Heart failure:
Managing risk and improving patient outcomes
Heart failure increases hospitalization

Heart failure is the most common medical reason for hospitalization and the most costly diagnosis among Medicare patients.¹

**FIGURE 1.** Annual hospital admissions for common Medicare diagnoses¹

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart failure</td>
<td>400,000</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>300,000</td>
</tr>
<tr>
<td>COPD</td>
<td>200,000</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>100,000</td>
</tr>
<tr>
<td>Acute MI</td>
<td>0</td>
</tr>
</tbody>
</table>

More than 16% of Pennsylvania residents over age 65 have heart failure (HF).²

**FIGURE 2.** Treating heart failure is expensive. Total medical costs of HF topped $31 billion in 2012, and are expected to exceed $70 billion by 2030.³

Direct medical costs = $21 billion

Indirect medical costs = $10 billion

- Hospitalization: 54%
- Morbidity: 18%
- Mortality: 14%
- Outpatient: 14%
Heart failure is progressive

Optimal management is based on stage and ejection fraction (EF):

<table>
<thead>
<tr>
<th>Heart failure with reduced ejection fraction (HF(r)EF)</th>
<th>≤ 40% EF</th>
<th>systolic HF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart failure with preserved ejection fraction (HF(p)EF)</td>
<td>≥ 50% EF</td>
<td>diastolic HF</td>
</tr>
</tbody>
</table>

**FIGURE 3.** Stages of heart failure guide appropriate management strategy.⁴

<table>
<thead>
<tr>
<th>STAGE</th>
<th>DESCRIPTION</th>
<th>GOAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAGE A</td>
<td>At risk for developing HF</td>
<td>Prevent HF by treating risk factors.</td>
</tr>
<tr>
<td>STAGE B</td>
<td>Asymptomatic with structural heart disease*</td>
<td>Treat with beta blockers and ACE inhibitors or ARBs† to prevent progression to HF in patients with reduced EF.</td>
</tr>
<tr>
<td>STAGE C</td>
<td>Symptomatic prior or current symptoms of HF</td>
<td>Use evidence-based treatments to reduce symptoms and improve outcomes.</td>
</tr>
<tr>
<td>STAGE D</td>
<td>Refractory or advanced HF</td>
<td>Refer to specialists for advanced therapies when indicated and discuss goal-directed care with patients.</td>
</tr>
</tbody>
</table>

Source: American College of Cardiology Foundation and American Heart Association

* **Structural heart disease**: left ventricular (LV) hypertrophy, LV dysfunction, prior myocardial infarction, or valvular disease
† **ACE**: Angiotensin-converting enzyme; **ARB**: Angiotensin receptor blocker
Recognize and treat HF risk factors

**FIGURE 4.** Risk factors for developing heart failure

<table>
<thead>
<tr>
<th>Condition</th>
<th>Hazard Ratio for developing HF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary heart disease</td>
<td>4.1</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3.5</td>
</tr>
<tr>
<td>LV hypertrophy</td>
<td>3.2</td>
</tr>
<tr>
<td>Valvular disease</td>
<td>2.7</td>
</tr>
<tr>
<td>Treated hypertension</td>
<td>2.3</td>
</tr>
<tr>
<td>Currently smoking</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Treat modifiable risk factors:
- comorbid conditions (e.g., coronary heart disease, hypertension, diabetes)
- behaviors (e.g., smoking, lack of physical activity, diet with excessive calories and/or salt)

**FIGURE 5.** Treating blood pressure over 150 mmHg systolic resulted in a 64% decrease in HF in older patients.
STAGE B: Asymptomatic patients with structural heart disease

Managing comorbidities benefits asymptomatic patients

Patients with **reduced EF** require treatment:

- Begin with an ACE inhibitor.

**FIGURE 6.** An ACE inhibitor reduces the risk of progression to HF or death in patients with low EF (<35%) by 29%.

![Graph showing risk reduction with enalapril compared to placebo](image)

- Use an ARB for patients who cannot tolerate an ACE inhibitor.

- Beta blockers also slow progression to HF by 14%.
Symptomatic patients: Self care is critical

- monitoring signs and symptoms of HF (e.g., daily weights)
- limiting sodium
- exercising as tolerated (independently or in a cardiac rehabilitation program)
- adhering to the prescribed regimen

**FIGURE 7. Algorithm for pharmacologic treatment in HF with reduced EF**

* Trials enrolled patients with symptoms, but current guidelines recommend the use of beta blockers in most HF patients.

Titr 

Titr **ACE inhibitors and beta blockers to maximally tolerated dose to achieve the greatest mortality benefit.**

Even a low dose of these drugs is better than no dose.
# The quality of evidence varies by drug

### TABLE 1. Evidence summary for pharmacologic treatment of HF

<table>
<thead>
<tr>
<th>Medication</th>
<th>Efficacy</th>
<th>Target dose</th>
<th>Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACE inhibitor or ARB†</strong></td>
<td><img src="#" alt="red" /></td>
<td>highest tolerated dose while maintaining adequate BP</td>
<td>serum potassium; renal function</td>
</tr>
<tr>
<td><strong>beta blocker</strong> (bisprolol, carvedilol, metoprolol XL)</td>
<td><img src="#" alt="red" /></td>
<td>highest dose tolerated for heart rate</td>
<td>heart rate</td>
</tr>
<tr>
<td><strong>diuretics</strong> (bumetanide, furosemide, torsemide)</td>
<td><img src="#" alt="red" /></td>
<td>as needed for symptom control</td>
<td>volume status; serum potassium; renal function</td>
</tr>
<tr>
<td><strong>aldosterone antagonist</strong> (spironolactone, eplerenone)</td>
<td><img src="#" alt="red" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>sacubitril / valsartan</strong></td>
<td><img src="#" alt="red" /></td>
<td>highest tolerated dose while maintaining adequate BP</td>
<td>serum potassium</td>
</tr>
<tr>
<td><strong>hydralazine / isosorbide dinitrate</strong></td>
<td><img src="#" alt="red" /></td>
<td>highest tolerated dose while maintaining adequate BP</td>
<td></td>
</tr>
<tr>
<td><strong>digoxin</strong></td>
<td><img src="#" alt="red" /></td>
<td>use lower doses in older patients</td>
<td>renal function; digoxin level</td>
</tr>
<tr>
<td><strong>ivabradine</strong></td>
<td><img src="#" alt="red" /></td>
<td>highest tolerated dose for heart rate</td>
<td>heart rate</td>
</tr>
</tbody>
</table>

* rEF = reduced EF, systolic HF  ** pEF = preserved EF, diastolic HF  † Use ACE inhibitors before using an ARB.

- Reduces mortality and hospitalization
- Reduces mortality and hospitalization in African Americans
- No reduction in mortality or hospitalization
- No data available
- Reduces hospitalization but not mortality

### Other treatment options for patients with heart failure with reduced ejection fraction:

- Implantable cardioverter defibrillators (ICDs) improve survival in symptomatic HF patients and asymptomatic patients who are post myocardial infarction (MI).¹¹
- In HF patients with prolonged QRS, cardiac resynchronization therapy (CRT) increases survival up to 36%.¹²
New treatment options for symptomatic patients with reduced EF ($rEF$)

Sacubitril / valsartan

**FIGURE 8.** In PARADIGM-HF, sacubitril / valsartan reduced mortality and hospitalization.$^{13}$

For patients with reduced EF who continue to be symptomatic on optimal medical therapy, sacubitril / valsartan replaces the ACE inhibitor or ARB.

Ivabradine

**FIGURE 9.** In SHIFT, ivabradine decreased hospitalization for worsening HF.

Ivabradine is limited to patients on maximally tolerated beta blocker therapy with heart rates > 70.$^{14}$

Managing patients with preserved EF ($pEF$)

- Treat hypertension.
- Use diuretics to control symptoms:
  Monitor for hypovolemia and hypotension. Patients with preserved EF may be more sensitive to diuretics and dihydropyridine calcium channel blockers (e.g., amlodipine, nifedipine) than patients with reduced EF.
- Control heart rate in patients with atrial fibrillation.
- Treat symptomatic ischemic heart disease.
Weigh risks and benefits of advanced therapy: Discuss goals of care

Half of patients admitted for HF are rehospitalized within 6 months.\textsuperscript{15}

Advanced or refractory HF care should focus on quality of life:

- determine if mechanical circulatory support is an option
- reduce time in the hospital
- review end of life goals when appropriate
- discuss palliative care if indicated

Options for advanced therapy include:

- continuous infusion inotropes
- left ventricular assist device
- heart transplant

**FIGURE 10.** More patients have been using hospice rather than hospital at the end of life. However, a growing proportion of hospitalized patients were in the ICU.\textsuperscript{16}
FIGURE 11. Cost of a 30-day supply of medications used in managing heart failure

Prices from goodrx.com, November 2015. Listed doses are based on Defined Daily Doses by the World Health Organization, and should not be used for dosing in all patients.
Key messages

- Identify risk factors for heart failure such as hypertension, diabetes, and atrial fibrillation and treat them to prevent or delay the development of heart failure.

- In HF with reduced EF, titrate beta blockers and either ACE inhibitors or ARBs to doses used in studies, or the maximally tolerated dose.

- Patients who have symptomatic HF with reduced EF even when on an ACE inhibitor or ARB may be candidates for sacubitril/valsartan (Entresto) to replace their ACE inhibitor or ARB.

- In HF with preserved EF, treat hypertension and manage other comorbidities to control symptoms.

- Diuretics are useful to maintain fluid balance in patients who have HF with both preserved and reduced EF.

- After HF hospitalization, address possible medication non-adherence, review weight goals, and reinforce salt or fluid restriction.

- Discuss goals of care and advance directives for patients with severe, end-stage HF.

References:


Visit alosafoundation.org/modules/heartfailure for links to additional resources and a longer evidence document.
About this publication

These are general recommendations only; specific clinical decisions should be made by the treating physician based on an individual patient’s clinical condition. More detailed information on this topic is provided in a longer evidence document at alosafoundation.org.

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