



Relevance to Population: Heart failure (HF) is a major public health problem in the United States. According to 2010 statistics, approximately 5.1 million people in this country have heart failure and this number is expected to increase 25% by the year 2030. Heart failure is the primary cause of more than 56,000 deaths each year and is mentioned as a contributing cause in more than 275,000 deaths. Survival after heart failure diagnosis has improved over time; however, 50% of people diagnosed with heart failure die within five years. In 2010 there were 1,023,000 hospitalizations and 1,801,000 physician office visits for HF. In 2009, there were 668,000 ER visits with heart failure. In 2010, the estimated total cost of heart failure in the United States was \$39.2 billion, representing 1-2% of all health care expenditures. The cost is expected to increase 120% to a total of \$70 billion by the year 2030. ¹

Population Covered by Guideline: All members with the diagnosis of Heart Failure with left ventricular systolic dysfunction.

Clinical Indicators Measured by Piedmont WellStar HealthPlans, Inc.:

(Source: (ACCF/AHA/AMA-PCPI 2011 Performance Measure for Adults with Heart Failure)²

1. LVEF Assessment: Percentage of patients aged ≥18 y with a diagnosis of HF for whom the quantitative or qualitative results of a recent or prior (any time in the past) LVEF assessment is documented within a 12-mo period.
2. ACE inhibitor or ARB therapy for LVSD (outpatient and inpatient setting): Percentage of patients aged ≥18 y with a diagnosis of HF with a current or prior LVEF of <40% who were prescribed ACE inhibitor or ARB therapy either within a 12-mo period when seen in the outpatient setting or at hospital discharge.

Definition: Heart failure is a complex clinical syndrome that results from any structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or eject blood.

Classification Systems:

- Functional Limitation (symptom-based): New York Heart Association (NYHA) and American Heart Association/American College of Cardiology (AHA/ACC) Classification of Functional Capacity: ³

ACC/AHA Stage		NYHA Functional Class	
Stage	Description	Class	Description
A	Patients at high risk of developing HF because of the presence of conditions strongly associated with the development of HF, but with no identified structural or functional abnormalities of the pericardium, myocardium, or cardiac valves and have never shown signs or symptoms of HF.	No comparable functional class	
B	Patients who have developed structural heart disease that is strongly associated with the development of HF but who have never shown signs or symptoms of HF.	I (Mild)	No limitation of activities; no symptoms from ordinary activities.
C	Patients who have current or prior symptoms of HF associated with underlying structural heart disease.	II (Mild)	Slight limitation of activity; comfortable at rest, but ordinary activity causes symptoms.
		III (Moderate)	Marked limitation of activity; comfortable at rest, but mild ordinary activity causes symptoms.
D	Patients with advanced structural heart disease and marked symptoms of HF at rest despite maximal medical therapy and who require specialized interventions.	IV (Severe)	Cardiac insufficiency symptoms at rest and worse with any physical activity.

Heart Failure Management:

The current ACC/AHA Guideline Update for the Diagnosis and Management of Chronic Heart Failure in the Adult is available at <http://www.sciencedirect.com/science/article/pii/S0735109708038023>.

Heart Muscle Function:

Weakening of the heart muscle most often causes heart failure. However, abnormal stiffening of the heart muscle is also a common cause. Diseases that predispose to heart failure include hypertension, myocardial infarction, diabetes mellitus, atrial fibrillation, and health style concerns, such as smoking and obesity. In some patients, the heart weakens without evident cause.⁴

- Systolic HF – Low left ventricular ejection fraction (LVEF) < 40% (usually associated with decreased myocardial contractility, decreased cardiac output and dilated left ventricular cavity)
- Diastolic HF – Normal LVEF > 40% (usually with normal myocardial contractility, but impaired filling of the left ventricle)

Goals of Heart Failure Management:

- Prevent daily symptoms and recurrent exacerbation.
- Maximize activity level.
- Minimize the need for acute services (ED/urgent care visits, hospitalization).
- Provide optimal pharmacotherapy with minimal or no side effects.
- Engage heart failure patients to become actively involved in self-care management of their conditions.

Heart Failure Diagnosis:

- Initial measurement of complete blood count, fasting blood sugar, glycohemoglobin, urinalysis, serum electrolytes (including calcium and magnesium), blood urea nitrogen, serum creatinine, blood lipids, liver function tests, and thyroid function tests, especially thyroid-stimulating hormone. Serial monitoring of serum electrolytes and renal function may be indicated.
- Serum ferritin level and transferrin saturation to detect hemochromatosis – if clinically appropriate.
- Initial 12-lead electrocardiogram and chest radiograph.
- Initial 2-dimensional echocardiography with Doppler flow studies or radionuclide ventriculography to assess left ventricular systolic function.
- Cardiac catheterization with coronary arteriography in patients with angina or significant ischemia who are candidates for revascularization.
- Use of Plasma Brain Natriuretic Peptide (BNP) in HF:
 - Combined with clinical evaluation, plasma BNP may be used to differentiate dyspnea due to HF from dyspnea due to other causes.
 - BNP elevation supports a diagnosis of HF, but alone is not diagnostic.
 - BNP may be elevated without HF, especially in women and people over 60 years old.
 - Measurement of BNP and NT-pro BNP can be useful in risk stratification of HF patients
 - Marked elevations of BNP levels in patients hospitalized for HF may predict higher risk for rehospitalization and death.
 - Use of serial BNP levels to titrate HF medications has not proven more effective than clinical titration to target doses.

General Therapy:

- Establish baseline or dry weight and monitor daily weight
- Establish and monitor daily fluid intake limits
- Define and quantify the daily amount of salt (sodium) allowed in the diet

- Identify and treat thyroid disorders
- Consider evaluation for sleep disordered breathing if there is clinical suspicion and/or if the patient does not respond or deteriorates with standard treatment
- Identify and manage underlying coronary artery disease
- Risk factor reduction:
 - Identify and maintain control of hypertension (systolic and diastolic values)
 - Identify and treat lipid disorders
 - Identify and control underlying diabetes
 - Identify tobacco use and provide smoking cessation counseling
- Identify alcohol and/or illegal drug use, and stress avoidance and provide cessation counseling
- Stress the importance of a regular exercise program
- Annual influenza vaccines
- Pneumococcal vaccine with revaccination once ≥ 5 years after the 1st dose
- Consider cardiologist consultation/referral in patients with refractory Class II-IV HF despite adequate treatment

Pharmacotherapy:

- Renin angiotensin inhibition:
 - ACE Inhibitors (ACE-I)
 - Indication: NYHA Class I-IV systolic heart failure (LVEF < 40%); ACC/AHA Stages B, C, D (also Stage A to prevent HF in patients at risk for HF who have a history of atherosclerotic vascular disease, diabetes, or hypertension with associated risk factors)
 - Outcomes:
 - Significant reductions in mortality, CV death, and CHF hospitalizations
 - Improved LV function, symptoms, and survival^{5,6}
 - Treat and titrate appropriately unless contraindicated or not tolerated
 - Angiotensin receptor blockers (ARBs)
 - Indications: NYHA Class I-IV systolic heart failure (LVEF < 40%); ACC/AHA Stages B, C, D (also Stage A [if ACE not tolerated]) to prevent HF in patients at risk for HF who have a history of atherosclerotic vascular disease, diabetes, or hypertension with associated risk factors).
 - Outcomes: (A class effect cannot be assumed for all ARBs)⁷
 - Losartan is comparable, but not superior to captopril⁸
 - Candesartan showed significant reductions in all cause and CV mortality, improved LV function and decreased heart failure hospitalizations
 - Candesartan is a good alternative to an ACE-I (decreased CV death or CHF hospitalizations - RRR 23%; NNT = 14)⁹
 - Candesartan beneficial in CHF with preserved LV function (decreased CV death or CHF hospitalizations - RRR 11%; NNT = 43)¹⁰
 - Dual ACE-I and ARB Therapy for Systolic Heart Failure is not routinely recommended.
 - Current available data do not support routine ACE-I + ARB therapy in heart failure

patients due to lack of consistent survival benefit and increase in adverse effects^{11,12,13,14}

- Aldosterone Antagonists
 - Indication: NYHA Class III-IV; ACC/AHA Stages C and D, unless contraindicated
 - Outcomes:
 - Spironolactone has been shown to decrease mortality in patients with NYHA Class III-IV congestive heart failure and should be considered in such patients with serum creatinine levels < 2.0-2.5 without recent worsening and serum K⁺ < 5.0.^{3,15}
 - Eplerenone reduced all-cause mortality and sudden cardiac death in patients with heart failure post MI.¹⁶
- Hydralazine/Nitrate combinations:
 - In African Americans with systolic heart failure, consider the hydralazine/nitrate combination in addition to other conventional first-line therapy (ACE-I/ARB, beta-blocker, spironolactone, diuretics); 43% improved survival in the African American Heart Failure Trial¹⁷
 - Indication: NYHA Class III-IV; ACC/AHA Stages C and D – in African Americans, in addition to ACE/ARB and beta-blocker, unless contraindicated
 - If ACE-I/ARB therapy cannot be used due to contraindication or intolerance, consider use of the hydralazine/nitrate combination in any patient with systolic heart failure.
 - Indication: NYHA Class III-IV; ACC/AHA Stages C and D – in all other systolic HF patients if they have persistent symptoms despite taking an ACE/ARB and beta-blocker or they cannot take an ACE/ARB due to drug intolerance.
- Beta-blocker therapy:
 - Indications: NYHA Class I-IV systolic heart failure (LVEF < 40%); ACC/AHA Stages B, C, D
 - Outcomes:
 - Carvedilol – 65% reduction in all-cause mortality, 63% reduction in heart-related mortality, and 27% decrease in heart-related hospitalizations^{18,19}
 - Metoprolol ER – 34% reduction all-cause mortality, 38% reduction heart-related mortality, and 19.8% decrease in heart-related hospitalizations²⁰
 - Bisoprolol – 33% reduction all-cause mortality, 29% reduction heart-related mortality, and 30% in heart failure hospitalizations¹¹
 - Bucindolol – less effect with 8.5% reduction all-cause mortality, 12.5% reduction heart-related mortality, and 16.7% decrease in heart-related hospitalizations²¹
- Digoxin:
 - Indications: NYHA Class III-IV systolic heart failure (LVEF < 40%); ACC/AHA Stages C and D
 - Outcomes:
 - Digoxin prevented clinical deterioration and hospitalizations, improved exercise tolerance, and LV function, but had no survival benefits^{22,23}
 - Digoxin was most beneficial in patients with LVEF ≤ 25%²⁴
 - Digoxin should be used in all patients with severe systolic heart failure in conjunction with diuretics, ACE-I/ARB, beta-blockers, and spironolactone^{3,25}
 - Digoxin should be added to therapy in mild to moderate systolic heart failure if there



has been inadequate response to treatment

- Digoxin may have deleterious effects (increased myocardial O₂ consumption, peripheral/coronary vasoconstriction, ventricular arrhythmias, increase infarct size^{26,27,28})
 - There is insufficient evidence to recommend Digoxin for diastolic heart failure
 - Lower dosages of Digoxin appear to be as effective as higher dosages and are associated with fewer side-effects¹⁹
 - The dose of Digoxin should be based on lean body mass, renal function, and concomitant medications; the dose should be 0.125mg in the majority of patients and the Digoxin level should be < 1.0 mg/ml²⁹
- Coumadin Anticoagulation:
 - Indication: Should be considered for atrial fibrillation, left ventricular thrombus, and systemic or pulmonary embolization
 - Without other indications, the target INR is 2.0-3.0

Pharmacotherapy Treatment Summary for Systolic Heart Failure by Stage					
ACC/AHA Class	Stage A High-risk; No symptoms	Stage B Structural disease; No	Stage C Structural disease; Current or previous symptoms		Stage D Structural disease; Refractory
NYHA Class	-	I (mild)	II (mod)	III (mod)	IV (severe)
ACE/ARB	√*	√	√	√	√
Beta-blocker		√	√	√	√
Diuretic			√	√	√
Hydralazine/nitrate				√	√
Aldosterone antagonist				√	√
Digoxin				√	√

*ACE (or ARB if ACE not tolerated) can be used to prevent HF in patients at risk for HF who have a history of atherosclerotic vascular disease, diabetes, or hypertension with associated risk factors.

Cardiac Resynchronization Therapy (CRT) or biventricular pacing (synchronized right and left ventricular pacing):

Prolongation of interventricular and intraventricular conduction causes mechanical delay within the left ventricle, which further reduces ventricular contractility, results in functional mitral regurgitation, adverse remodeling and left ventricular dilatation. In appropriate patients, biventricular pacing, known as cardiac resynchronization therapy, can reduce the electromechanical delay, improve systolic function, and reduce heart failure symptoms. Current guidelines recommend referral for this procedure in patients with left ventricular ejection fraction ≤ 35% despite 3 months of treatment with recommended heart failure medications. Patients who cannot tolerate heart failure medications because of side effects or low blood pressure but who otherwise meet criteria for the procedure should also be considered. In addition, patients who require a defibrillator or pacemaker for other rhythm disturbances, such as ventricular tachycardia or sinus bradycardia, and meet the criteria for resynchronization should be considered even if they have not received a full 3 months of guideline-directed medical therapy (GDMT). [In view of the advances in medical therapy the term “guideline-directed medical therapy” will replace “optimal medical therapy” in all future ACCF/AHA guidelines.]³⁰

Patients with unfavorable coronary sinus anatomy often cannot have a CRT properly placed adjacent to the posterolateral wall of the LV. A study comparison by Giraldi et al suggests that in such patients, a mini-

thoracotomy allows for proper lead placement. These patients had improved outcomes in terms of improved EF and decreased end-systolic volume.³⁰

Recommendations for CRT in patients with systolic heart failure include:³⁰

Class I

1. CRT is indicated for patients who have LVEF $\leq 35\%$, sinus rhythm, left bundle branch block (LBBB) with QRS duration ≥ 150 ms, and NYHA Class II, III or ambulatory IV symptoms on GDMT. (level of evidence: A for NYHA Class III/IV; level of evidence: B for NYHA Class II)

Class IIa

1. CRT can be useful for patients who have LVEF $\leq 35\%$, sinus rhythm, LBBB with QRS 120-149 ms, and NYHA Class II, III or ambulatory IV symptoms on GDMT. (level of evidence: B)
2. CRT can be useful for patients who have LVEF $\leq 35\%$, sinus rhythm, a non-LBBB pattern with QRS duration ≥ 150 ms, and NYHA Class III or ambulatory Class IV symptoms on GDMT. (level of evidence: A)
3. CRT can be useful in patients with atrial fibrillation and LVEF $\leq 35\%$, on GDMT if a) the patient requires ventricular pacing or otherwise meets CRT criteria and b) AV nodal ablation or pharmacologic rate control will allow near 100% ventricular pacing with CRT. (level of evidence: B)
4. CRT can be useful for patients on GDMT who have LVEF $\leq 35\%$ and are undergoing new or replacement device placement with anticipated requirement for significant ventricular pacing. (level of evidence: C)

Class IIb

1. CRT may be considered for patients who have LVEF $\leq 30\%$, ischemic etiology of heart failure, sinus rhythm, LBBB with QRS duration ≥ 150 ms and NYHA Class I symptoms on GDMT. (level of evidence: C)
2. CRT may be considered for patients who have LVEF $\leq 35\%$, sinus rhythm, a non-LBBB pattern with QRS duration 120-149 ms, and NYHA, Class III or ambulatory Class IV symptoms on GDMT. (level of evidence: B)
3. CRT may be considered for patients who have LVEF $\leq 35\%$, sinus rhythm, a non-LBBB pattern with QRS duration ≥ 150 ms, and NYHA, Class II on GDMT. (level of evidence: B)

Class III: No Benefit

1. CRT is not recommended for patients with NYHA Class I or II symptoms and non-LBBB pattern with QRS < 150 ms. (level of evidence: B)
2. CRT is not indicated for patients whose comorbidities and/or frailty limit survival with good functional capacity to less than 1 year. (level of evidence: C)

Functional benefits of CRT:

- Increased 6 minute walking distance
- Increased health-related quality of life scores
- Increased peak oxygen consumption
- Relative risk reduction of 40%-50% in heart failure hospitalization and mortality (this benefit is independent of advanced age or gender)
- 66% to 75% improvement of at least 1 New York Heart Association functional classification.

****Most patients who are eligible for CRT also meet criteria for Implantable Cardioverter Defibrillator (ICD) implantation.***

Recommendations for Implantable Cardioverter Defibrillators (ICD):³⁰

Class I

1. ICD therapy is indicated in patients with LVEF $\leq 35\%$ due to prior MI who are at least 40 days post-MI and are in NYHA functional Class II or III. (level of evidence: A)
2. ICD therapy is indicated in patients with non-ischemic DCM who have an LVEF $\leq 35\%$ and who are in NYHA functional Class II or III. (level of evidence: B)
3. ICD therapy is indicated in patients with LV dysfunction due to prior MI who are at least 40 days post-MI, have and LVEF $\leq 30\%$ and are in NYHA functional Class I. (level of evidence: A)

Class IIb

1. ICD therapy may be considered in patients with nonischemic heart disease who have an LVEF of $\leq 35\%$ and who are in NYHA functional Class I. (level of evidence: C)

Class III: No Benefit

1. ICD therapy is not indicated for patients who do not have a reasonable expectation of survival with an acceptable functional status for at least 1 year, even if they meet ICD implantation criteria specified in the recommendations above. (level of evidence: C)
2. ICD therapy is not indicated for NYHA Class IV patients with drug-refractory congestive heart failure who are not candidates for cardiac transplantation or CRT-D. (level of evidence: C)

Instructions and Treatment Plan for Patients: Engaging and motivating patients to actively participate in self- management of heart failure can increase patient confidence in managing their condition and is associated with a decrease in both heart failure and all-cause hospital admissions and readmissions, as well as significantly lower heart failure specific inpatient costs. Specifically it is important to encourage and help heart failure patients to:³¹

- Devise systems to help them remember to take their medications regularly and on time;
- Monitor routinely for early changes in signs and symptoms of heart failure;
- Understand and adhere to a 2-4 gram sodium diet;
- Avoid or limit alcoholic beverages to 1-2 drinks per day in men and 1 drink per day in women;
- Tailor a regular exercise program based on results of exercise testing, even in those with severe, symptomatic LV dysfunction, if currently stable and compensated;
- Maintain regular and timely physician visits;
- Quit smoking;
- Receive annual influenza immunization;
- Receive pneumonia immunization
- Engage in routine hand washing;
- Perform daily, effective dental hygiene and receive routine dental care.
- Importance of compliance with the treatment plan, even when there are no symptoms present

Patients with HF should be given verbal and written instructions regarding their treatment plan, including the following:

- Weighing themselves daily on the same scale at the same time of the day
 - If there is weight gain ≥ 2 pounds in 24 hours or ≥ 3 pounds in 48 hours instruct the patient to:
 - Call the physician or
 - Follow the predetermined diuretic rescue protocol in the written plan
- Indications and use for each of their medications along with a schedule for each dose

- Instructions to take all medications/dosages prescribed, even if symptom free
- Instructions to call their physician with any of the following warning signs:
 - Increasing fatigue with usual activity
 - Increasing shortness of breath with activity
 - Shortness of breath at rest
 - Need to sleep on an increasing number of pillows
 - Waking at night with shortness of breath
 - Edema
- Specific diet recommendations:
 - Limit sodium intake (2-4 grams daily)
 - How to read food labels for sodium content
 - Alcohol limits or abstinence
- Important life style modifications:
 - Smoking cessation
 - Alcohol limits or abstinence
 - Blood pressure management
 - Maintain normal HbA1c for patients with diabetes
 - Control lipids if necessary
 - Maintain specified body weight

Clinical practice guidelines are designed to assist clinicians by providing a framework for the evaluation and treatment of patients. The heart failure management guideline is based on the most current recommendations from the American College of Cardiology/American Heart Association 2009 Guideline Update for the Diagnosis and Management of Chronic Heart Failure in the Adult developed in collaboration with the American College of Chest Physicians and the International Society for Heart and Lung Transplantation in addition to the scientific evidence sources referenced below. The current ACC/AHA Guideline Update for the Diagnosis and Management of Chronic Heart Failure in the Adult is available at <http://www.sciencedirect.com/science/article/pii/S0735109708038023>.

Additional Resources for Piedmont WellStar HealthPlans, Inc.

- **MyHealth Advice Line** is staffed by experienced Registered Nurses and is available 24/7 to provide telephone support to members. Call 855-514-3679.
- Online interactive preventive health programs and resources are available in partnership with WebMD by logging in at www.pwplans.org/individuals.

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