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ACC/AHA Pocket Guidelines

Evaluation and Management of Chronic Heart Failure in the Adult

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

February 2002

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ACC/AHA Pocket Guidelines for

Evaluation and Management of Chronic Heart Failure in the Adult

February 2002

A Report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines (Committee to Revise the 1995 Guidelines for the Evaluation and Management of Heart Failure)

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I. Introduction

Heart failure (HF) is a major public health problem in the United States. Nearly 5 million patients in this country have HF, and nearly 500,000 patients are diagnosed with HF for the first time each year. The disorder is the underlying reason for 12 to 15 million office visits and 6.5 million hospital days each year. During the last 10 years, the annual number of hospitalizations has increased from approximately 550,000 to nearly 900,000 for HF as a primary diagnosis and from 1.7 to 2.6 million for HF as a primary or secondary diagnosis. Nearly 300,000 patients die of HF as a primary or contributory cause each year, and the number of deaths has increased steadily despite advances in treatment.

HF is primarily a disease of the elderly. Approximately 6% to 10% of people older than 65 years have HF, and approximately 80% of patients hospitalized with HF are more than 65 years old. HF is the most common Medicare diagnosis-related group, and more Medicare dollars are spent for the diagnosis and treatment of HF than for any other diagnosis. The total inpatient and outpatient costs for HF in 1991 were approximately $38.1 billion, which was approximately 5.4% of the healthcare budget that year. In the United States, approximately $500 million annually is spent on drugs for the treatment of HF.

The writing committee decided to take a new approach to the classification of HF that emphasized both the evolution and progression of the disease. In doing so, we identified 4 stages of HF. Stage A identifies the patient who is at high risk for developing HF but has no structural disorder of the heart; stage B refers to a patient with a structural disorder of the heart but who has never developed symptoms of HF; stage C denotes the patient with past or current symptoms of HF associated with underlying structural heart disease; and stage D designates the patient with end-stage disease who requires specialized treatment strategies such as mechanical circulatory support, continuous inotropic infusions, cardiac transplantation, or hospice care (see Table 1). Only the latter 2 stages, of course, qualify for the traditional clinical diagnosis of HF for diagnostic or coding purposes. This classification recognizes that there are established risk factors and structural prerequisites for the development of HF and that therapeutic interventions performed even before the appearance of left ventricular dysfunction or symptoms can reduce the morbidity and mortality of HF.

Table 1. Stages of Heart Failure

Stage	Description	Examples
A	**Patients at high risk of developing HF** because of the presence of conditions that are strongly associated with the development of HF. Such patients have no identified structural or functional abnormalities of the pericardium, myocardium, or cardiac valves and have never shown signs or symptoms of HF.	Systemic hypertension; coronary artery disease; diabetes mellitus; history of cardiotoxic drug therapy or alcohol abuse; personal history of rheumatic fever; family history of cardiomyopathy.
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.**	Left ventricular hypertrophy or fibrosis; left ventricular dilatation or hypocontractility; asymptomatic valvular heart disease; previous myocardial infarction.
C	**Patients who have current or prior symptoms of HF** associated with underlying structural heart disease.	Dyspnea or fatigue due to left ventricular systolic dysfunction; asymptomatic patients who are undergoing treatment for prior symptoms of HF.
D	**Patients with advanced structural heart disease** and marked symptoms of HF at rest despite maximal medical therapy and **who require specialized interventions.**	Patients who are frequently hospitalized for HF or cannot be safely discharged from the hospital; patients in the hospital awaiting heart transplantation; patients at home receiving continuous intravenous support for symptom relief or being supported with a mechanical circulatory assist device; patients in a hospice setting for the management of HF.

This classification system is intended to complement but not to replace the New York Heart Association (NYHA) functional classification, which primarily gauges the severity of symptoms in patients who are in stage C or D. It has been recognized for many years, however, that the NYHA functional classification reflects a subjective assessment by a physician and changes frequently over short periods of time and that the treatments used do not differ significantly across the classes. Therefore, the committee believed that a staging system was needed that would reliably and objectively identify patients in the course of their disease and would be linked to treatments that were uniquely appropriate at each stage of their illness. According to this new approach, patients would be expected to advance from one stage to the next unless progression of the disease was slowed or stopped by treatment. This new classification scheme adds a useful dimension to our thinking about HF similar to that achieved by staging systems for other disorders (e.g., those used in the classification of cancer).

All recommendations provided in this document follow the format of previous ACC/AHA guidelines:

Class I	Conditions for which there is evidence and/or general agreement that a given procedure or treatment is useful and effective.
Class II	Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of performing the procedure/therapy. **Class IIa** Weight of evidence/opinion is in favor of usefulness/efficacy. **Class IIb** Usefulness/efficacy is less well established by evidence/opinion.
Class III	Conditions for which there is evidence and/or general agreement that a procedure/therapy is not useful/effective and in some cases may be harmful.

II. Characterization of HF as a Clinical Syndrome

HF is a complex clinical syndrome that can result from any structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or eject blood. The cardinal manifestations of HF are dyspnea and fatigue, which may limit exercise tolerance, and fluid retention, which may lead to pulmonary and peripheral edema. Both abnormalities can impair the functional capacity and quality of life of affected individuals, but they may not necessarily dominate the clinical picture at the same time.

Coronary artery disease is the underlying cause of HF in approximately two thirds of patients with left ventricular systolic dysfunction. The remainder have nonischemic causes of systolic dysfunction and may have an identifiable cause (e.g., hypertension, valvular disease, myocardial toxins, or myocarditis) or may have no discernible cause (e.g., idiopathic dilated cardiomyopathy).

III. Assessment of Patients

1. Identification of Patients

In general, patients with left ventricular dysfunction present to the physician in 1 of 3 ways: with a syndrome of decreased exercise tolerance; with a syndrome of fluid retention; or with no symptoms and incidentally discovered left ventricular dysfunction.

2. Identification of Structural Abnormality

A complete history and physical examination are the first steps in evaluating the structural abnormality or cause responsible for the development of HF. Although the history and physical examination may provide important clues about the nature of the underlying cardiac abnormality, identification of the structural abnormality leading to HF generally requires either noninvasive or invasive imaging of the cardiac structures. The single most useful diagnostic test in the evaluation of patients with HF is the 2-dimensional echocardiogram, coupled with Doppler flow studies. Other tests may be used to provide information regarding the nature and severity of the cardiac abnormality.

3. Evaluation of the Cause of Ventricular Dysfunction

Identification of the disorder leading to HF may be important, because some causes of left ventricular dysfunction are reversible or treatable. However, it may not be possible to discern the cause of HF in many patients who present with this syndrome, and in others, the underlying condition may not be amenable to treatment. Hence, physicians should focus their efforts on diagnoses that have some potential for improvement, with therapy directed at the underlying condition.

Recommendations for the Evaluation of Patients With HF

Class I

1. Thorough history and physical examination to identify cardiac and noncardiac disorders that might lead to the development of HF or accelerate the progression of HF.

2. Initial and ongoing assessment of patient's ability to perform routine and desired activities of daily living.

3. Initial and ongoing assessment of volume status.

4. Initial measurement of complete blood count, urinalysis, serum electrolytes (including calcium and magnesium), blood urea nitrogen, serum creatinine, blood glucose, liver function tests, and thyroid-stimulating hormone.

5. Serial monitoring of serum electrolytes and renal function.

6. Initial 12-lead electrocardiogram and chest radiograph.

7. Initial 2-dimensional echocardiography with Doppler or radionuclide ventriculography to assess left ventricular systolic function.

8. Cardiac catheterization with coronary arteriography in patients with angina who are candidates for revascularization.

Class IIa

1. Cardiac catheterization with coronary arteriography in patients with chest pain who have not had evaluation of their coronary anatomy and who have no contraindications to coronary revascularization.

2. Cardiac catheterization with coronary arteriography in patients with known or suspected coronary artery disease but without angina who are candidates for revascularization.

3. Noninvasive imaging to detect ischemia and viability in patients with known coronary artery disease and no angina who are being considered for revascularization.

4. Maximal exercise testing with measurement of respiratory gas exchange and/or blood oxygen saturation to help determine whether HF is the cause of exercise limitation when the contribution of HF is uncertain.

5. Maximal exercise testing with measurement of respiratory gas exchange to identify high-risk patients who are candidates for cardiac transplantation or other advanced treatments.

6. Echocardiography in asymptomatic first-degree relatives of patients with idiopathic dilated cardiomyopathy.

7. Repeat measurement of ejection fraction in patients who have had a change in clinical status or who have experienced or recovered from a clinical event or received treatment that might have had a significant effect on cardiac function.

8. Screening for hemochromatosis.

9. Measurement of serum antinuclear antibody, rheumatoid factor, urinary vanillylmandelic acid, and metanephrines in selected patients.

Class IIb

1. Noninvasive imaging to define the likelihood of coronary artery disease in patients with left ventricular dysfunction.

2. Maximal exercise testing with measurement of respiratory gas exchange to facilitate prescription of an appropriate exercise program.

3. Endomyocardial biopsy in patients in whom an inflammatory or infiltrative disorder of the heart is suspected.

4. Assessment of human immunodeficiency virus status.

Class III

1. Endomyocardial biopsy in the routine evaluation of patients with HF.

2. Routine Holter monitoring or signal-averaged electrocardiography.

3. Repeat coronary arteriography or noninvasive testing for ischemia in patients for whom coronary artery disease has previously been excluded as the cause of left ventricular dysfunction.

4. Routine measurement of circulating levels of norepinephrine or endothelin.

IV. Therapy

Patients at High Risk of Developing Left Ventricular Dysfunction HF (Stage A)

Many conditions or behaviors that are associated with an increased risk of HF can be identified before patients show any evidence of structural heart disease. Because early modification of these factors can often reduce the risk of HF, working with patients with these risk factors provides the earliest opportunity to reduce the impact of HF on public and individual health.

Recommendations for Patients at High Risk of Developing HF (Stage A)

Class I

1. Control of systolic and diastolic hypertension in accordance with recommended guidelines.
2. Treatment of lipid disorders in accordance with recommended guidelines.
3. Avoidance of patient behaviors that may increase the risk of HF (e.g., smoking, alcohol consumption, and illicit drug use).
4. Angiotensin converting enzyme (ACE) inhibition in patients with a history of atherosclerotic vascular disease, diabetes mellitus, or hypertension and associated cardiovascular risk factors.
5. Control of ventricular rate in patients with supraventricular tachyarrhythmias.
6. Treatment of thyroid disorders.
7. Periodic evaluation for signs and symptoms of HF.

Class IIa

Noninvasive evaluation of left ventricular function in patients with a strong family history of cardiomyopathy or in those receiving cardiotoxic interventions.

Class III

1. Exercise to prevent the development of HF.
2. Reduction of dietary salt beyond that which is prudent for healthy individuals in patients without hypertension or fluid retention.
3. Routine testing to detect left ventricular dysfunction in patients without signs or symptoms of HF or evidence of structural heart disease.
4. Routine use of nutritional supplements to prevent the development of structural heart disease.

Patients With Left Ventricular Dysfunction Who Have Not Developed Symptoms (Stage B)

Patients without symptoms but who have had a myocardial infarction or have evidence of left ventricular dysfunction are at considerable risk of developing HF. In such patients, HF can be prevented by reducing the risk of additional injury and by retarding the evolution and progression of left ventricular dysfunction. Appropriate measures include those listed as class I recommendations for patients in stage A.

Recommendations for Patients With Asymptomatic Left Ventricular Systolic Dysfunction (Stage B)

Class I

1. ACE inhibition in patients with a recent or remote history of myocardial infarction regardless of ejection fraction.

2. ACE inhibition in patients with a reduced ejection fraction, whether or not they have experienced a myocardial infarction.

3. Beta-blockade in patients with a recent myocardial infarction regardless of ejection fraction.

4. Beta-blockade in patients with a reduced ejection fraction, whether or not they have experienced a myocardial infarction.

5. Valve replacement or repair for patients with hemodynamically significant valvular stenosis or regurgitation.

6. Regular evaluation for signs and symptoms of HF.

7. Measures listed as class I recommendations for patients in stage A.

Class IIb

Long-term treatment with systemic vasodilators in patients with severe aortic regurgitation.

Class III

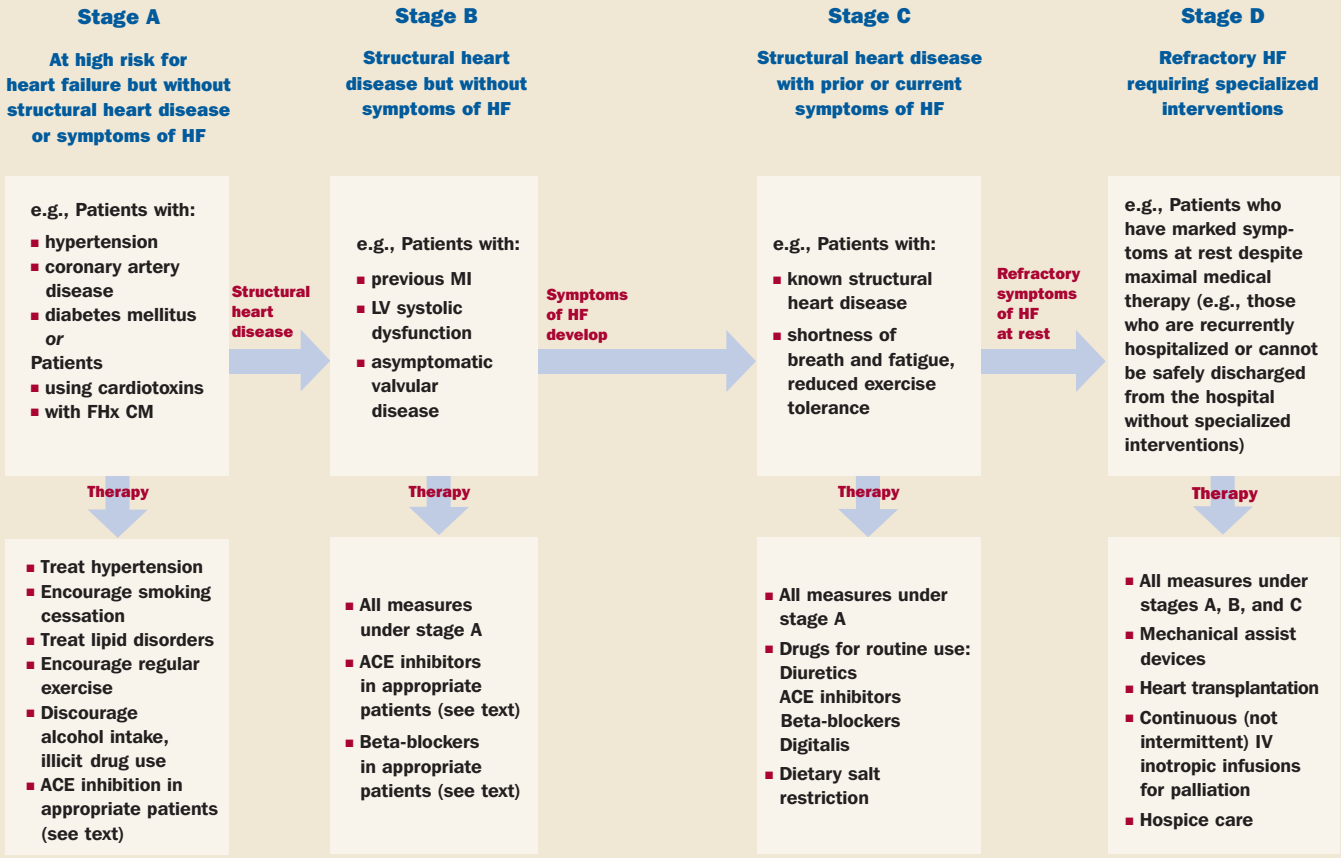
1. Treatment with digoxin in patients with left ventricular dysfunction who are in sinus rhythm.

2. Reduction of dietary salt beyond that which is prudent for healthy individuals in patients without hypertension or fluid retention.

3. Exercise to prevent the development of HF.

4. Routine use of nutritional supplements to treat structural heart disease or prevent the development of symptoms of HF.

Figure 1. Stages in the Evolution of Heart Failure/Recommended Therapy by Stage



Patients With Symptomatic Left Ventricular Dysfunction With Current or Prior Symptoms (Stage C)

1. General Measures

Measures listed as class I recommendations for patients in stages A and B are also appropriate for patients with current or prior symptoms of HF. In addition, moderate sodium restriction is indicated, along with daily measurement of weight, to permit effective use of lower and safer doses of diuretic drugs. Immunization with influenza and pneumococcal vaccines may reduce the risk of a respiratory infection. Although most patients should not participate in heavy labor or exhaustive sports, physical activity should be encouraged, except during periods of acute decompensation or in patients with suspected myocarditis, because restriction of activity promotes physical deconditioning, which may adversely affect clinical status and contribute to the exercise intolerance of patients with HF.

Of the general measures that should be pursued in patients with HF, possibly the most effective yet least utilized is close attention and follow-up. Noncompliance with diet and medications can rapidly and profoundly affect the clinical status of patients, and increases in body weight and minor changes in symptoms commonly precede the major clinical episodes that require emergency care or hospitalization. Patient education and close supervision, which includes surveillance by the patient and his or her family between physician visits, can reduce the likelihood of noncompliance and can often lead to the detection of changes in body weight or clinical status early enough to allow the patient or a health-care provider an opportunity to institute treatments that can prevent clinical deterioration and hospitalization. Supervision between physician visits ideally may be performed by a nurse or physician assistant with special training in the care of patients with HF.

2. Drugs Recommended for Routine Use

Most patients with symptomatic left ventricular dysfunction should be routinely managed with a combination of 4 types of drugs: a diuretic, an ACE inhibitor, a beta-adrenergic blocker, and (usually) digitalis. The value of these drugs has been established in numerous large-scale clinical trials, and the evidence supporting a central role for their use is compelling and persuasive. Patients with evidence of fluid retention should be given a diuretic until a euvolemic state is achieved, and diuretic therapy should be continued to prevent the recurrence of fluid retention. Even if the patient has responded favorably to the diuretic, treatment with an ACE inhibitor and a beta-blocker should be initiated and maintained in patients who can tolerate them, because they have been shown to favorably influence the long-term prognosis of HF. Therapy with digoxin may be initiated at any time to reduce symptoms and enhance exercise tolerance (see Table 2).

Table 2. Drugs Commonly Used for Treatment of Chronic Heart Failure

Drug	Initial Dose	Maximum Dose
Loop diuretics*		
Bumetanide	0.5 to 1.0 mg once or twice daily	Titrate to achieve dry weight (up to 10 mg daily)
Furosemide	20 to 40 mg once or twice daily	Titrate to achieve dry weight (up to 400 mg daily)
Torsemide	10 to 20 mg once or twice daily	Titrate to achieve dry weight (up to 200 mg daily)
ACE inhibitors		
Captopril	6.25 mg three times daily	50 mg 3 times daily
Enalapril	2.5 mg twice daily	10 to 20 mg twice daily
Fosinopril	5 to 10 mg once daily	40 mg once daily
Lisinopril	2.5 to 5.0 mg once daily	20 to 40 mg once daily
Quinapril	10 mg twice daily	40 mg twice daily
Ramipril	1.25 to 2.5 mg once daily	10 mg once daily
Beta-receptor blockers		
Bisoprolol	1.25 mg once daily	10 mg once daily
Carvedilol	3.125 mg twice daily	25 mg twice daily; 50 mg twice daily for patients greater than 85 kg
Metoprolol tartrate	6.25 mg twice daily	75 mg twice daily
Metoprolol succinate extended release+	12.5 to 25 mg daily	200 mg once daily
Digitalis glycosides		
Digoxin	0.125 to 0.25 mg once daily	0.125 to 0.25 mg once daily

ACE indicates angiotensin converting enzyme.

* *Thiazide diuretics are not listed in this table but may be appropriate for patients with mild heart failure or associated hypertension or as a second diuretic in patients refractory to loop diuretics alone.*

+ *Referred to in some publications as metoprolol CR/XL.*

Therapy

3. Interventions to Be Considered for Use in Selected Patients

Several interventions have been shown in controlled clinical trials to be useful in a limited cohort of patients with HF. Some of these are undergoing active investigation in large-scale trials to determine whether their role in the management of HF might justifiably be expanded. They include aldosterone antagonists, angiotens in receptor blockers, hydralazine and isosorbide dinitrate, and exercise training.

4. Drugs and Interventions Under Active Investigation

Several drugs and interventions are under active evaluation in long-term large-scale trials because they showed promise in pilot studies that involved small numbers of patients. Until the results of definitive trials are available, none of these interventions can be recommended for use in patients with HF. These include vasopeptidase inhibitors, cytokine antagonists, endothelin antagonists, synchronized biventricular pacing, external counterpulsation, and techniques for respiratory support.

5. Interventions of Unproved Value and Not Recommended

Interventions of unproved value that are not recommended include nutritional supplements and hormonal therapies, intermittent intravenous positive inotropic therapy, and dynamic cardiomyoplasty.

Recommendations for Treatment of Symptomatic Left Ventricular Systolic Dysfunction (Stage C)

Class I

1. Diuretics in patients who have evidence of fluid retention.
2. ACE inhibition in all patients, unless contraindicated.
3. Beta-adrenergic blockade in all stable patients, unless contraindicated. Patients should have no or minimal evidence of fluid retention and should not have required treatment recently with an intravenous positive inotropic agent.
4. Digitalis for the treatment of symptoms of HF, unless contraindicated.
5. Withdrawal of drugs known to adversely affect the clinical status of patients (e.g., nonsteroidal anti-inflammatory drugs, most antiarrhythmic drugs, and most calcium channel blocking drugs).
6. Measures listed as class I recommendations for patients in stages A and B.

Class IIa

1. Spironolactone in patients with recent or current class IV symptoms, preserved renal function, and a normal potassium concentration.

2. Exercise training as an adjunctive approach to improve clinical status in ambulatory patients.

3. Angiotensin receptor blockade in patients who are being treated with digitalis, diuretics, and a beta-blocker and who cannot be given an ACE inhibitor because of cough or angioedema.

4. A combination of hydralazine and a nitrate in patients who are being treated with digitalis, diuretics, and a beta-blocker and who cannot be given an ACE inhibitor because of hypotension or renal insufficiency.

Class IIb

1. Addition of an angiotensin receptor blocker to an ACE inhibitor.

2. Addition of a nitrate (alone or in combination with hydralazine) to an ACE inhibitor in patients who are also being given digitalis, diuretics, and a beta-blocker.

Class III

1. Long-term intermittent use of an infusion of a positive inotropic drug.

2. Use of an angiotensin receptor blocker instead of an ACE inhibitor in patients with HF who have not been given or who can tolerate an ACE inhibitor.

3. Use of an angiotensin receptor blocker before a beta-blocker in patients with HF who are taking an ACE inhibitor.

4. Use of a calcium channel blocking drug as a treatment for HF.

5. Routine use of nutritional supplements (coenzyme Q10, carnitine, taurine, and antioxidants) or hormonal therapies (growth hormone or thyroid hormone) for the treatment of HF.

Patients With Refractory End-Stage HF (Stage D)

Most patients with HF due to left ventricular systolic dysfunction respond favorably to pharmacological and nonpharmacological treatments and enjoy a good quality of life and enhanced survival. However, despite optimal medical therapy, some patients do not improve with treatment or experience rapid recurrence of symptoms. Such patients generally have symptoms (including profound fatigue) at rest or on minimal exertion, cannot

perform most activities of daily living, frequently have evidence of cardiac cachexia, and typically require repeated or prolonged hospitalizations for intensive management. These individuals represent the most advanced stage of HF and should be considered for specialized treatment strategies such as mechanical circulatory support, continuous intravenous positive inotropic therapy, referral for cardiac transplantation, or hospice care. Before a patient is considered to have refractory HF, it is critical that physicians confirm the accuracy of the diagnosis; identify and reverse, if possible, any contributing conditions; and ensure that all conventional medical strategies have been optimally employed.

Many patients with advanced HF have symptoms that are related to the retention of salt and water and thus will respond favorably to interventions designed to restore sodium balance. Hence, a critical step in the successful management of end-stage HF is the recognition and meticulous control of fluid retention.

Controlled trials suggest that patients with advanced HF respond favorably to treatment with both ACE inhibitors and beta-blockers in a manner similar to those with mild to moderate disease. However, because neurohormonal mechanisms play an important role in the support of circulatory homeostasis as HF progresses, neurohormonal antagonism may be less well tolerated by patients with severe symptoms than by patients with mild symptoms. Patients who are at the end stage of their disease are at particular risk of developing hypotension and renal insufficiency after the administration

of an ACE inhibitor and of experiencing worsening HF after treatment with a beta-blocker. As a result, patients with refractory HF may tolerate only small doses of these neurohormonal antagonists or may not tolerate them at all.

Many commonly performed cardiac surgical procedures (e.g., coronary artery bypass grafting and valve repair/replacement) are being performed with increasing frequency in patients with HF, including those with advanced symptoms. Revascularization is routinely recommended for patients with left ventricular dysfunction who have angina, but its role in patients without symptoms of ischemia remains controversial. Cardiac transplantation is currently the only established surgical approach for the treatment of refractory HF, but it is available to no more than 2,500 patients yearly in the United States. Alternative surgical and mechanical approaches for the treatment of end-stage HF are under development.

Recommendations for Patients With Refractory End-Stage HF (Stage D)

Class I	1. Meticulous identification and control of fluid retention.
	2. Referral for cardiac transplantation in eligible patients.
	3. Referral to an HF program with expertise in the management of refractory HF.
	4. Measures listed as class I recommendations for patients in stages A, B, and C.

Class IIb	1. Pulmonary artery catheter placement to guide therapy in patients with persistently severe symptoms. 2. Mitral valve repair or replacement for severe secondary mitral regurgitation. 3. Continuous intravenous infusion of a positive inotropic agent for palliation of symptoms.
Class III	1. Partial left ventriculectomy. 2. Routine intermittent infusions of positive inotropic agents.

V. Treatment of Special Populations and Concomitant Disorders

1. Special Subpopulations

Many subgroups are underrepresented in most trials, and some present unique problems in HF management. These include women and men, racial minorities, and elderly patients.

2. Concomitant Disorders

Patients with left ventricular dysfunction frequently have associated cardiovascular and noncardiovascular disorders, the course or treatment of which may exacerbate the syndrome of HF. In many patients, appropriate management of these concomitant illnesses may produce clinical and prognostic benefits that may be as important as the treatment of HF itself. These concomitant conditions include cardiovascular disorders such as hypertension, hyperlipidemia, and diabetes mellitus; coronary artery disease; supraventricular arrhythmias; ventricular arrhythmias and prevention of sudden death; and prevention of thrombotic events. Associated noncardiovascular disorders include renal insufficiency, pulmonary disease, cancer, and thyroid disease.

Recommendations for Management of Concomitant Diseases in Patients With HF

Class I

1. Control of systolic and diastolic hypertension in patients with HF in accordance with recommended guidelines.

2. Nitrates and beta-blockers (in conjunction with diuretics) for the treatment of angina in patients with HF.

3. Coronary revascularization in patients who have both HF and angina.

4. Anticoagulants in patients with HF who have paroxysmal or chronic atrial fibrillation or a previous thromboembolic event.

5. Control of the ventricular response in patients with HF and atrial fibrillation with a beta-blocker (or amiodarone, if the beta-blocker is contraindicated or not tolerated).

6. Beta-adrenergic blockade (unless contraindicated) in patients with HF to reduce the risk of sudden death. Patients should have no or minimal fluid retention and should not have recently required treatment with an intravenous positive inotropic agent.

7. Implantable cardioverter-defibrillator (alone or in combination with amiodarone) in patients with HF who have a history of sudden death, ventricular fibrillation, or hemodynamically destabilizing ventricular tachycardia.

Class IIa

1. Antiplatelet agents for prevention of myocardial infarction and death in patients with HF who have underlying coronary artery disease.

2. Digitalis to control the ventricular response in patients with HF and atrial fibrillation.

Class IIb

1. Coronary revascularization in patients who have HF and coronary artery disease but no angina.

2. Restoration of sinus rhythm by electrical cardioversion in patients with HF and atrial fibrillation.

3. Amiodarone to prevent sudden death in patients with HF and asymptomatic ventricular arrhythmias.

4. Anticoagulation in patients with HF who do not have atrial fibrillation or a previous thromboembolic event.

Class III 1. Routine use of an implantable cardioverter-defibrillator in patients with HF.

2. Class I or III antiarrhythmic drugs (except amiodarone) in patients with HF for the prevention or treatment of asymptomatic ventricular arrhythmias.

3. Ambulatory electrocardiographic monitoring for the detection of asymptomatic ventricular arrhythmias.

VI. Diastolic Dysfunction

Approximately 20% to 40% of patients with HF have preserved left ventricular systolic function and (in the absence of valvular disease) are believed to have an impairment of ventricular relaxation as the primary mechanism leading to symptoms. Several recognized myocardial disorders are associated with diastolic dysfunction, including restrictive cardiomyopathy, obstructive and nonobstructive hypertrophic cardiomyopathy, and infiltrative cardiomyopathies. However, the vast majority of patients who present with HF and normal systolic function do not have a defined myocardial disease but nevertheless have a clinically significant impairment of diastolic function. These patients suffer considerably from dyspnea and fatigue, which can limit their exercise tolerance and quality of life, and they are hospitalized frequently for clinical stabilization. Although the risk of death in these patients appears to be lower than in patients with HF and poor systolic function, the management of these patients still has major socioeconomic implications.

It is difficult to be precise about the diagnosis of diastolic dysfunction. Noninvasive methods, especially those that rely on Doppler echocardiography,

have been developed to assist in such diagnosis. In practice, however, the diagnosis of diastolic HF is generally based on the finding of typical symptoms and signs of HF in a patient who is shown to have a normal left ventricular ejection fraction and no valvular abnormalities on echocardiography.

In contrast to the treatment of HF due to systolic dysfunction, few clinical trials are available to guide the management of patients with HF due to diastolic dysfunction. Although controlled studies have been performed with digitalis, ACE inhibitors, angiotensin receptor antagonists, beta-blockers, and calcium channel blockers in patients with HF who had a normal left ventricular ejection fraction, these trials have been small or have produced inconclusive results. Nevertheless, many patients with diastolic HF receive treatment with these drugs because of the presence of comorbid conditions (i.e., atrial fibrillation, hypertension, diabetes, or coronary artery disease). In addition, recommendations regarding the use of anticoagulation and antiarrhythmic agents apply to both systolic and diastolic HF.

Recommendations for Management of HF and Preserved Systolic Function

Class I	1. Control systolic and diastolic hypertension, in accordance with published guidelines. 2. Control ventricular rate in patients with atrial fibrillation. 3. Diuretics to control pulmonary congestion and peripheral edema.
Class IIa	Coronary revascularization in patients with coronary artery disease in whom symptomatic or demonstrable myocardial ischemia is judged to be having an adverse effect on diastolic function.
Class IIb	1. Restoration of sinus rhythm in patients with atrial fibrillation. 2. Use of beta-adrenergic blocking agents, ACE inhibitors, angiotensin receptor blockers, or calcium antagonists in patients with controlled hypertension to minimize symptoms of HF. 3. Digitalis to minimize symptoms of HF.

VII. End-of-Life Considerations

Although issues surrounding end-of-life care deserve attention for all chronic terminal diseases, several general principles merit particular discussion in the context of chronic HF. Education of both patient and family regarding the expected or anticipated course of illness, final treatment options, and planning should be undertaken before the patient becomes too ill to participate in decisions.

Hospice services have only recently been extended to patients dying of HF. Originally developed for patients with end-stage cancer, the focus of hospice care has now been expanded to include the relief of symptoms other than pain. This is appropriate, because the suffering of patients with HF is characteristically linked to symptoms of breathlessness, and thus, compassionate care may require the frequent administration of intravenous diuretics and (in some cases) the continuous infusion of positive inotropic agents rather than the use of potent analgesics.

Recommendations for End-of-Life Care

Class I	1. Ongoing patient and family education regarding prognosis for function and survival. 2. Patient and family education about options for formulating and implementing advance directives. 3. Continuity of medical care between inpatient and outpatient settings. 4. Components of hospice care that are appropriate to the relief of suffering.
Class III	Implantation of a cardioverter-defibrillator in patients with class IV symptoms who are not anticipated to experience clinical improvement from available treatments.

End-of-Life