiveness phrases [†]		treatment/strategy A is recommended/indicated in preference to treatment B treatment A should be chosen over treatment B	treatment/strategy A is probably recommended/indicated in preference to treatment B it is reasonable to choose treatment A over treatment B			

A recommendation with Level of Evidence B or C does not imply that the recommendation is weak. Many important clinical questions addressed in the guidelines do not lend themselves to clinical trials. Although randomized trials are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

*Data available from clinical trials or registries about the usefulness/efficacy in different subpopulations, such as sex, age, history of diabetes, history of prior myocardial infarction, history of heart failure, and prior aspirin use.

†For comparative effectiveness recommendations (Class I and IIa; Level of Evidence A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

IX. Abbreviations

A1C	Hemoglobin A1C	HFpEF	Heart Failure with preserved Ejection Fraction
ACC	American College of Cardiologists	HFrEF	Heart Failure with reduced Ejection Fraction
ACCF	American College of Cardiology Foundation	Hg	Hemoglobin
ACE Inhibitor	Angiotensin-converting enzyme inhibitor	HR	Heart Rate
ACS	Acute coronary syndrome	HRS	Heart Rhythm Society
AF	Atrial fibrillation	ICD	Implantable Cardioverter Defibrillator
AHA	American Heart Association	K	Potassium
ANA	Anti-nuclear antibody	KCCQ 12	Kansas City Cardiomyopathy Questionnaire
ARB	Angiotensin receptor blockers	LBBB	Left bundle branch block
ARNi	Angiotensin receptor-neprilysin inhibitor	LDL	Low density lipoprotein
ASCVD	Atherosclerotic cardiovascular disease	LFT	Liver Function Tests
AV	Atrioventricular	LOE	Level of Evidence
BID	Twice daily	LV	Left ventricular
BiPAP	BiLevel Positive Airway Pressure	LVEF	Left Ventricular Ejection Fraction
BNP	Brain natriuretic peptide	Mg	Magnesium
BP	Blood Pressure	MI	Myocardial Infarction
BUN	Blood urea nitrogen	MRI	Magnetic resonance imaging
Ca	Calcium	Na	Sodium
CAD	Coronary Artery Disease	NSAIDS	Nonsteroidal anti-inflammatory drugs
CBC	Complete blood count	NSVT	Non-sustained ventricular tachycardia
CCB	Calcium channel blocker	NT-proBNP	N-terminal pro-BNP
CKD	Chronic Kidney Disease	NYHA	New York Heart Association
CPAP	Continuous Positive Airway Pressure	QD	Daily
Cr	Serum creatinine	QOD	Every other day
CrCl	Creatinine Clearance	QOL	Quality of Life
CRT	Cardiac resynchronization therapy	RVR	Rapid ventricular rate
CXR	Chest X-ray	SBP	Systolic Blood Pressure
DBP	Diastolic Blood Pressure	SCD	Sudden cardiac death
Echo	2-Dimensional echocardiogram	SGLT2 inhibitors	Sodium-glucose Cotransporter-2 Inhibitors
EKG, ECG	12-lead electrocardiogram	SLE	Systemic lupus erythematosus
EF	Ejection Fraction	TDD	Total daily dose
eGFR	Estimated glomerular filtration rate	TID	Three times daily
EPS	Electrophysiology studies	TSH	Thyroid Stimulating Hormone
ESRD	End stage renal disease	UA	Urinalysis
GDMT	Guideline directed medical therapy		
HF	Heart Failure		

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