Mount Sinai Health System
Heart Failure
Ambulatory Pathway
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Heart Failure

Background

- This document is intended to provide guidance to support primary care providers and the collaborative team on heart failure diagnosis and management.

- **Primary care has a vital role** in providing holistic, person-centered care from first symptoms to end of life.

- 3 types of heart failure: Heart Failure with Reduced Ejection Fraction (HFrEF), Heart Failure with Preserved Ejection Fraction (HFpEF), and Right Sided Heart Failure (RHF).

- While this pathway's major focus is on HFrEF, the content outlines, in appropriate sections, unique considerations for HFpEF and RHF.

- Hypertension control, dietary compliance, reduced salt intake apply to all types of heart failure.

- The optimal care of patients with HFrEF involves a commitment to guideline directed medical therapy (GDTM) and a multidisciplinary care team.

Table of Contents

This 2022 MSHS Heart Failure Ambulatory Pathway is organized into the following sections:
Prevention, Diagnosis, Categorization, and Staging of Heart Failure

Prevention
To prevent the initial development of heart failure (HF)¹:

- Effectively manage contributing comorbidities such as diabetes and hypertension
- Regular physical activity (exercising ≥5 d/wk)
- Maintaining a healthy body weight
- Not smoking
- Eating fruits and vegetables (4 servings/day) and moderate alcohol intake (1 drink/day)

Diagnosis
Initial evaluation of patients with symptoms or signs suggestive of HF includes clinical assessment (history and physical exam), electrocardiogram, echocardiogram, blood tests, and chest radiograph.

Early measurement of brain natriuretic peptide (BNP) or N-terminal proBNP levels is suggested in patients with suspected HF in whom the diagnosis is uncertain. BNP levels > 400 ng/L imply a cardiac cause with a sensitivity of 95-97% and a negative predictive value of 90-97%. While BNP levels < 100 ng/L imply a pulmonary cause, BNP levels 100-400 BNP are neither sensitive nor specific for excluding or confirming HF²,³.

Categorization of Heart Failure⁴,⁵

Heart Failure with Reduced Ejection Fraction (HFrEF)
EF less than or equal to 40%. Mortality benefit proven with Carvedilol, long acting metoprolol (succinate), and bisoprolol, ACE inhibitors/ARBs or Spironolactone.

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Heart Failure with Preserved Ejection Fraction (HFpEF)
A clinical syndrome in which patients have symptoms and signs of HF, a normal or near normal left ventricular ejection fraction (LVEF ≥50 percent), and evidence of cardiac dysfunction as a cause of symptoms (eg, abnormal left ventricular filling and elevated filling pressures).

- Approximately ~50% of patients with heart failure have an EF> 50%, a proportion that is increasing over time. Dominant form of heart failure in the elderly.
- No therapies with proven mortality benefit, unlike HFrEF.

Prevention, Diagnosis, Categorization and Staging of Heart Failure

Right Sided Heart Failure (RHF)
RHF is a clinical syndrome in which symptoms and signs are caused by dysfunction of the right heart structures (predominantly the right ventricle [RV], but also the tricuspid valve apparatus and right atrium) or impaired vena cava flow, resulting in impaired ability of the right heart to perfuse the lungs at normal central venous pressures.

- RHF is commonly seen with HFrEF (48%) and HFpEF (20-40%) and, when present, independently associated with increased morbidity and mortality, thus important to ensure actively managed in conjunction with treatment of left heart failure
- Cardiac MRI more accurate than echocardiogram in assessing RV structure and function
- Cardiac catheterization is definitive test, if non-invasive testing inconclusive

Common Classifications of Heart Failure

<table>
<thead>
<tr>
<th>New York Heart Association (NYHA) Functional Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class</strong></td>
</tr>
<tr>
<td>-----------</td>
</tr>
</tbody>
</table>
| Class I   | Patients with cardiac disease (low EF, prior history of systolic or diastolic HF symptoms) but no limitation of ordinary physical activity. **Ordinary physical activity does not cause symptoms** (undue fatigue, SOB, palpitations).  
*Note:* Patient may have mild symptoms on greater-than-ordinary activity, e.g. walking up 4 flights of stairs, carrying heavy objects. | Very mild or no impairment |
| Class II  | Patients with cardiac disease causing slight limitation of physical activity. **Ordinary physical activity causes symptoms.**  
*Note:* “Ordinary” activity generally means: walking (not running) up 1-2 flights, walking a few blocks on flat ground, carrying lightweight objects. | Mild |
<table>
<thead>
<tr>
<th>Class III</th>
<th>Patients with cardiac disease causing marked limitation of physical activity. Comfortable at rest. <strong>Less-than-ordinary activity causes symptoms.</strong></th>
<th>Moderate to severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class IV</td>
<td><strong>ANY</strong> amount of physical activity causes symptoms. Symptoms may be present at rest.</td>
<td>Severe</td>
</tr>
</tbody>
</table>

**ACC/AHA Stages of Heart Failure**

<table>
<thead>
<tr>
<th>Stage A</th>
<th>At high risk for HF but <strong>without structural heart disease</strong> or symptoms of HF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage B</td>
<td>Structural heart disease but <strong>without signs or symptoms</strong> of HF</td>
</tr>
<tr>
<td>Stage C</td>
<td>Structural heart disease with prior or current symptoms of HF</td>
</tr>
<tr>
<td>Stage D</td>
<td>Refractory HF requiring specialized interventions.</td>
</tr>
</tbody>
</table>
Medications

Guidelines for Initial Medication Selection in Heart Failure with Reduced Ejection Fraction (HFrEF) Based Primarily on Clinical Findings\textsuperscript{6,7,8,9}

Table 1: Starting and Target Doses of Select Guideline-Directed Medical Therapy for HFrEF

<table>
<thead>
<tr>
<th>Medication</th>
<th>Starting Dose</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ARNI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sacubitril/valsartan</td>
<td>24/26 mg-49/51 mg twice daily</td>
<td>97/103 mg twice daily</td>
</tr>
<tr>
<td><strong>ACEI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Captopril</td>
<td>6.25 mg 3x daily</td>
<td>50 mg 3x daily</td>
</tr>
<tr>
<td>Enalapril</td>
<td>2.5 mg 2x daily</td>
<td>10-20 mg 2x daily</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>2.5-5 mg daily</td>
<td>20-40 mg daily</td>
</tr>
<tr>
<td>Ramipril</td>
<td>1.25 mg daily</td>
<td>10 mg daily</td>
</tr>
<tr>
<td><strong>ARB</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Candesartan</td>
<td>4-8 mg daily</td>
<td>32 mg daily</td>
</tr>
<tr>
<td>Losartan</td>
<td>25-50 mg daily</td>
<td>150 mg daily</td>
</tr>
<tr>
<td>Valsartan</td>
<td>40 mg 2x daily</td>
<td>160 mg 2x daily</td>
</tr>
<tr>
<td><strong>Beta Blockers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bisoprolol</td>
<td>1.25 mg once daily</td>
<td>10 mg once daily</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>3.125 mg 2x daily</td>
<td>25 mg 2x daily for weight &lt;85 kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 mg 2x daily for weight ≥85 kg</td>
</tr>
<tr>
<td>Metoprolol succinate</td>
<td>12.5-25 mg/d</td>
<td>200 mg daily</td>
</tr>
</tbody>
</table>


\textsuperscript{7} Diuretics, Loop, In Epocrates for apple IOS software. [Mobile Application Software], retrieved June 18, 2020


Table 1: Starting and Target Doses of Select Guideline-Directed Medical Therapy for HFrEF (continued)

_Note:_ Unlike immediate-release metoprolol and atenolol, metoprolol ER is proven to improve symptoms of heart failure, lower the risk of death from heart failure, and lower the risk of hospitalization due to heart problems. While atenolol is technically another hypertension drug, it doesn’t have these additional benefits.

### Aldosterone Antagonists

<table>
<thead>
<tr>
<th>Drug</th>
<th>Starting Dose</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eplerenone</td>
<td>25 mg daily</td>
<td>50 mg daily</td>
</tr>
<tr>
<td>Spironolactone</td>
<td>12.5-25 mg daily</td>
<td>25-50 mg daily</td>
</tr>
</tbody>
</table>

### SGLT2 Inhibitors

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dapagliflozin</td>
<td>10 mg daily</td>
</tr>
<tr>
<td>Empagliflozin</td>
<td>10 mg daily</td>
</tr>
</tbody>
</table>

### Vasodilators

<table>
<thead>
<tr>
<th>Drug</th>
<th>Starting Dose</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydralazine</td>
<td>25 mg 3x daily</td>
<td>75 mg 3x daily</td>
</tr>
<tr>
<td>Isosorbide dinitrate</td>
<td>20 mg 3x daily</td>
<td>40 mg 3x daily</td>
</tr>
<tr>
<td>Fixed-dose combination isosorbide dinitrate/hydralazine</td>
<td>20 mg/37.5 mg (one tab) 3 x daily</td>
<td>2 tabs 3 x daily</td>
</tr>
</tbody>
</table>

### Ivabradine

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Titration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivabradine</td>
<td>2.5-5 mg 2x daily</td>
<td>Titrate to heart rate 50-60 bpm. Maximum dose 7.5 mg 2x daily</td>
</tr>
</tbody>
</table>

### Digoxin

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digoxin</td>
<td>0.125 mg once</td>
</tr>
</tbody>
</table>

### Diuretics—Thiazides

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorthalidene</td>
<td>12.5-25 mg once</td>
</tr>
<tr>
<td>Hydrochlorothiazide</td>
<td>25 mg once or twice</td>
</tr>
<tr>
<td>Metolazone</td>
<td>2.5 mg once</td>
</tr>
</tbody>
</table>

### Diuretics—Loop

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bumetanide</td>
<td>0.5-1.0 mg once or twice</td>
</tr>
<tr>
<td>Furosemide</td>
<td>20-40 mg once or twice</td>
</tr>
<tr>
<td>Torsemide</td>
<td>10-20 mg once</td>
</tr>
</tbody>
</table>
Other HFrEF Medication Notes

- It is recommended that only one of the neurohormonal antagonist (Beta-blocker, ACE, ARB, ARNI, Aldosterone antagonist) be increased at each visit. If the patient is hemodynamically stable, it is generally acceptable to double the dose of these agents when escalating the dose.
- In general, calcium channel blockers should be avoided in HFrEF. However, second generation calcium channel blockers such as amlodipine may be used for blood pressure control in HFrEF. Other calcium channel blockers such as verapamil, diltiazem, and nifedipine should be avoided in patients with HFrEF due to their negative ionotropic effects and studies indicating worse outcomes.
- Anticoagulation indicated if atrial fibrillation present. Choice of agent should be individualized. Routine anticoagulation for heart failure without atrial fibrillation is not indicated.
- **If possible, avoid non-steroidal anti-inflammatory drugs (NSAIDs) in HFrEF**, because they can cause sodium retention and vasoconstriction and can reduce the effectiveness and increase the toxicity of ACE inhibitors and diuretics.

HFpEF MEDICATION CONSIDERATIONS

- Nitrates associated w adverse outcomes and should be avoided in HFpEF.³
- Mineralocorticoid receptor antagonists may be useful adjunctive therapy.

RHF MEDICATION CONSIDERATIONS

- Judicious use of diuretics as RHF patients are volume sensitive.

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³ 2017 Heart Failure Pathway
⁴ 2013 Heart Failure Pathway
Figure 2: Treatment Algorithm for Guideline-Directed Medical Therapy Including Novel Therapies

**HFpEF Stage C Treatment**

**ARNI/ACEI/ARB**
(ARNI preferred; Figures 3A and 3B)*, AND evidence-based beta-blocker† (Figure 3C) with diuretic agent (Figure 3D) as needed

- For patients with eGFR ≥ 30 mL/min/1.73m² or creatinine ≤ 2.5 mg/dL in males or ≤ 2.0 mg/dL in females or Kt ≤ 5.0 mEq/L, NYHA Class II-IV

  - Add Aldosterone antagonist (Figure 3E)

- For patients meeting eGFR criteria (Figure 3F), NYHA class II-IV

  - Add SGLT2 inhibitor (Figure 3F)

- For patients with persistent volume overload, NYHA class II-IV

  - Titrate Diuretic agent (Figure 3D)

- For persistently symptomatic patients despite ARNI/beta-blocker/aldosterone antagonist/SGLT2 inhibitor, NYHA class III-IV

  - Add Hydralazine + isosorbide dinitrate (Figure 3G)

- For patients with resting HR ≥ 70, on maximally tolerated beta-blocker dose in sinus rhythm, NYHA class II-III

  - Add Ivabradine (Figure 3H)

Blue boxes indicate Class I guideline recommendations, while the pink box indicates a Class II recommendation. ACEI = angiotensin-converting enzyme inhibitors; ARB = angiotensin receptor blockers; ARNI = angiotensin receptor-neprilysin inhibitor; eGFR = estimated glomerular filtration rate; HFpEF = heart failure with reduced ejection fraction; HR = heart rate; NYHA = New York Heart Association; SGLT2 = sodium-glucose cotransporter-2

†Carvedilol, metoprolol succinate, or bisoprolol

*ACEI/ARB should only be considered in patients with contraindications, intolerance or inaccessibility to ARNI. In those instances please consult Figure 3 for guidance on initiation.
TITRATION GUIDELINES FOR COMMON HEART FAILURE MEDICATIONS

Figure 3 Guideline-Directed Medical Therapy Including Novel Therapies in the Expert Consensus Decision Pathway for Chronic Heart Failure

A

ARNI

Ensure 36 hours off ACEI, adequate blood pressure, and eGFR ≥ 30 mL/min/1.73m² before initiating sacubitril/valsartan

Select starting dose: See Tables 1 and 3 for dosing information
See Table 2 for indications for ARNI use

If patient is taking equivalent of ≤ 10 mg daily of enalapril or equivalent of ≤ 160 mg daily of valsartan:
24/26 mg twice daily

In 2-4 weeks, assess tolerability
If possible, increase dose stepwise to target of 97/103 mg twice daily
Monitor blood pressure, electrolytes, and renal function after initiation and during titration

B

ACEI/ARB

Consider in patients where ARNI administration is not possible

Select initial dose of ACEI or ARB: See Table 1 for dosing information

If patient is taking equivalent of >10 mg daily of enalapril or equivalent of > 160 mg daily of valsartan:
49/51 mg twice daily

Consider increasing dose of ACEI/ARB every 2 weeks until maximum tolerated or target dose is achieved
Monitor blood pressure, renal function, and potassium after initiation and during titration

C

Evidence-based beta-blockers

Select initial dose of beta blocker: See Table 1 for dosing information

Consider increasing dose of beta blocker every 2 weeks and maximum tolerated or targeted dose is achieved
Monitor heart rate, blood pressure, and for signs of congestion after initiation and during titration
TITRATION GUIDELINES FOR COMMON HEART FAILURE MEDICATIONS

Figure 3 Cont'd

D
Diuretics

Select initial loop diuretic dose:
Initial dose depends on multiple factors including renal function and prior exposure to diuretic therapy

Titrate dose to relief of congestion over days to weeks. In some instances it may be necessary to reduce diuretic dosing in the setting of increasing doses of ACEI/ARB/ARNI

Monitor blood pressure electrolytes, and renal function after initiation and during titration

If reaching high dose of loop diuretic (i.e. equivalent of 80mg of furosemide twice daily) consider
a. Changing to a different loop diuretic or
b. Adding thiazide diuretic, taken together with loop diuretic

Monitor blood pressure, electrolytes, and renal function after initiation and during titration

E
Aldosterone Antagonists

Select initial dose of aldosterone antagonist:
See Table 1 for dosing information

Consider increasing dose of aldosterone antagonist at least every 2 weeks until maximum tolerated or target dose is achieved

Monitor electrolytes (especially potassium) and renal function 2-3 days following initiation, and then 7 days after initiation/titration

Then, check monthly for 3 months and every 3 months afterwards

Clinical status may warrant closer monitoring

F
SGLT2 inhibitor

Select dapagliflozin or empagliflozin:
See Table 1 for dosing information
See Table 2 for indications for SGLT2 inhibitor use

Ensure eGFR ≥ 30 mL/min/1.73 m² for dapagliflozin and eGFR ≥ 20 mL/min/1.73 m² for empagliflozin before initiation
TITRATION GUIDELINES FOR COMMON HEART FAILURE MEDICATIONS

Figure 3 Continued

G

Hydralazine + isosorbide dinitrate

Select initial dose of hydralazine and isosorbide dinitrate, either as individual medications or fixed-dose combination:
See Table 1 for dosing information

Consider increasing dose of hydralazine and/or isosorbide dinitrate every 2 weeks until maximum tolerated or target dose is achieved
Monitor blood pressure after initiation and during titration

H

Ivabradine

Re-assess that beta blockers are adjusted to maximally tolerated doses and/or target doses. Verify patient is in sinus rhythm.
See Table 1 for target beta blocker doses
See Table 2 for indications for ivabradine therapy

Select starting dose of ivabradine:
See Tables 1 and 4 for dosing information

Age ≥ 75 years
2.5 mg twice daily with food

Age < 75 years
5.0 mg twice daily with food

Reassess heart rate in at least 2-4 weeks

Heart rate <50 bpm or symptoms of bradycardia
Reduce dose by 2.5 mg twice daily with food or discontinue if already at 2.5 mg twice daily with food
Monitor heart rate

Heart rate 50-60 bpm
Maintain current dose and monitor heart rate

Heart rate > 60 bpm
Increase by 2.5 mg twice daily with food until reaching maximum dose of 7.5 mg twice daily with food
Monitor heart rate
**Table 2: Guideline-Recommended Indications for ARNI, Invabradine and SGLT2 Inhibitor Use**

<table>
<thead>
<tr>
<th>Indications for Use of ARNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>• HFrEF (EF ≤40%)</td>
</tr>
<tr>
<td>• NYHA Class II - IV HF</td>
</tr>
</tbody>
</table>
| • Administered in conjunction with a background of GDMT for HF in place of an ACEI or ARB  

<table>
<thead>
<tr>
<th>Indications for Use of Invabradine</th>
</tr>
</thead>
<tbody>
<tr>
<td>• HFrEF (EF ≤35%)</td>
</tr>
<tr>
<td>• On maximum tolerated doses of beta blocker</td>
</tr>
<tr>
<td>• Sinus rhythm with a resting heart rate ≥70 bpm</td>
</tr>
<tr>
<td>• NYHA Class II or III HF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indications for Use and SGLT2 Inhibitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>• HFrEF (EF ≤40%) with or without diabetes</td>
</tr>
<tr>
<td>• NYHA Class II - IV HF</td>
</tr>
</tbody>
</table>
| • Administered in conjunction with a background of GDMT for HF  

**Table 3: Dose Adjustments of Sacubitril/Valsartan for Specific Patient Populations**

<table>
<thead>
<tr>
<th>Population</th>
<th>INITIAL DOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-dose ACEI</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; Enalapril 10 mg total daily dose or therapeutically equivalent dose of another ACEI</td>
<td>49/51 mg twice daily</td>
</tr>
<tr>
<td><strong>High-dose ARB</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; Valsartan 160 mg total daily dose or therapeutically equivalent dose of another ARB</td>
<td></td>
</tr>
<tr>
<td><strong>De novo initiation of ARNI OR Low or medium dose ACEI</strong></td>
<td></td>
</tr>
<tr>
<td>≤ Enalapril 10 mg total daily dose or therapeutically equivalent dose of another ACEI</td>
<td></td>
</tr>
<tr>
<td><strong>Low or medium dose ARB</strong></td>
<td></td>
</tr>
<tr>
<td>≤ Valsartan 160 mg total daily dose or therapeutically equivalent dose of another ARB</td>
<td>24/26 mg twice daily</td>
</tr>
<tr>
<td><strong>ACE/ARB naïve</strong></td>
<td></td>
</tr>
<tr>
<td>Severe renal impairment (eGFR &lt;30 mL/min/1.73 m²)*</td>
<td></td>
</tr>
<tr>
<td>Moderate hepatic impairment (Child-Pugh Class B)</td>
<td></td>
</tr>
<tr>
<td>Elderly (age ≥75 years)</td>
<td></td>
</tr>
</tbody>
</table>

*This population was not studied in the PARADIGM-HF trial. The statement is consistent with FDA-approved labeling indications.
### TABLE 4: Contraindications and Cautions for Sacubitril/Valsartan, Ivabradine, and SGLT2 inhibitors

#### Contraindications and Cautions for Ivabradine

<table>
<thead>
<tr>
<th>Ivabradine</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contraindications</strong></td>
<td><strong>Cautions</strong></td>
</tr>
<tr>
<td>- HF with preserved Ejection Fraction (HFrEF)</td>
<td>- Sinus node disease</td>
</tr>
<tr>
<td>- Presence of angina with normal EF</td>
<td>- Cardiac conduction defects</td>
</tr>
<tr>
<td>- Hypersensitivity</td>
<td>- Prolonged QT interval</td>
</tr>
<tr>
<td>- Severe hepatic impairment (Child-Pugh C)</td>
<td></td>
</tr>
<tr>
<td>- Acute decompensated HF</td>
<td></td>
</tr>
<tr>
<td>- Blood pressure &lt;90/50 mm Hg</td>
<td></td>
</tr>
<tr>
<td>- Sick sinus syndrome without a pacemaker</td>
<td></td>
</tr>
<tr>
<td>- Sinoatrial node block</td>
<td></td>
</tr>
<tr>
<td>- 2nd or 3rd degree AV block without a pacemaker</td>
<td></td>
</tr>
<tr>
<td>- Resting heart rate &lt;60 bpm</td>
<td></td>
</tr>
<tr>
<td>- Persistent atrial fibrillation or flutter</td>
<td></td>
</tr>
<tr>
<td>- Atrial pacemaker dependence</td>
<td></td>
</tr>
<tr>
<td>- Sinus node disease</td>
<td></td>
</tr>
<tr>
<td>- Cardiac conduction defects</td>
<td></td>
</tr>
<tr>
<td>- Prolonged QT interval</td>
<td></td>
</tr>
</tbody>
</table>

#### Contraindications and Cautions for Sacubitril/Valsartan

<table>
<thead>
<tr>
<th>Sacubitril/Valsartan</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contraindications</strong></td>
<td><strong>Cautions</strong></td>
</tr>
<tr>
<td>Within 36 hours of ACEI use</td>
<td>Renal impairment:</td>
</tr>
<tr>
<td>History of angiodema with or without an ACEI or ARB</td>
<td>- Mild-to-moderate (eGFR 30-59 mL/min/1.73 m²): No starting dose adjustment required</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>- Severe eGFR &lt;30mL/min/1.73 m²: Reduce starting dose to 24 mg/26 mg twice daily; double the dose every 2-4 weeks to target maintenance dose of 97 mg/103 mg twice daily as tolerated</td>
</tr>
<tr>
<td>Lactation (no data)</td>
<td>Hepatic impairment:</td>
</tr>
<tr>
<td>Severe hepatic impairment (Child-Pugh C)</td>
<td>- Mild (Child-Pugh A): No starting dose adjustment required</td>
</tr>
<tr>
<td>Concomitant aliskiren use in patients with diabetes</td>
<td>- Moderate (Child-Pugh B): Reduce starting dose to 24 mg/26 mg twice daily; double the dose every 2-4 weeks to target maintenance dose of 97 mg/103 mg twice daily as tolerated</td>
</tr>
<tr>
<td>Known hypersensitivity to either ARBs or ARNs</td>
<td>Renal artery stenosis</td>
</tr>
<tr>
<td></td>
<td>Systolic blood pressure &lt;100 mmHg</td>
</tr>
<tr>
<td></td>
<td>Volume depletion</td>
</tr>
</tbody>
</table>

#### Recommended Indications/Contraindications for Vasodilators

**Indications**

- In self-described African American patients with persistently symptomatic NYHA Class III-IV HFrEF despite optimal GDMT, hydralazine-isosorbide dinitrate combinations can reduce morbidity and mortality

---

3 2017 HF Guideline
4 2013 HF Guideline
9 2021 ACC Heart Failure Pathway

Mount Sinai Health Partners
February 2022
### Contraindications
- Hypersensitivity to either agent
- Concomitant use of phosphodiesterase-5 inhibitors or riociguat (i.e. pulmonary HTN med)

<table>
<thead>
<tr>
<th>Cautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume depletion</td>
</tr>
<tr>
<td>Hypotension</td>
</tr>
</tbody>
</table>

### Contraindications for Cardiac Glycoside Use

#### Indications for Use of Digoxin
- Can be useful in HFrEF for persistent NYHA Class III and IV symptoms despite optimal guideline directed therapy to reduce hospitalizations for HF
- May be useful adjunctive therapy to control heart rate in atrial fibrillation
- In HF, the target steady-state, serum concentration is 0.5 ng/ml to 0.8 ng/ml, preferably obtained prior to receipt of next dose
- Has narrow toxic to therapeutic window

<table>
<thead>
<tr>
<th>Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant sinus or AV block</td>
</tr>
<tr>
<td>Acute or subacute kidney injury</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose adjustments warranted based on ideal body weight and renal function</td>
</tr>
<tr>
<td>Presence of hypokalemia, hypomagnesemia, or hypercalcemia</td>
</tr>
<tr>
<td>Use cautiously with other medications that effect sinus or AV nodal function or impact serum digoxin concentration</td>
</tr>
<tr>
<td>Cardiac amyloidosis</td>
</tr>
</tbody>
</table>

---

3 2017 HF Guideline
4 2013 HF Guideline
New Therapies for HFrEF: SGLT-2i (Sodium Glucose Cotransporter-2 Inhibitors)

SGLT-2 Inhibitors, which were originally used for diabetic control, now have an increasing role in HFrEF care.

**Mechanism:** The primary mechanism for glucose regulation of these medications is through inhibition of reabsorption of glucose in the kidney.

**Impact:** Of note, all 3 SGLT-2i show benefit in HF with DM\(^{10,11}\). Please note table below.

<table>
<thead>
<tr>
<th>SGLT-2i</th>
<th>3 Point MACE*</th>
<th>HF Hospitalizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canagliflozin (trade: Invokana)</td>
<td>Decreased risk:</td>
<td>Decrease:</td>
</tr>
<tr>
<td>Dapagliflozin (trade: Farxiga)</td>
<td>Canagliflozin -14%</td>
<td>Canagliflozin -33%</td>
</tr>
<tr>
<td>Empagliflozin (trade: Jardiance)</td>
<td>Dapagliflozin -14%</td>
<td>Dapagliflozin -27%</td>
</tr>
<tr>
<td></td>
<td>Empagliflozin -17%</td>
<td>Empagliflozin -35%</td>
</tr>
</tbody>
</table>

*3 Point MACE (events/100 pt-ys): Major nonfatal stroke, nonfatal MI, CV death, HF hospitalizations. Mean follow-up periods ranged from 18 -50 months across studies.\(^{10}\)

When to consider and how to prescribe

In patients with and without diabetes, with HFrEF or worsening CKD, (Step 4 if still symptomatic on ARNI, B-Blocker, Mineralocorticoid Receptor Antagonist) consider adding a SGLT2 Inhibitor if GFR >30.

*If the patient’s HbA1C is < 8% and are taking agents which can cause hypoglycemia (e.g. insulin, sulfonylureas/metaglitinides), their regimen may need to be modified to avoid hypoglycemia. For those with HbA1C > 10%, attention should be paid towards excessive glucosuria induced diuresis and an increased incidence of GU/mycotic infections.

*If not able to tolerate or GFR < 30, add a Glucagon-like peptide 1 receptor agonists (GLP-1 RAs), which are more easily tolerated without the risk of DKA or amputations.

---


## Contraindications and Cautions for SGLT2 Inhibitors

### SGLT2 Inhibitors

<table>
<thead>
<tr>
<th>Contraindications</th>
<th>Cautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Diabetes Type I due to increased risk of diabetic ketoacidosis</td>
<td>• For HF care, dapagliflozin, eGFR &lt;30 mL/min/1.73 m2</td>
</tr>
<tr>
<td>• Known hypersensitivity to drug</td>
<td>• For HF care, empagliflozin, eGFR &lt;20 mL/min/1.73 m2</td>
</tr>
<tr>
<td>• Lactation (no data)</td>
<td>• Pregnancy</td>
</tr>
<tr>
<td>• On dialysis</td>
<td>• Increased risk of mycotic genital infections</td>
</tr>
<tr>
<td>• <strong>Symptomatic hypotension or BP &lt;95 mmHg</strong></td>
<td>• May contribute to volume depletion. Consider altering diuretic dose if applicable</td>
</tr>
<tr>
<td>• Risk for foot amputations (neuropathy, ulcers, PVD, deformity)</td>
<td>• Ketoacidosis in patients with diabetes:</td>
</tr>
<tr>
<td>• Recurrent UTI’s/genital mycotic infections</td>
<td>o  Temporary discontinuation before scheduled surgery is recommended to avoid potential risk for ketoacidosis</td>
</tr>
<tr>
<td>• GFR &lt;30</td>
<td>o  Assess patients who present with signs and symptoms of metabolic acidosis for ketoacidosis, regardless of blood glucose level</td>
</tr>
<tr>
<td></td>
<td>• Acute kidney injury and impairment in renal function: consider temporarily discontinuing in settings of reduced oral intake or fluid losses</td>
</tr>
<tr>
<td></td>
<td>• Urosepsis and pyelonephritis: evaluate patients for signs and symptoms of urinary tract infections and treat promptly, if indicated</td>
</tr>
<tr>
<td></td>
<td>• Necrotizing fasciitis of the perineum (Fournier’s gangrene): rare, serious, life-threatening cases have occurred in both female and male patients; assess patients presenting with pain or tenderness, erythema, or swelling in the genital or perineal area, along with fever or malaise</td>
</tr>
<tr>
<td></td>
<td>• Osteopenia</td>
</tr>
</tbody>
</table>
Of note, a SGLT-2i diabetic medication, Dapagliflozin (Trade: Farxiga), was FDA approved\textsuperscript{12} in May 2020 for adults with NYHA Class II-IV HFrEF with and \textit{without DM} to reduce the risk of cardiovascular death and heart failure hospitalizations. In 2019, in the Dapagliflozin And Prevention of Adverse-Outcomes in Heart Failure (DAPA-HF) trial\textsuperscript{13}, a randomized, double-blind, placebo-controlled study of nearly 5,000 HFrEF patients who received 10 mg daily of dapagliflozin in addition to standard care exhibited fewer cardiovascular deaths, hospitalizations for heart failure, and urgent heart failure visits compared to controls receiving the placebo after 18 months.

- 26% relative risk reduction and 5% absolute risk reduction for composite outcome of CV death or the worsening of HF (triggering hospitalization or urgent visit requiring IV diuretics)
- NNT was 21 for death or hospitalization for HF or urgent visit.
- Findings were similar in those with and without diabetes.
- Contraindications and cautions in below table below

Dapagliflozin is covered through a majority of payers. Of note, costs $589 per month ($7,068 annually), without discount\textsuperscript{14}.

\textbf{HFpEF Consideration}

- Consider use of SGLT-2i (GFR >30) or GLP-1 Agonists if SGLT-2i contraindicated. However, trials ongoing to evaluate impact of SGLT-2i in HFpEF

\begin{table}[h]
\centering
\begin{tabular}{|c|p{10cm}|}
\hline
\textbf{Influenza vaccine} & Recommended for all patients with HF \\
\hline
\textbf{Pneumococcal vaccination} & The PPSV23 is recommended for all adult patients with heart failure. Administration of PCV13 should also be considered for patients >65 years old \\
\hline
\end{tabular}
\end{table}

9 2021 HF Guidelines
CARE DELIVERY STEPS & CLINICAL INTEGRATION MODELS

- A wide-variety of team members can be involved in the diagnosis, severity classification and care of heart failure. Please see Table 5 below for care delivery steps.
- Below are potential team members and options to integrate primary and advanced care for heart failure patients.

<table>
<thead>
<tr>
<th>Table 5: Care Delivery Step</th>
<th>Possible Team Member(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis and Severity Classification</td>
<td>Specialist, PCP, APN</td>
</tr>
<tr>
<td>Initial Treatment (Medications, Nutrition, Vaccines)</td>
<td>Specialist, PCP, APN, Pharmacy</td>
</tr>
<tr>
<td>Maintenance Treatment (Medication Adjust/Adherence, Nutrition, Vaccines)</td>
<td>Specialist, PCP, APN, Pharmacy</td>
</tr>
<tr>
<td>Self-Management (Weight monitoring/ Symptom response, Motivational Interviewing)</td>
<td>Pharmacy, Care Management (RN), Health Coaches, Certified Diabetic Educators</td>
</tr>
<tr>
<td>Coordinate Specialty Treatment or Testing / Advanced Care</td>
<td>Care Management (SW, RN)</td>
</tr>
<tr>
<td>Behavioral Health- Screen and Refer/ Initiate Treatment</td>
<td>PCP, APN, Pharmacy, LCSW (If available)</td>
</tr>
<tr>
<td>Care Management / Home Care Services</td>
<td>CM (RN, SW), Home Health Aide, Community Paramedicine</td>
</tr>
<tr>
<td>Tele-monitoring / Home Care Services</td>
<td>Specialist, Care Management (RN), Home Health Aide</td>
</tr>
<tr>
<td>Palliative Care- Screening</td>
<td>Specialist (Cardiologist, Pulmonologist, or Palliative Care), PCP, APN, Pharmacy, Care Management (RN)</td>
</tr>
</tbody>
</table>

Team Member Acronym Legend

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCP</td>
<td>Primary Care Provider</td>
</tr>
<tr>
<td>APN</td>
<td>Advanced Practice Nurse</td>
</tr>
<tr>
<td>RN</td>
<td>Registered Nurse</td>
</tr>
<tr>
<td>LCSW</td>
<td>Licensed Clinical Social Worker</td>
</tr>
<tr>
<td>SW</td>
<td>Social Worker</td>
</tr>
</tbody>
</table>
Testing & Referral

Use of BNP in Heart Failure

B-type natriuretic peptide (BNP) and N-terminal pro–B type natriuretic peptide (NT-proBNP) are the most studied biomarkers in Heart Failure:

- **BNP is released in direct relationship to myocardial wall stress.**
- **It plays a role in diagnosis and prognostication.**
- Higher concentrations of BNP or NT-proBNP in an ambulatory patient with HFrEF informs high risk, particularly when the concentrations are rising.
- Current clinical practice guidelines give a Class I recommendation to measure NT-proBNP or BNP to support a clinical diagnosis of HF, to assess disease severity, or to establish prognosis.
- More recently, biomarkers have been examined for their role as a marker of clinical responsiveness to GDMT for HFrEF. Patients whose natriuretic peptide concentrations do not fall with GDMT (“nonresponders”) have a worse prognosis.
- **Measurement can support clinical judgment with respect to prescription of GDMT, and to provide helpful objective data regarding decision-making for referral to advanced HF therapies.**
- In the setting of worsening symptoms, the reassessment of BNP or NT-proBNP may be informative.
- **However, serial assessment of BNP or NT-proBNP to guide aggressive titration of GDMT is not indicated and not warranted.**
- Several factors may interfere with the interpretation of natriuretic peptide concentrations:
  - Severe renal dysfunction
  - Sacubitril/valsartan (Entresto) will increase BNP levels due to neprilysin inhibition, and concentrations tend not to return to baseline despite chronic therapy. BNP concentrations will increase (while NT-proBNP will most often fall) with ARNI therapy, and thus it may be more prudent to check only NT-proBNP in patients on ARNI.
  - Also, transient increases in natriuretic peptide levels have been documented in the initial phases of beta-blocker initiation; such changes should not preclude up-titration of beta-blocker therapy, which should be guided by patient tolerance instead of asymptomatic change in natriuretic peptide levels.

**HFpEF BNP considerations:** Absolute values are lower than in HFpEF, with up to 30% of HFpEF patients having normal levels.

---

3 2017 Heart Failure Pathway
17 Henning RJ. Diagnosis and treatment of heart failure with preserved left ventricular ejection fraction World J Cardiol 2020 January 26; 12(1): 7-25
Mount Sinai Health Partners
February 2022
Figure 4 Testing and Medication Titration Following Diagnosis of HFrEF

**Studies to Order**
- BNP/NT-proBNP
- CBC, basic metabolic panel, liver function, iron studies, thyroid studies, HbA1c
- EKG
- Chest X-ray
- Echocardiogram
- Coronary angiogram, cardiac MRI, biopsy, other imaging as appropriate

**If no cause is found consider contributing etiologies:**
- Alcoholism, substance abuse, cocaine
- Pulmonary disease

---

**Serial Evaluation and Titration of Medications**
- Clinic visit with history/symptoms, vitals, exam, labs
- If volume status requires treatment, adjust diuretics follow up 1-2 weeks
- If euvolemic and stable, start increase switch GDMT, follow up 1-2 weeks via phone or repeat clinic visit with basic metabolic panel as may be indicated
- Repeat cycle until no further changes are possible or tolerated

---

**End-Intensification/maintenance**
- Ongoing assessment
- Additional adjustments as indicated
- Repeat objective data as needed to reestablish prognosis

---

**Assess response to therapy and cardiac remodeling**
- Repeat laboratory tests, for example, BNP/NT-pro BNP and basic metabolic panel
- Repeat echocardiogram (or similar imaging modality for cardiac structure and function)
- Repeat EKG for change in symptoms, condition, or dose titration
- Consider EP referral for those eligible for CRT or ICD

---

**Lack of response/instability**

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**Stabilization ~3 months**

---

**Intensification 2-4 months (1-4 week cycles)**

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**Remember acronym to assist in decision making for referral to advanced heart failure specialist:**

**I – NEED - HELP**
- I: IV inotropes
- N: NYHA III/IV or persistently elevated natriuretic peptides
- E: Ejection fraction ≤ 35%
- D: Defibrillator shocks
- H: Hospitalizations > 1
- E: Edema despite escalating diuretics
- L: Low blood pressure, high heart rate
- P: Prognostic medication – progressive intolerance or down-titration of GDMT

---

**BNP = B-type natriuretic peptide; CBC = complete blood count; CRT = cardiac resynchronization therapy; EKG = electrocardiogram; EP = electrophysiology; GDMT = guideline-directed medical therapy; HbA1c = hemoglobin A1c; HF/EF = heart failure with reduced ejection fraction; ICD = implantable cardioverter defibrillator; IV = intravenous; MRI = magnetic resonance imaging; NT-proBNP = N-terminal pro-B-type natriuretic peptide; NYHA = New York Heart Association**
HFpEF Evaluation and Testing Considerations\textsuperscript{17,18}

- Consider Amyloidosis (Red Flag Sxs- Carpal Tunnel, Spinal Stenosis, Neuropathy). Note: High baseline BNP levels and serum troponin concentrations are highly suggestive of cardiac amyloidosis, allowing differentiation from other etiologies of cardiac hypertrophy. In cardiac amyloid, the electrocardiogram may show low voltages despite the presence of ventricular hypertrophy on the echocardiogram.
- If etiology of HFpEF remains unclear consider Rheumatologic causes (Scleroderma, Sarcoidosis, Connective Tissue Disease).
- Cardiac imaging plays an important role in diagnosis:
  - Echocardiogram: EF>50%, LVH, pulmonary hypertension, and evidence of significant diastolic dysfunction are common findings.
  - Cardiac MRI: useful in evaluating myocardial extracellular volume, detecting infiltrative processes, and assessing scar burden (2013 guideline).
  - Technetium pyrophosphate scanning can be useful in the evaluation of patients with suspected cardiac amyloidosis.
- Cardiac catheterization: invasive hemodynamic assessment of LV, RV, and pulmonary artery pressures, at rest and with exercise, and endomyocardial biopsy are helpful when noninvasive evaluation is inconclusive.

RHF Evaluation and Testing Considerations\textsuperscript{5}

- RHF impairs LV filling leading to decreased Stroke Volume and Cardiac Output, neurohormonal activation, salt and water retention, increased central venous pressure, systemic venous hypertension, congestive hepatopathy and cardiorenal syndrome.
  - Cardiorenal syndrome- Increased CVP and renal vein pressure and decreased cardiac output lead to renal dysfunction.
  - Cardiohepatic syndrome- Due to hepatic congestion and decreased perfusion. May lead to cirrhosis.

\textsuperscript{5} Konstam MA, Kiernan MS, Bernstein D et al. Evaluation and Management of Right-Sided Heart Failure A Scientific Statement From the American Heart Association. Circulation. 2018;137:e578–e622
\textsuperscript{17} Henning RJ. Diagnosis and treatment of heart failure with preserved left ventricular ejection fraction World J Cardiol 2020 January 26; 12(1): 7-25
When to Refer to a HF Specialist

<table>
<thead>
<tr>
<th>Triggers for HF Patient Referral to a Specialist/Advanced Heart Failure Program(^3,^9,^9)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New-onset HF (regardless of EF):</strong> Refer for evaluation of etiology, guideline-directed evaluation and management of recommended therapies, and assistance in disease management, including consideration of advanced imaging, endomyocardial biopsy, or genetic testing for primary evaluation of new-onset HF</td>
</tr>
<tr>
<td><strong>Chronic HF with high-risk features, such as development of 1 or more of the following risk factors:</strong></td>
</tr>
<tr>
<td>• Need for chronic IV inotropes</td>
</tr>
<tr>
<td>• Persistent NYHA functional class III-IV symptoms of congestion or profound fatigue</td>
</tr>
<tr>
<td>• Systolic blood pressure ≤90 mm Hg or symptomatic hypotension</td>
</tr>
<tr>
<td>• Creatinine ≥1.8 mg/dl or BUN ≥43 mg/dl</td>
</tr>
<tr>
<td>• Onset of atrial fibrillation or ventricular arrhythmias or repetitive ICD shocks</td>
</tr>
<tr>
<td>• 2 or more emergency department visits or hospitalizations for HF in prior 12 months</td>
</tr>
<tr>
<td>• Inability to tolerate optimally dosed beta-blockers and/or ACI/ARB/ARNI and/or aldosterone antagonists</td>
</tr>
<tr>
<td>• Clinical deterioration, as indicated by worsening edema, rising biomarkers (BNP, NT-proBNP, others), worsened exercise testing, decompensated hemodynamics, or evidence of progressive re-modeling on imaging</td>
</tr>
<tr>
<td>• High mortality risk using a validated risk model for further assessment and consideration of advanced therapies, such as Seattle Heart Failure Model</td>
</tr>
</tbody>
</table>

To assist with management of GDMT, including replacement of ACEI or ARB therapy with ARNI for eligible patients or to address comorbid conditions such as chronic renal disease or hyperkalemia, which may complicate treatment.

Persistent reduced LVEF ≤35% despite GDMT for ≥3 months for consideration of device therapy in those patients without prior placement of ICD or CRT, unless decided therapy is contraindicated or inconsistent with overall goals of care.

**Second opinion needed regarding etiology of HF; for example:**
- Coronary ischemia and the possible value of revascularization
- Suspected myocarditis
- Established or suspected specific cardiomyopathies, e.g., hypertrophic cardiomyopathy, arrhythmogenic right ventricular dysplasia, Chagas disease, restrictive cardiomyopathy, cardiac sarcoidosis, amyloidosis, aortic stenosis.
- Valvular heart disease and the possible value of valve repair

Annual review of patients with established advanced HF in which patients/caregivers and clinicians discuss current and potential therapies for both anticipated and unanticipated events, possible HF disease trajectory and prognosis, patient preferences, and advanced care planning.

Assessment of patient for possible participation in a clinical trial.

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\(^3\) 2017 Heart failure Pathway

\(^9\) 2021 HF Guidelines

\(^9\) Department of Cardiology, Mount Sinai Health System

Mount Sinai Health Partners

February 2022

Page 23 of 37
**When to Refer for Device Therapy**
- Consider EP referral for primary ICD or CRT in patients with:
  - EF ≤ 35% for at least 90 days (or 40 days post MI) on chronic GDMT.

**When to Refer to Cardiac Rehab**
People of all ages with heart conditions, including HF, can benefit from a cardiac rehab program.
- Medicare and most other insurers provide reimbursement for cardiac rehab for HFrEF.
  - Exceptions include cardiac rehab in the wake of procedures to implant a pacemaker or implantable cardioverter defibrillator (ICD).
  - Coverage after heart failure is usually limited to patients with compromised EF. Specifically, patients with left ventricular ejection fraction of 35% or less and New York Heart Association Class II to IV symptoms with at least 6 weeks of heart failure therapy will be covered. Anyone outside this criteria will not be covered.

**Mount Sinai Heart’s Cardiac Rehabilitation Program**
Cardiac Rehabilitation has substantial benefits in driving outcomes for most patients with Heart Failure. Providers who refer patients can expect a 6-12 weeks (2-3x a week) comprehensive, individualized program, well beyond exercise and diet to include education, counseling, and emotional support, among other services. Program is covered by Medicare, NY State Medicaid, and most commercial plans.

Consider referring patients to Mount Sinai Heart’s Cardiac Rehabilitation Program if patient has the following diagnosis or condition:
- Stable, HFrEF, with left ventricular ejection fraction of 35% or less and New York Heart Association class II to IV symptoms with at least 6 weeks of heart failure therapy.
- Stable Angina
- Hx of PCI
- Hx of MI within the preceding 12 months
- Bypass or valve surgery
- Heart Transplant
- Any patients with diabetes who you believe will benefit. (Diabetes alone is not a covered condition/diagnosis but we can encourage them to enroll into our Medical Fitness program).
- Minimal insurance coverage for HFpEF if no other cardiac history.

**Locations and How to Refer**
- **Mount Sinai Doctors - East 85th Street**
  - Address: 234 E 85th Street, Lower Level, New York, NY 10028
  - Phone: 212-241-8597

**Mount Sinai South Nassau Cardiac Rehabilitation Program**
The MSSN Cardiac Rehabilitation Program is a 36 session program where patients commit to coming to the Center every M-W-F for 12 weeks. The program is covered by Medicare and the...
program accepts NY Medicaid, and most commercial plans. When a referral is made to the Cardiac Rehabilitation Program insurance is verified, authorizations obtained and patients are called to inform them of any copays and out of pocket expenses they will incur.

MSSN Cardiac Rehabilitation program follows CMS strict admissions guidelines for Outpatient Cardiac Rehabilitation. Listed below are the diagnoses that are accepted:

- An acute myocardial infarction within the preceding 12 months
- A coronary artery bypass surgery
- Current stable angina pectoris
- Heart valve repair or replacement
- Percutaneous transluminal coronary angioplasty or coronary stenting
- A heart or heart-lung transplant
- Heart Failure: Stable, chronic heart failure is defined as patients with left ventricular ejection fraction of 35% or less and New York Heart Association (NYHA) class II to IV symptoms despite being on optimal heart failure therapy for at least 6 weeks

Locations and How to Refer
Mount Sinai South Nassau
Address: 440 Merrick Road, Oceanside, NY 11572
Phone: 516-255-8280

Suggested Actions for Managing Comorbidities in Heart Failure Patients

<table>
<thead>
<tr>
<th>Comorbidity</th>
<th>Association with Heart Failure Outcomes</th>
<th>Clinical Trial Evidence for Modulating Comorbidity</th>
<th>Suggested Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Artery Disease</td>
<td>Strong</td>
<td>Strong</td>
<td>Evaluate and revascularize in appropriate patients</td>
</tr>
<tr>
<td>Atrial Fibrillation/Flutter</td>
<td>Strong</td>
<td>Intermediate</td>
<td>Treat according to current ACC/AHA/HRS Guideline for the Management of Patients with A-Fib</td>
</tr>
<tr>
<td>Mitral Regurgitation</td>
<td>Strong</td>
<td>Intermediate</td>
<td>Refer to structural heart disease expert &amp; treat according to current AHA/ACC Guideline for the Management of Patients with Valvular Heart Disease. Consider transcatheter intervention in carefully selected patients with symptomatic HF and secondary MR</td>
</tr>
<tr>
<td>Aortic Stenosis</td>
<td>Strong</td>
<td>Strong</td>
<td>Refer to structural heart disease expert &amp; treat according to current AHA/ACC Guideline for the Management of Patients with Valvular Heart Disease</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Uncertain</td>
<td>Strong for prevention</td>
<td>Treat according to ACC/AHA hypertension guidelines</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>Uncertain</td>
<td>Strong for prevention</td>
<td>Treat according to ACC/AHA Guidelines on the Management of Blood Cholesterol and the ACC</td>
</tr>
</tbody>
</table>

---

3 2017 Heart Failure Pathway
9 2021 HF Guidelines
19 Department of Cardiology, Mount Sinai Health System
<table>
<thead>
<tr>
<th>Condition</th>
<th>Grade of Evidence</th>
<th>Evidence Strength</th>
<th>Treatment Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral Vascular Disease</td>
<td>Moderate</td>
<td>None</td>
<td>Treat according to current AHA/ACC vascular guidelines</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>Moderate</td>
<td>Weak</td>
<td>Treat according to current AHA stroke guidelines</td>
</tr>
<tr>
<td><strong>Noncardiovascular</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>Moderate (inverse)</td>
<td>Weak</td>
<td>Further data needed</td>
</tr>
<tr>
<td>Chronic Lung Disease</td>
<td>Strong</td>
<td>Weak</td>
<td>Optimize therapy, consider pulmonary consultation, Smoking cessation</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>Strong</td>
<td>Strong</td>
<td>Optimize therapy, consider SGLT-2i, consider endocrine consult &amp; follow current American Diabetes Association Standards of Medical Care in Diabetes</td>
</tr>
<tr>
<td>Chronic Renal Disease</td>
<td>Strong</td>
<td>Strong</td>
<td>Optimize RAASi therapy, consider nephrology consult, administer SGLT2 inhibitor, use hydralazine/ISDN if ARNI/ACEI/ARB cannot by used</td>
</tr>
<tr>
<td>Anemia</td>
<td>Moderate</td>
<td>Weak</td>
<td>Evaluate secondary causes, consider transfusing in severe cases</td>
</tr>
<tr>
<td>Iron Deficiency</td>
<td>Strong</td>
<td>Intermediate</td>
<td>Consider intravenous iron replacement for symptom improvement in NYHA Class II and iron deficiency (ferritin &lt;100 mg/mL or 100 to 300 ng/mL if transferrin saturation is &lt;20%), to improve functional status and QoL</td>
</tr>
<tr>
<td>Thyroid Disorder-hypo or hyper</td>
<td>Strong</td>
<td>Weak</td>
<td>Consider referral to endocrinologist and/or treatment</td>
</tr>
<tr>
<td>Sleep Disordered Breathing</td>
<td>Strong</td>
<td>Intermediate</td>
<td>Consider sleep study and treat severe obstructive sleep apnea to improve sleep quality, consider referring to sleep specialist. Adaptive servoventilation should not be used in HF patients with central sleep apnea</td>
</tr>
<tr>
<td>Hyperkalemia</td>
<td>Uncertain, may limit initiation and titration of GDMT</td>
<td>Weak</td>
<td>Recommend dietary modifications, consider treatment with patiromer</td>
</tr>
</tbody>
</table>

**HFpEF Consideration**

Management of co-morbid conditions is primary focus of care for HFpEF. Major disease focus areas: Atrial fibrillation, Coronary Artery Disease, Diabetes, Pulmonary Hypertension, Obesity, Cardiac Valvular Disease, Chronic Anemia and Rheumatologic Disease.

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Palliative Care

Background
- Palliative care is beneficial at any stage of a serious illness.
- Palliative care, and the medical sub-specialty of palliative medicine, is specialized medical care for people living with serious illness.
- It focuses on providing relief from the symptoms and stress of a serious illness.
- The goal is to improve quality of life for both the patient and their family.

Referral Criteria
Consider a specialty-level palliative care referral for patients who meet any of these criteria:
- NYHA class III/IV symptoms with frequent heart failure readmissions
- Anxiety or depression adversely affecting patient's quality of life or their ability to manage their illness
- Assistance with decision-making regarding advanced therapies (VAD, transplant, home inotropic therapy)

Referral Options for Palliative Care Within MSHS
Patients with Congestive Heart Failure may be referred to one of two practices. The services provided at each location are identical; please choose the location that is most convenient to your patient.

Mount Sinai Health System Palliative Care Practices
- To make a referral to the Martha Stewart Center for Living at 1440 Madison Avenue, please call: 212-241-1446
- To make a referral to the Martha Stewart Center for Living Downtown at Union Square, please call: 212-844-1712

Remote patient monitoring facilitates care. Strongly consider use of pulmonary artery pressure monitoring (CardioMEMS) to reduce heart failure hospitalization rates.

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28 Information developed and provided by the Mount Sinai Brookdale Department of Geriatrics and Palliative Medicine
29 Center to Advance Palliative Care; Serious Illness Quality Alignment HUB: State Palliative Care Definitions and Standards. Available at: https://www.capc.org/documents/133/).
Remote Patient Monitoring (RPM)
Remote patient monitoring is important in heart failure management for select patients using these two approaches:

- **CardioMEMS**
  - Consider use of pulmonary artery pressure monitoring (CardioMEMS) to reduce heart failure hospitalization rates, for both HFrEF and HFpEF¹⁹
  - Many current Mount Sinai patients (especially HFpEF and RHF) benefit from this monitoring

- **Connected Hearts Program**
  - Using Omron® devices for home blood pressure measurement and weight measurement via Bluetooth data hub transmission to Epic EMR flowsheet
  - Clinical Pharmacist monitors data and intervenes directly with patients on medications, diet and care coordination

Pharmacy
- Pharmacists are a key part of the care team for chronic disease management including heart failure, diabetes, and COPD
- The team of pharmacists is rapidly expanding in primary and specialty care
- They are credentialed providers that can prescribe and adjust medications through the Collaborative Drug Treatment Model²²

Referrals to pharmacists are appropriate for:
- Uncontrolled chronic diseases, such as:
  - Hypertension, Diabetes, Heart Failure, Asthma, COPD
- Polypharmacy
- Medication Reconciliation
- Medication Adherence

Home Health
- Referrals for Home Health should be handled through the designated Home Health nurse coordinator, a member of the care management team
- The Home Health nurse coordinator will assess the patient’s needs and determine appropriateness of Home Health
- Telephonic education and reinforcement can be also be delivered by the Nurse Clinical Coordinator. (The Home Health RN will not provide patient interventions, they will refer to the nurse care coordinator, if needed.)
- Providing Home Health nursing and therapy can promote recovery in vulnerable HF patients with post-hospital syndrome and potentially reduce readmissions²³
- Nursing interventions can include various educational components, including recognition of HF symptoms with an action plan, dietary guidelines, medication management, and weight monitoring.

¹⁹ Department of Cardiology, Mount Sinai Health System
²² Academy of Managed Care Pharmacy, Practice Advisory on Collaborative Drug Therapy Management, https://www.amcp.org/sites/default/files/2019-03/Practice%20Advisory%20on%20CDTM%202012_0.pdf, accessed online July 28, 2020
Care Coordination in Heart Failure at MSHS

- The medical complexity inherent in most patients with HF generally requires the involvement of multiple clinicians across many care settings
- Interdisciplinary, team-based care may be the most effective approach to complex HF care
- Mount Sinai Health Partners Care Management social workers and nurses partner with patients, family caregivers, and providers to identify and address known risk factors that can impact patients’ health
- Care Management intervention includes:
  - A comprehensive assessment of the patient’s understanding of and ability to manage their illness and the psychosocial issues that impact their care
  - Development of a comprehensive care plan to set goals to optimize health and quality of life

**Referral Criteria** may include those with:
- Multiple no-shows
- Unexplained non-adherence to medications, testing or treatment
- Demonstrated difficulty managing symptoms and/or disease processes (including those newly diagnosed)
- Frequent admissions or ED visits that may be preventable with additional support
- Complex family dynamics that deplete the provider
- Difficulty accessing needed community-based care
- A high “worry score” (patients you as the provider are most worried about from visit to visit)

**How to refer to care management:**
- Use the MSHP Care Management Referral in Epic (order #391414)
- Email mshpcmreferral@mountsinai.org or call 212-241-7228
  - Providers who refer patients can expect:
    - Prompt and efficient processing of your referral
    - Communication about referral processing and assignment through the Epic Inbasket
    - Follow up from clinical staff within one week of assignment

**Behavioral Health**

Patients should be screened for depression using the PHQ-2/PHQ-9 and referred to psychiatric services, as indicated, through their current care pathway depending on their clinic.
- Individuals with CHF are 2-5 times more likely to have anxiety and depressive disorders compared with the general population
- Patients with chronic medical illness and a co-morbid psychiatric diagnosis have poorer quality of life, increased functional disability, and increased mortality, to name a few
- Increased recognition of treatment of these comorbid conditions is essential

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24 Information developed and provided by the Mount Sinai Care Management Department
25 Information developed and provided by the Mount Sinai Department of Psychiatry.
Rapid Follow Up Clinics (RFU Clinics)

- RFUs can provide additional post-discharge support
- Treatment in specialized HF clinics using nurse intervention reduces readmission frequencies and improves quality of care for HF patients
- For referrals contact the individuals listed below

<table>
<thead>
<tr>
<th>Campus</th>
<th>Primary Contact</th>
<th>Hours &amp; Location</th>
<th>Uses ReDS Vest (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSH</td>
<td>Jennifer Ullman, NP (212) 241-7300 <a href="mailto:Jennifer.Ullman@mountsinai.org">Jennifer.Ullman@mountsinai.org</a></td>
<td>Wednesdays 8:00 am to 5:00 pm, flexible hours upon request, 1190 Fifth Avenue, GP1C</td>
<td>Yes</td>
</tr>
<tr>
<td>MSBI</td>
<td>Jayitha Janardhanan, NP (646) 400-4889 <a href="mailto:Jayitha.Janardhanan@mountsinai.org">Jayitha.Janardhanan@mountsinai.org</a></td>
<td>Tuesday 9:00 am to 12:00 pm, 10 Union Square East</td>
<td>No</td>
</tr>
<tr>
<td>MSQ</td>
<td>Dr. Preethi Pirlamarla, MD <a href="mailto:Preethi.Pirlamarla@mountsinai.org">Preethi.Pirlamarla@mountsinai.org</a></td>
<td>Monday 1:00 pm to 5:00 pm, Tuesday 1:00 pm to 5:00 pm, Thursday 1:00 pm to 2:00 pm, Friday 9:00 am to 12pm, MSQ Ambulatory Pavilion 2510 30th St., 5th Floor</td>
<td>Yes, outpatient only</td>
</tr>
<tr>
<td>MSM</td>
<td>Cathleen Varley, NP (212) 523-2700 <a href="mailto:Cathleen.Varley@mountsinai.org">Cathleen.Varley@mountsinai.org</a></td>
<td>Monday thru Thursday 8:00 am to 4:30 pm, Friday 8am-1pm, 440 West 114th Street, 2nd Floor, Cardiovascular Institute</td>
<td>Yes (inpatient to be available 2022)</td>
</tr>
<tr>
<td>MSSN</td>
<td>Jozelle Diaz, NP <a href="mailto:Jozelle.Diaz@snch.org">Jozelle.Diaz@snch.org</a></td>
<td>Monday and Wednesday through Friday 11:00 am to 4:00 pm, One Healthy Way, Oceanside, NY 11572, Telehealth available</td>
<td>No</td>
</tr>
</tbody>
</table>

ReDS Vests

MSHS has several vests in use including at Rapid Follow Up clinics

- The ReDS vest measures lung fluid in heart failure patients
- The vest uses radar technology to measure the % of water in the Right Middle Lobe
- It is non-invasive and readings are available within 90 seconds

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Certified Diabetes Educators (I.E. Wellness Coaches)
Certified Diabetes Educators (CDEs) practice at the top of their license. They can help manage patients with both a diagnosis of diabetes and heart failure. CDEs are embedded in primary and specialty care.

Patients receive customized education and strategies to achieve optimal quality of life. CDE engagement includes:
- Assessing and educating patients and caregivers on their health condition(s)
- Cohesive collaboration with the medical team to integrate evidenced-based care into patient’s plan of care
- Ongoing monitoring, real time support and follow up by the medical team
- Seamless communication amongst the medical team
- Specialty care consultations for high risk patients
- Oversight and training by a Heart Failure Medical Director, and outcomes evaluation

Community Paramedicine (CP)
Community Paramedicine at Mount Sinai offers rapid evaluation and in-home treatment for patients with acute symptoms with the goal of stabilizing the patient at home and preventing ED visits. The response is provided by a paramedic with ED physician oversight and telemedicine support. There is a 60 minute (or less) response time to anywhere in New York City, 24/7. We also offer service to Nassau County, Long Island. Relevant diagnostic tools and medications that can be performed/administered in the home setting include:
- EKG
- Vital Signs
- Complete Physical Assessments
- IV Fluids
- IV Medications including Lasix, Zofran and more!
- Pain management

How to use the service:
Step 1: Sign Up
Clinicians must be signed up in order to use CP. Contact Ari Breslauer at 347-861-4242 or Ari.Breslauer@mountsinai.org to enroll.

Step 2: Get Trained
Schedule a brief (20-30 minutes) on-boarding session with Ari Breslauer

Training includes:
- Overview of Community Paramedicine operational workflow
- Review of appropriate patient cases for activation
- Review of steps to activate services

Step 3: Identify Eligible Patient and Call
Call 1-800-TO-SINAI (option 3) or 646-605-5962 to activate Community Paramedicine for your patient.

Who can initiate this service at my practice?
- Any clinician (including mid-levels and RN’s) can trigger this service for their patient who needs urgent evaluation and treatment at home, with the goal of stabilizing the patient and preventing an ED visit.
# Initial and Subsequent Office Visit Templates

<table>
<thead>
<tr>
<th><strong>Initial Visit (confirm diagnosis, etiology, and initiate appropriate therapy)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provider History</strong></td>
</tr>
<tr>
<td>• Duration of illness</td>
</tr>
<tr>
<td>• NYHA Class (I-IV)</td>
</tr>
<tr>
<td>• Weight gain/loss, new or worsening edema, orthopnea, and dyspnea</td>
</tr>
<tr>
<td>• Assessment of comorbidities including obesity, prior CAD, atrial fibrillation, DM, HLD, and smoking</td>
</tr>
<tr>
<td>• Potential clues suggesting etiology of heart failure if unknown <em>(ischemic vs. non-ischemic)</em>.</td>
</tr>
<tr>
<td>• Assess, if indicated, for any known or suspected anemia, valvular, lung, liver, thyroid, renal, or rheumatologic diseases, pulmonary hypertension, sleep apnea, HIV infection, recent pregnancies, relevant travel, or symptoms of pheochromocytoma</td>
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<tr>
<td>• Complete medication review, including OTC medications</td>
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<tr>
<td>• PHQ 2 and if positive, PHQ 9.</td>
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<tr>
<td>• Current/past alcohol use</td>
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<tr>
<td>• Prior drug abuse, including IVDA</td>
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<tr>
<td>• Diet and fluid intake</td>
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<tr>
<td>• Family history</td>
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<tr>
<td>• Inquire if Healthcare Proxy form has been completed</td>
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<tr>
<td>• Previous COVID-19 infection and antibody status</td>
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<tr>
<td><strong>Provider Physical</strong></td>
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<tr>
<td>• Blood pressure, pulse, weight, BMI, possibly O2 sat</td>
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<tr>
<td>• Assessment of volume status</td>
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<tr>
<td>• Cardiovascular exam (especially JVD, hepatojugular reflex, and presence of S3)</td>
</tr>
<tr>
<td>• Telemedicine consideration:</td>
</tr>
<tr>
<td>• “edema check”: (“PLACE YOUR FINGERS WHERE YOU HAVE SWELLING ON YOUR LOWER LEG, PUSH DOWN HARD AND REMOVE, DO YOU SEE AN INDENTATION? IF YES, HOW DEEP IS THAT INDENTATION)</td>
</tr>
<tr>
<td><strong>Diagnostic Studies</strong></td>
</tr>
<tr>
<td>1. Lab work</td>
</tr>
<tr>
<td>• CBC with diff</td>
</tr>
<tr>
<td>• BMP, magnesium</td>
</tr>
<tr>
<td>• Lipid profile</td>
</tr>
<tr>
<td>• BNP or NT-proBNP <em>(if no prior documentation)</em></td>
</tr>
<tr>
<td>• Troponin <em>(risk marker)</em></td>
</tr>
<tr>
<td>• Digoxin level, if signs or symptoms of toxicity or recent addition of interacting drug</td>
</tr>
<tr>
<td>• PT/INR <em>(Every patient on warfarin should be enrolled in an anticoagulation clinic or have his/her PT/INR followed closely by a designated provider.)</em></td>
</tr>
<tr>
<td>2. Consider the following in appropriate patients if the etiology of HF is unknown</td>
</tr>
<tr>
<td>• TSH</td>
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<tr>
<td>• LFTs</td>
</tr>
<tr>
<td>• HIV Ab <em>(if not recently documented)</em></td>
</tr>
<tr>
<td>• Anemia panel and Hemochromatosis screen <em>(transferrin sat, ferritin)</em></td>
</tr>
<tr>
<td>• Rheumatologic evaluation</td>
</tr>
<tr>
<td>• Evaluation for amyloidosis, if red flags present</td>
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<tr>
<td>• Others as indicated</td>
</tr>
<tr>
<td>3. Procedures</td>
</tr>
<tr>
<td>• 12-lead EKG; document QRS duration</td>
</tr>
<tr>
<td>• Echo with Doppler flow studies; document EF</td>
</tr>
<tr>
<td>• Chest X-ray: PA &amp; Lat</td>
</tr>
</tbody>
</table>
• Ischemic workup in appropriate patients

**Telemedicine considerations**
• When possible, get blood tests done ~ 1 week prior to virtual visit, either at office, local phlebotomy center (Labcorp/Quest) or have blood drawn at home (Apex Lab)
• Results of home cardiac rhythm (KardiaMobile) monitoring can be transmitted to practice in advance of visit
• Patient should upload results of home monitoring into Epic or fax to office prior to visit
• When available, staff can outreach to patient in advance of visit to collect needed information

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**For patients with HFrEF**

Plan to initiate treatment in stepwise manner. Titrate to target dose as per GDMT.
If the patient is hemodynamically stable, it is generally acceptable to double the dose of the neurohormonal antagonist (Beta-blockers, ACE, ARB, ARNI mineralocorticoid antagonists (i.e. Spironolactone)) when increasing the dose. It is recommended that only one of these agents be increased each visit. Caution is advised if increasing more than one.

**Document contraindications or intolerance**

- ACEI/ARB: initiate/titrated to target dose, document contraindications/intolerance.
- Use Subcutril/Valsartan (i.e. Entresto) instead of ACE/ARB for patients with NYHA class II-III and LVEF ≤ 35% who are stable an an ACEI/ARB.
- Beta blocker: initiate/titrated using either carvedilol, sustained-release metoprolol succinate, or bisoprolol
- Aldosterone antagonist: initiate/titrated if not contraindicated (GFR >30ml/min, K <5.0 mEq/ml) and NYHA class II-IV HF with LVEF ≤ 35% (*NYHA Class II should have hx of prior CV hospitalization or elevated BNP*) or post-MI with LVEF ≤ 40% with symptoms of HF or who have DM
- Hydralazine/isosorbide dinitrate: Initiate/titrated in African American patients NYHA class III-IV on standard medical therapy including ACEI/ARB or ARNI, and BB; consider in all patients who cannot tolerate an ACEI/ARB or ARNI unless contraindicated.
- Diuretic: initiate/titrated in patients with fluid retention.
- Ivabradine: if sinus rhythm, HR >70 bpm on maximally tolerated beta blocker, NYHA II-III, and no contraindications
- Digoxin for NYHA III-IV symptoms despite optimal GMT and/or rate control for atrial fib.
- Dapagliflozin (ie SGLT-2i) should be considered as adjunctive therapy, to reduce CV death and worsening HF, even in absence of Type 2 diabetes, unless contraindicated, and after considering potential incremental cost to patient
- Anticoagulation indicated if atrial fibrillation present. Choice of agent should be individualized. Routine anticoagulation for heart failure without atrial fibrillation is not indicated.
- Antiplatelet therapy: as indicated
- Lipid-lowering therapy: as indicated

**For patients with HFpEF:**

- Focus on treating volume overload (diuretics, salt restriction) and effectively managing their comorbidities.
- Mineralocorticoid receptor antagonists may be helpful in HFpEF.
- Consider use of SGLT-2i (GFR >30) or GLP-1 Agonists if SGLT-2i contraindicated.
- Avoid nitrates.
## Considerations for Patients with Co-existing Type 2 Diabetes

- **Metformin** remains first line therapy for diabetes (if GFR > 30).
- **SGLT-2i** (dapagliflozin, canagliflozin, empagliflozin) are preferred in HFrEF when additional therapy required, unless contraindicated/cautions (Type 1 DM, symptomatic hypotension or SBP <95 mmHg, GFR <30, prior/high risk for DKA, risk of foot amputation (ulcer, PVD, neuropathy, deformity), recurrent UTI’s/genital mycotic infections).
- Thiazolidinendiones (pioglitazone, rosiglitazone) are contraindicated.
- GLP-1 receptor antagonists (exenatide, semaglutide, dulaglutide, liraglutide) can be used if SGLT-2 inhibitors are contraindicated. Contraindications to GLP-1 RA include personal/fam hx of medullary thyroid cancer, MEN Type 2, pancreatitis, gastroparesis, GFR <30. (perhaps remove)
- DPP-4 inhibitors (linagliptin, sitagliptin, alogliptin) should be used cautiously in all patients who have diagnosis. Saxagliptin should not be used. (perhaps remove)

## Immunizations

- Pneumococcal vaccination (PPSV-23 and possibly PV-13) and annual influenza vaccination in the absence of known contraindications. For telemedicine visits, can be ordered and subsequently administered in office or at local pharmacy.

## Device Therapy

- Remote monitoring of BP, pulse, weight, possibly 02 sat.
- Consider EP referral for primary ICD or CRT in patients with:
  - EF ≤ 35% for at least 90 days (or 40 days post MI) on chronic GDMT.

## Escalation Pathway

- **Primary Care**: Every patient should have a primary care physician (Patients should be seen at least quarterly by PCP or Cardiologist.)
- **Cardiology**: All new diagnoses of heart failure, assistance desired with GDMT, including replacement of ACEI/ARB w ARNI, and/or other significant co-existing cardiac disorders
- **Advanced Heart Failure**: Refer patients if refractory symptoms or end stage heart failure, (acronym "I-NEED_HELP")
- **Cardiac Rehabilitation**: If stable HFrEF, EF <35%, NYHA III-IV despite 6 weeks of HF therapy.

## Other Referrals to Consider

- **Sleep Medicine Referral**: If coexisting obstructive sleep apnea.
- **Care Management referral**: frequent ED visits and hospitalizations, multiple no-shows, non-adherence to treatment plan, complex psychosocial issues impacting care, difficulty accessing community resources
- **Pharmacist referral**: uncontrolled HF, non-adherence to medications, polypharmacy, poorly controlled comorbid diseases, med reconciliation
- **Home Health referral**: particularly for recently discharged, vulnerable HF patients
- **Behavioral Health referral**: active psychiatric disorders adversely impacting heart failure care, not manageable in primary care setting
- **Wellness Coaches (CDE)**: for patients with co-existing diabetes
- **Remote patient monitoring for select patients**: Connected Hearts Program and Cardiomems
- **Palliative Care referral**: for NYHA III-IV with frequent admissions, significant anxiety and depression, and assistance with decision-making regarding advanced therapies (LVAD, transplant, home ionotropic therapy)

## Patient Education

- Provide patient/family with the heart failure education booklet, "Managing Your Heart Health", and other general information about heart failure.
- Technique to measure and record blood pressure, pulse, weight, 02 sat at home
- How to record and transmit cardiac rhythm, for those with afib/flutter. (KardiaMobile)
- How to access mychart and any desired clinical apps

## Diet/Fluids

- Limit salt intake to < 3 grams/day
- Other diets as indicated
- Fluid restriction <2 L/day (6-8 glasses) for patients with moderate hyponatremia (serum sodium <130 mEq/L) and should be considered in other patients to assist in treatment of fluid overload
### Subsequent Follow-Up Visits

#### Provider History
- NYHA Class (I-IV)
- Document etiology of heart failure
- Interval history including recent ED visits, hospitalization, weight changes, new/worsening HF symptoms
- Reassessment of status of medical comorbidities
- Complete medication review and assessment of compliance
- Determine if Healthcare Proxy form has been completed previously

#### Provider Physical
- BP, pulse, weight, BMI, possibly o2 sat
- Assessment of volume status
- Cardiac exam (especially JVD, hepatojugular reflex, and presence of S3)
  - Telemedicine consideration: “edema check”: (“PLACE YOUR FINGERS WHERE YOU HAVE SWELLING ON YOUR LOWER LEG, PUSH DOWN HARD AND REMOVE, DO YOU SEE AN INDENTATION? IF YES, HOW DEEP IS THAT INDENTATION”

#### Diagnostic Studies
1. **Lab work as necessary:**
   - BMP: check 1-2 weeks after dose titration of ACEI/ARB or spironolactone/eplerenone.
   - Magnesium: if on diuretic, check at same interval as BMP
   - BNP or NT-proBNP if volume status unclear
   - Digoxin level, if signs of toxicity or recent addition of interacting drug
   - PT/INR (Every patient on warfarin should be enrolled in an anticoagulation clinic or have their PT/INR followed closely by a designated provider)

2. **Procedures:**
   - Repeat echo if significant change in clinical status, recent clinical event, on GDMT that may significantly affect cardiac function, or may be candidates for device therapy
   - Consider cardiac MRI if cause of HFpEF or RHF unclear

Telemedicine consideration
- When possible, get blood tests done ~ 1 week prior to virtual visit, either at office, local phlebotomy center (Labcorp/Quest) or have blood drawn at home (Apex Lab)
- Results of home cardiac rhythm monitoring (KardiaMobile) can be transmitted to practice in advance of visit
- Patient should upload results of home monitoring into Epic or fax to office prior to visit
- When available, staff can outreach out to patient in advance of visit to collect needed information

#### Medical Therapy
**For patients with heart failure with HFrEF:**
**Escalate treatment in stepwise manner. Titrate to target dose as per GDMT.**
If the patient is hemodynamically stable, it is generally acceptable to double the dose of the neurohormonal antagonist (BB, ACEI/ARB, MRA, ARNI) when increasing the dose. It is recommended that only one neurohormonal antagonist be increased at each visit. Caution is advised if increasing more than one.

**By end of Visit #2, each patient should be on both a beta-blocker and either an ACEI or an ARB.**
**Document contraindications or intolerance**

- ACEI/ARB: initiate/titrte to target dose, document contraindications/ intolerance.
- Consider Entresto for patients with NYHA class II-III and LVEF ≤ 35% who are stable on an ACEI/ARB.
- Beta blocker: initiate/titrte using either carvedilol, sustained-release metoprolol succinate, or bisoprolol
- Aldosterone antagonist: initiate/titrate if not contraindicated (GFR >30 ml/min, K <5.0 mEq/ml) and NYHA class II-IV HF with LVEF ≤ 35% *(NYHA Class II should have hx of prior CV hospitalization or elevated BNP)* or post-MI with LVEF ≤40% with symptoms of HF or who have DM
- Hydralazine/isosorbide dinitrate: Initiate/titrate in African American patients, NYHA class III-IV on standard medical therapy including ACEI or ARNI, and BB; consider in all patients who cannot tolerate an ACEI/ARB or ARNI unless contraindicated.
- Diuretic: initiate/titrate in patients with fluid retention.
- Ivabradine: if sinus rhythm, HR >70 bpm on maximally tolerated beta blocker, NYHA II-III, and no contraindications
- Digoxin for NYHA III-IV symptoms despite optimal GDMT and/or rate control for atrial fib.
- Dapagliflozin should be considered as adjunctive therapy, to reduce CV death and worsening HF, even in the absence of diabetes, unless contraindicated and after considering incremental cost to the patient.
- Anticoagulation: For atrial fibrillation, the choice of agent should be individualized. Routine anticoagulation for HF without atrial fibrillation is not indicated.
- Antiplatelet therapy: as indicated
- Lipid-lowering therapy: as indicated

**For Patients with HFrEF**
- Continue to treat any volume overload (diuretics, salt restriction) and optimize control of comorbid medical disorders
- Consider the addition of MRA.
- Consider use of SGLT-2i (GFR >30) or GLP-1 Agonists if SGLT-2i contraindicated.
- Avoid nitrates.

**Considerations for Patients with Co-existing Type 2 Diabetes**
- Metformin remains first line therapy for diabetes (if GFR >30).
- SGLT-2i’s (dapagliflozin, canagliflozin, empagliflozin) are preferred in HFrEF when additional therapy required, unless contraindicated/cautions *(Type 1 DM, symptomatic hypotension or SBP <95 mmHg, GFR <30, prior/high risk for DKA, risk of foot amputation (ulcer, PVD, neuropathy, deformity), recurrent UTI/genital mycotic infections)*.
- Thiazolidinendiones (pioglitazone, rosiglitazone) are contraindicated.
- GLP-1 receptor antagonists (exenatide, semaglutide, dulaglutide, liraglutide) can be used if SGLT-2i are contraindicated. Contraindications to GLP-1 RA include personal/fam hx of medullary thyroid cancer, MEN Type 2, pancreatitis, gastroparesis, GFR <30.
- DPP-4 inhibitors (linagliptin, sitagliptin, alogliptin) should be used cautiously in all patients who have diagnosis. Saxagliptin should not be used.

**Immunizations**
- Pneumococcal vaccination (PV23 and possibly, PV 13) and annual influenza vaccination in the absence of known contraindications. For telemedicine visits, can be ordered and subsequently administered in office or at local pharmacy.

**Device Therapy**
- Remote monitoring of BP, pulse, weight, and possibly 02 sat
- Consider EP referral for primary ICD or CRT in patients with:
  - EF ≤ 35% for at least 90 days (or 40 days post MI) on chronic GDMT.

**Escalation Pathway**
- Primary Care: Every patient should have a primary care physician (Patients should be seen at least quarterly by PCP or Cardiologist.)
- Cardiology: All new diagnoses of heart failure, assistance desired with GDMT, including replacement of ACEI/ARB w ARNI, and/or other significant co-existing cardiac disorders
- Advanced Heart Failure: Refer patients if refractory symptoms or end stage heart failure, acronym “I-NEED_HELP”
- Cardiac Rehabilitation: If stable HFrEF, EF <35%, NYHA III-IV despite 6 weeks of HF therapy.

**Other Referrals to Consider**
- Sleep Medicine Referral for coexisting obstructive sleep apnea
- Care Management referral: frequent ED visits and hospitalizations, multiple no shows, non-adherence to treatment plan, complex psychosocial issues impacting care, difficulty accessing community resources
- Pharmacist referral (if available): uncontrolled HF, non-adherence to medications, polypharmacy, poorly controlled comorbid diseases, med reconciliation
- Home Health referral: particularly for recently discharged, vulnerable HF patients
- Behavioral Health referral: active psychiatric disorders adversely impacting heart failure care not manageable in primary care setting
- Wellness Coaches (CDE): for patients with co-existing diabetes
- Remote patient monitoring for select patients: Connected Hearts Program and Cardiomems
- Palliative Care referral for NYHA III-IV with frequent admissions, significant anxiety and depression, and assistance with decision-making regarding advanced therapies (LVAD, transplant, home, ionotropic therapy)

| Patient Education | Review recommendations, assess knowledge, treatment adherence; identify/address barriers, needs of patient/ family  
| Diet/Fluids | Emphasize the importance of daily weights  
| | Assess dietary compliance  
| | Assess adherence to fluid restriction, as indicated |