HFSA 2006 Guideline Executive Summary

Executive Summary: HFSA 2006 Comprehensive Heart Failure Practice Guideline

HEART FAILURE SOCIETY OF AMERICA

St. Paul, Minnesota

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ABSTRACT

Heart failure (HF) is a syndrome characterized by high mortality, frequent hospitalization, reduced quality of life, and a complex therapeutic regimen. Knowledge about HF is accumulating so rapidly that individual clinicians may be unable to readily and adequately synthesize new information into effective strategies of care for patients with this syndrome. Trial data, though valuable, often do not give direction for individual patient management. These characteristics make HF an ideal candidate for practice guidelines.

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The 2006 Heart Failure Society of America comprehensive practice guideline addresses the full range of evaluation, care, and management of patients with HF.
Key Words: Heart failure, Practice guidelines.

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Section 1: Development and Implementation of a Comprehensive Heart Failure Practice Guideline

Introduction

Heart failure (HF) is a syndrome characterized by high mortality, frequent hospitalization, poor quality of life, and a complex therapeutic regimen. Knowledge about HF is accumulating so rapidly that individual clinicians may be unable to synthesize new information into effective principles of patient care. Trial data, though valuable, often do not give adequate direction for individual patient management.

Given the complex and changing picture of HF and the accumulation of evidence-based HF therapy, it is not possible for the clinician to rely solely on personal experience and observation to guide therapeutic decisions. The prognosis of individual patients differs considerably, making it difficult to generalize. Treatments might not dramatically improve symptoms of the disease process, yet might provide important reductions or delays in morbid events and deaths. The assessment of specific therapeutic outcomes is complicated by the potential differential impact of various cotherapies.

The complexity of HF, its high prevalence in society, and the availability of evidence supporting certain therapeutic options make it an ideal candidate for practice guidelines. The first HF guideline developed by the Heart Failure Society of America (HFSA) had a narrow scope, concentrating on the pharmacologic treatment of chronic, symptomatic left ventricular dysfunction.[1] It did not consider subsets of the clinical syndrome of HF, such as acute decompensated HF and "diastolic dysfunction," or issues such as prevention. The current comprehensive guideline addresses the full range of evaluation, care and management of patients with HF, including acute HF, disease management, and HF in special populations. It represents a continuation of important contributions already made to the field of HF guidelines by HFSA members.[2–6]

HFSA Guideline Approach to Medical Evidence

Two considerations are critical in the development of practice guidelines: assessing level of evidence and determining strength of recommendation. Strength of evidence is determined both by the type of evidence available and the assessment of validity, applicability, and certainty of a specific type of evidence. Following the lead of previous guidelines, strength of evidence in this guideline is heavily dependent on the source or type of evidence used. The HFSA guideline process has used three grades (A, B, or C) to characterize the type of evidence available to support specific recommendations (Table 1.2).

Table 1.2. Relative Weight of Evidence Used to Develop HFSA Practice Guideline

Hierarchy of Types of Evidence	
Level A	Randomized, Controlled, Clinical Trials
	May be assigned based on results of a single trial
Level B	Cohort and Case-Control Studies
	Post hoc, subgroup analysis, and meta-analysis
	Prospective observational studies or registries
Level C	Expert Opinion
	Observational studies–epidemiologic findings
	Safety reporting from large-scale use in practice

It must be recognized, however, that the evidence supporting recommendations is based largely on population responses that may not always apply to individuals within the population. Therefore, data may support overall benefit of 1 treatment over another but cannot exclude that some individuals within the population may respond better to the other treatment. Thus guidelines can best serve as evidence-based recommendations for management, not as mandates for management in every patient. Furthermore, it must be recognized that trial data on which recommendations are based have often been carried out with background therapy not comparable to therapy in current use. Therefore, physician decisions regarding the management of individual patients may not always precisely match the recommendations. A knowledgeable physician who integrates the guidelines with pharmacologic and physiologic insight and knowledge of the individual being treated should provide the best patient management.

Strength of Evidence A. Randomized controlled clinical trials provide what is considered the most valid form of guideline evidence. The HFSA Guideline Committee typically has accepted a single randomized, controlled, outcome-based clinical trial as sufficient for level A evidence. However, randomized clinical trial data, whether derived from one or multiple trials, have not been taken simply at face value. They have been evaluated for: (1) endpoints studied, (2) level of significance, (3) reproducibility of findings, (4) generalizability of study results, and (5) sample size and number of events on which outcome results are based.[7]

Strength of Evidence B. The HFSA guideline process also considers evidence arising from cohort studies or smaller clinical trials with physiologic or surrogate endpoints. This level B evidence is derived from studies that are diverse in design and may be prospective or retrospective in nature. They may involve subgroup analyses of clinical trials or have a case-control or propensity design using a matched subset of trial populations. Dose-response studies, when available, may involve all or a portion of the clinical trial population. These types of evidence have well-recognized, inherent limitations. Nevertheless, their value may be weighed through attention to factors such as prespecification of hypotheses in cohort analyses and replication of findings within different populations.

Strength of Evidence C. The present HFSA guideline makes extensive use of expert opinion, or C-level evidence. The need to formulate recommendations based on level C evidence is driven primarily by a paucity of scientific evidence in many areas critical to a comprehensive guideline. For example, the diagnostic process and the steps used to evaluate and monitor patients with established HF have not been the subject of clinical studies that formally test the validity of one approach versus another. In areas such as these, recommendations must be based on expert opinion or go unaddressed.

HFSA Guideline Approach to Strength of Recommendation

Although level of evidence is important, the strength given to specific recommendations is critical. The process used to determine the strength of individual recommendations is complex. The goal of guideline development is to achieve the best recommendations for evaluation and management, considering not only efficacy, but the cost, convenience, side effect profile, and safety of various therapeutic approaches. The HFSA Guideline Committee often determined the strength of a recommendation by the ''totality of evidence,'' which is a synthesis of all types of available data, pro and con, about a particular therapeutic option.

Most guidelines have several strengths, ranging from ''recommended,'' to ''should or may be considered,'' to ''not recommended.'' The HFSA guideline employs the categorization outlined in Table 1.3. When the available evidence is considered to be insufficient or too premature, or consensus fails, issues are labeled unresolved and included as appropriate at the end of the relevant section.

Process of Guideline Development

Key steps in the development of this guideline are listed in Table 1.4.[8] Having determined the broad scope of the current guideline, members of the Guideline Committee were asked to identify the relevant medical evidence in assigned sections. Sources identified were reviewed by the Committee as a whole and then by the Executive Council of the HFSA. Evidence was then evaluated for relative value and strength, as described earlier.

Table 1.3. HFSA System for Classifying the Strength of Recommendations

''Is recommended''	Part of routine care
	Exceptions to therapy should be minimized
''Should be considered''	Majority of patients should receive the intervention
	Some discretion in application to individual patients should be allowed
''May be considered''	Individualization of therapy is indicated
''Is not recommended''	Therapeutic intervention should not be used

Table 1.4. Steps in the Development of the HFSA Practice Guideline

Determine the scope of the practice guideline
Identify the medical evidence relevant to the guideline
Specify the type of evidence and relative weight of evidence
Formulate the strength of evidence used
Establish therapeutic justification for recommended therapies
Formulate recommendations of specific strength
Create the initial document
Develop a review process for the document
Disseminate the practice guideline
Determine the life cycle of the document

The process of moving from ideas of recommendations to a final document includes many stages of evaluation and approval. Every section, once written, had a lead reviewer and 2 additional reviewers. After a rewrite, each section was assigned to another review team, which led to a version reviewed by the Committee as a whole and then the HFSA Executive Council, representing 1 more level of expertise and experience. Out of this process emerged the final document.

Consensus. The development of a guideline involves the selection of individuals with expertise and experience to drive the process of formulating specific recommendations and producing a written document. The role of these experts goes well beyond the formulation of recommendations supported by expert opinion.

Experts involved in the guideline process must function as a group, not as isolated individuals. Expert opinion is not always unanimous. Interpretations of data vary. Disagreements arise over the generalizability and applicability of trial results to various patient subgroups. Experts are influenced by their own experiences with particular therapies, but still generally agree on the clinical value of trial data. Discomfort with the results of trials reported as positive or negative generally focus on factors that potentially compromise the evidence. There are no absolute rules for downgrading or upgrading trial results or for deciding that the limitations of the trial are sufficient to negate what has been regarded as a traditionally positive or negative statistical result.

The HFSA Guideline Committee sought resolution of difficult cases through consensus building. Written documents were essential to this process, because they provided the opportunity for feedback from all members of the group. On occasion, consensus of Committee opinion was sufficient to override positive or negative results of almost any form of prior evidence.

The involvement of many groups in the development of this guideline helped avoid the introduction of bias, which can be personal, practice-based, or based on financial interest. Committee members and reviewers from the Executive Council received no direct financial support from the HFSA or any other source for the development of the guideline. Administrative support was provided by the HFSA staff, and the writing of the document was performed on a volunteer basis by the Committee. Financial relationships that might represent conflicts of interest were collected for all members of the Guideline Committee and of the Executive Council, who were asked to disclose potential conflicts and recuse themselves from discussions when necessary.

Dissemination and Continuity. The value of a practice guideline is significantly influenced by the scope of its dissemination. The current document will be implemented on the Internet both for file transfer and as a hypertext source of detailed knowledge concerning HF. Development of concise summaries of the recommendations in card format and translation of the recommendations to portable computing devices is envisioned.

An important final consideration is the continuity of the guideline development process. The intent is to create a ''living document'' that will be updated and amended as necessary to ensure continuing relevance. The rapid development of new knowledge in HF from basic and clinical research and the continuing evolution of pharmacologic and device therapy for this condition provides a strong mandate for timely updates. The HFSA intends to undertake targeted reviews and updates in areas where new research has implications for practice.

Section 2: Conceptualization and Working Definition of Heart Failure

HF is a syndrome rather than a primary diagnosis. It has many potential etiologies, diverse clinical features, and numerous clinical subsets. Patients may have a variety of primary cardiovascular diseases and never develop cardiac dysfunction, and those in whom cardiac dysfunction is identified through testing may never develop clinical HF. In addition to cardiac dysfunction, other factors, such as vascular stiffness and renal sodium handling, play major roles in the manifestation of the syndrome of HF.

Patients at risk for many cardiovascular diseases are at risk for HF. Early identification and treatment of risk factors is perhaps the most significant step in limiting the public health impact of HF.[9,10] Emphasis on primary and secondary prevention is particularly critical because of the difficulty of successfully treating left ventricular (LV) dysfunction, especially when severe.[9,10]

Although HF is progressive, current therapy may provide stability and even reversibility. Therapy with angiotensin-converting enzyme (ACE) inhibitors (or angiotensin receptor blockers [ARB]) and β-blockers can lead to partial reversal or to slowing of remodeling. Because of this prolonged survival, comorbid conditions, such as coronary artery disease or renal failure, can progress, complicating treatment.

Although HF may be caused by a variety of disorders, this working definition focuses on HF due primarily

to the loss or dysfunction of myocardial muscle or interstitium.

> HF is a syndrome caused by cardiac dysfunction, generally resulting from myocardial muscle dysfunction or loss and characterized by LV dilation or hypertrophy. Whether the dysfunction is primarily systolic or diastolic or mixed, it leads to neurohormonal and circulatory abnormalities, usually resulting in characteristic symptoms such as fluid retention, shortness of breath, and fatigue, especially on exertion. In the absence of appropriate therapeutic intervention, HF is usually progressive at the levels of cardiac function and clinical symptoms. The severity of clinical symptoms may vary substantially during the course of the disease process and may not correlate with changes in underlying cardiac function. Although HF is progressive and often fatal, patients can be stabilized, and myocardial dysfunction and remodeling may improve, either spontaneously or as a consequence of therapy.
>
> In physiologic terms, HF is a syndrome characterized by elevated cardiac filling pressure and/or inadequate peripheral oxygen delivery, at rest or during stress, caused by cardiac dysfunction.

HF is often classified as HF with abnormal systolic function versus HF with preserved systolic function. Although not truly equivalent, these classifications often consider normal systolic function and normal ejection fraction to be the same. Myocardial remodeling often precedes the clinical syndrome of HF. Additional definitions are provided in Table 2.1.

Section 3: Prevention of Ventricular Remodeling, Cardiac Dysfunction, and Heart Failure

Epidemiologic, clinical, and basic research have identified a number of antecedent conditions that predispose individuals to HF and its predecessors, LV remodeling and dysfunction.[11–19] Recognition that many of these risk factors can be modified and that treating HF is difficult and costly has caused attention to focus on preventive strategies for HF. Treatment of systemic hypertension, with or without LV hypertrophy, reduces the development of HF.[9,20–27] Prevention of myocardial infarction (MI) in patients with atherosclerotic cardiovascular disease is a critical intervention, since occurrence of MI confers an 8- to 10-fold increased risk for subsequent HF.[24] Other modifiable risk factors include diabetes, hyperlipidemia, obesity, valvular abnormalities, alcohol, certain illicit drugs, and some cardiotoxic medications.[28] ACE inhibitors are recommended for use in patients at high risk for the development of HF, and β-blockers are recommended for patients with prior MI.

Table 2.1. Additional HF Definitions

"HF With Reduced LVEF" Sometimes: "HF With a Dilated Left Ventricle"	A clinical syndrome characterized by signs and symptoms of HF and reduced LVEF. Most commonly associated with LV chamber dilation.
"HF With a Preserved LVEF" Sometimes: "HF With a Nondilated LV"	A clinical syndrome characterized by signs and symptoms of HF with preserved LVEF. Most commonly associated with a nondilated LV chamber. May be the result of valvular disease or other causes (Section 11).
"Myocardial Remodeling"	Pathologic myocardial hypertrophy or dilation in response to increased myocardial stress. These changes are generally accompanied by pathologic changes in the cardiac interstitium. Myocardial remodeling is generally a progressive disorder.

Recommendations for Patients With Risk Factors for Ventricular Remodeling, Cardiac Dysfunction, and Heart Failure

3.1 A careful and thorough clinical assessment, with appropriate investigation for known or potential risk factors, is recommended in an effort to prevent development of LV remodeling, cardiac dysfunction, and HF. These risk factors include, but are not limited to, hypertension, hyperlipidemia, atherosclerosis, diabetes mellitus, valvular disease, obesity, physical inactivity, excessive alcohol intake, and smoking. (Strength of Evidence = A)

3.2 The recommended goals for the management of specific risk factors for the development of cardiac dysfunction and HF are shown in Table 3.1.

3.3 ACE inhibitors are recommended for prevention of HF in patients at high risk of this syndrome, including those with coronary artery disease, peripheral vascular disease, or stroke. Patients with diabetes and another major risk factor or patients with diabetes who smoke or have microalbuminuria are also at high risk and should receive ACE inhibitors. (Strength of Evidence = A)

3.4 β-blockers are recommended for patients with prior MI to reduce mortality, recurrent MI, and the development of HF. (Strength of Evidence = A)

Section 4: Evaluation of Patients for Ventricular Dysfunction and Heart Failure

Patients undergoing evaluation for ventricular dysfunction and HF fall into 3 general groups: (1) patients at risk of developing HF, (2) patients suspected of having HF based on signs and symptoms or incidental evidence of abnormal cardiac structure or function, and (3) patients with symptomatic HF.

Table 3.1. Goals for the Management of Risk Factors for the Development of HF

Risk Factor	Population	Treatment Goal	Strength of Evidence
Hypertension	No diabetes or renal disease	<140/90 mm Hg	A
	Diabetes	<130/80 mm Hg	A
	Renal insufficiency >1 g/day of proteinuria	125/75	A
	Renal insufficiency ≤1 g/day of proteinuria	130/85	A
Diabetes	See American Diabetes Association (ADA) Guideline		
Hyperlipidemia	See National Cholesterol Education Program (NCEP) Guideline		
Physical inactivity	Everyone	Sustained aerobic activity 20–30 minutes, 3–5 times weekly	B
Obesity	Everyone BMI ≥30	Weight reduction BMI <30	C
Excessive alcohol intake	Men	Limit alcohol intake to 1–2 drink equivalents per day (Table 3.3)	C
	Women	1 drink equivalent per day	
	Those with propensity to abuse alcohol or with alcoholic cardiomyopathy	Abstention	
Smoking	Everyone	Cessation	A
Dietary sodium	Everyone	Maximum 2–3 g of sodium per day (see Table 3.2)	B
	Everyone	Diet high in K+/calcium	B

Evaluation of Patients at Risk

Patients identified as at risk for HF require aggressive management of modifiable risk factors. Patients with risk factors may have undetected abnormalities of cardiac structure or function. In addition to risk factor reduction, these patients require careful assessment for the presence of symptoms of HF and, depending on their underlying risk, may warrant noninvasive evaluation of LV structure and function.

4.1 Evaluation with a routine history, physical examination, chest x-ray, and electrocardiogram (ECG) is recommended in patients with the medical conditions or test findings listed in Table 4.1. (Strength of Evidence = B)

4.2 Assessment of Cardiac Structure and Function. Echocardiography with Doppler is recommended to determine LV size and function in patients without signs or symptoms suggestive of HF who have the risk factors listed in Table 4.2. (Strength of Evidence = B)

Table 4.1. Indications for Evaluation of Patients at Risk for HF

Conditions	Hypertension
	Diabetes
	Obesity
	Coronary artery disease (eg, after MI, revascularization)
	Peripheral arterial disease or cerebrovascular disease
	Valvular heart disease
	Family history of cardiomyopathy in a first-degree relative
	History of exposure to cardiac toxins
	Sleep-disordered breathing
Test Findings	Sustained arrhythmias
	Abnormal ECG (eg, LVH, left bundle branch block, pathologic Q waves)
	Cardiomegaly on chest X-ray

4.3 Determination of plasma B-type natriuretic peptide (BNP) or N-terminal pro-BNP concentration is not recommended as a routine part of the evaluation for structural heart disease in patients at risk but without signs or symptoms of HF. (Strength of Evidence = B)

Evaluation of Patients Suspected of Having HF

The evaluation of patients suspected of having HF focuses on interpretation of signs and symptoms that have led to the consideration of this diagnosis. A careful history and physical examination, combined with evaluation of cardiac structure and function, should be undertaken to determine the cause of symptoms and to evaluate the degree of underlying cardiac pathology.

4.4 Symptoms Consistent with HF. The symptoms listed in Table 4.3 suggest the diagnosis of HF. It is recommended that each of these symptoms be solicited and graded in all patients in whom the diagnosis of HF is being considered. (Strength of Evidence = B)

4.5 Physical Examination. It is recommended that patients suspected of having HF undergo careful physical

Table 4.2. Risk Factors Indicating the Need to Assess Cardiac Structure and Function in Patients at Risk for HF

Coronary artery disease (eg, after MI, revascularization)
Valvular heart disease
Family history of cardiomyopathy in a first-degree relative
Atrial fibrillation or flutter
Electrocardiographic evidence of LVH, left bundle branch block, or pathologic Q waves
Complex ventricular arrhythmia
Cardiomegaly, S3 gallop, or potentially significant heart murmurs by physical examination

Table 4.3. Symptoms Suggesting the Diagnosis of HF

Symptoms	Dyspnea at rest or on exertion
	Reduction in exercise capacity
	Orthopnea
	Paroxysmal nocturnal dyspnea or nocturnal cough
	Edema
	Ascites or scrotal edema
Less specific presentations of HF	Early satiety, nausea and vomiting, abdominal discomfort
	Wheezing or cough
	Unexplained fatigue
	Confusion/delirium

examination with determination of vital signs and be carefully evaluated for signs and symptoms shown in Table 4.4. (Strength of Evidence = C)

4.6 It is recommended that BNP or NT-proBNP levels be assessed in all patients suspected of having HF when the diagnosis is not certain. (Strength of Evidence = B)

4.7 The differential diagnoses in Table 4.5 should be considered as alternative explanations for signs and symptoms consistent with HF. (Strength of Evidence = C)

Initial Evaluation of Patients With HF

The evaluation of patients with an established diagnosis of HF is undertaken to identify the etiology, assess symptom nature and severity, determine functional impairment, and establish a prognosis. Follow-up of patients with HF or ventricular dysfunction involves continuing reassessment of symptoms, functional capacity, prognosis, and therapeutic effectiveness.

4.8 It is recommended that patients with a diagnosis of HF undergo evaluation as outlined in Table 4.6. (Strength of Evidence = C)

Table 4.4. Signs to Evaluate in Patients Suspected of Having HF

Cardiac Abnormality	Sign
Elevated cardiac filling pressures and fluid overload	Elevated jugular venous pressure
	S3 gallop
	Rales
	Hepatojugular reflux
	Ascites
	Edema
Cardiac enlargement	Laterally displaced or prominent apical impulse
	Murmurs suggesting valvular dysfunction

Table 4.5. Differential Diagnosis for HF Symptoms and Signs

Myocardial ischemia
Pulmonary disease (pneumonia, asthma, chronic obstructive pulmonary disease, pulmonary embolus, primary pulmonary hypertension)
Sleep-disordered breathing
Obesity
Deconditioning
Malnutrition
Anemia
Hepatic failure
Renal failure
Hypoalbuminemia
Venous stasis
Depression
Anxiety and hyperventilation syndromes

Table 4.6. Initial Evaluation of Patients With a Diagnosis of HF

Assess clinical severity of HF by history and physical examination
Assess cardiac structure and function
Determine the etiology of HF
Evaluate for coronary disease and myocardial ischemia
Evaluate the risk of life-threatening arrhythmia
Identify any exacerbating factors for HF
Identify comorbidities which influence therapy
Identify barriers to adherence and compliance

4.9 Symptoms. In addition to symptoms characteristic of HF, the following symptoms should be considered in the diagnosis of HF:

- Angina
- Symptoms of possible cerebral hypoperfusion, including syncope, presyncope, or lightheadedness
- Symptoms suggestive of embolic events
- Symptoms suggestive of sleep-disordered breathing (Strength of Evidence = C)

4.10 It is recommended that the severity of clinical disease and functional limitation be evaluated and recorded and the ability to perform typical daily activities be determined. This evaluation may be graded by metrics such as New York Heart Association (NYHA) functional class (Strength of Evidence = A) or by the 6-minute walk test (Strength of Evidence = C).

4.11 The degree of volume excess is a key consideration during treatment. It is recommended that it be routinely assessed by determining:

- Presence of paroxysmal nocturnal dyspnea or orthopnea
- Daily weights and vital signs with assessment for orthostatic changes
- Presence and degree of rales, S3 gallop, jugular venous pressure elevation, positive hepatojugular reflux, edema, and ascites (Strength of Evidence = B)

4.12 It is recommended that the following laboratory tests be obtained routinely in patients being evaluated for HF: serum electrolytes, blood urea nitrogen, creatinine, glucose, calcium, magnesium, lipid profile (low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, triglycerides), complete blood count, serum albumin, liver function tests, urinalysis, and thyroid function. (Strength of Evidence = B)

4.13 It is recommended that all patients with HF have an ECG performed to:

- assess cardiac rhythm and conduction
- detect LV hypertrophy
- evaluate QRS duration, especially when ejection fraction (EF) < 35%
- detect evidence of myocardial infarction or ischemia (Strength of Evidence = B)

4.14 It is recommended that all patients with HF have a posteroanterior and lateral chest X-ray examination for determination of heart size, evidence of fluid overload, and detection of pulmonary and other diseases. (Strength of Evidence = B)

4.15 It is recommended that patients with no apparent etiology of HF or no specific clinical features suggesting unusual etiologies undergo additional directed blood and laboratory studies to determine the cause of HF. (Strength of Evidence = C)

4.16 Exercise testing is not recommended as part of routine evaluation in patients with HF.
Specific circumstances in which maximal exercise testing with measurement of expired gases should be considered include:

- Assessing disparity between symptomatic limitation and objective indicators of disease severity
- Distinguishing non–HF-related causes of functional limitation, specifically cardiac versus pulmonary
- Considering candidacy for cardiac transplantation or mechanical intervention
- Determining the prescription for cardiac rehabilitation
- Addressing specific employment capabilities

Exercise testing for inducible abnormality in myocardial perfusion or wall motion abnormality should be considered to screen for the presence of coronary artery disease with inducible ischemia. (Strength of Evidence = C)

4.17 Routine endomyocardial biopsy is not recommended in cases of new-onset HF. Endomyocardial biopsy should be considered in patients with rapidly progressive clinical HF or ventricular dysfunction, despite appropriate medical therapy. Endomyocardial biopsy also should be considered in patients suspected of having myocardial infiltrative processes, such as sarcoidosis or amyloidosis, or in patients with malignant arrhythmias out of proportion to LV dysfunction, when sarcoidosis and giant cell myocarditis are considerations. (Strength of Evidence = C)

4.18 It is recommended that clinical evaluation at each follow-up visit include the assessments listed in Table 4.9. (Strength of Evidence = B)

Table 4.9. Elements to Determine at Follow-Up Visits of HF Patients

Functional capacity and activity level
Changes in body weight
Patient understanding of and compliance with dietary sodium restriction
Patient understanding of and compliance with medical regimen
History of arrhythmia, syncope, presyncope, or palpitation
Compliance and response to therapeutic interventions
The presence or absence of exacerbating factors for HF, including worsening ischemic heart disease, hypertension, and new or worsening valvular disease

These assessments should include the same symptoms and signs assessed during the initial evaluation. (Strength of Evidence = C)

4.19 Routine reevaluation of cardiac function by noninvasive or invasive methods is not recommended. Repeat measurements of ventricular volume and EF should be considered under limited circumstances:

- After at least 3 months of medical therapy when prophylactic ICD placement is being considered to confirm that EF criteria are still met. (Strength of Evidence = B)
- In patients who show substantial clinical improvement (for example, in response to β-blocker treatment). Such change may denote improved prognosis, although it does not in itself mandate alteration or discontinuation of specific treatments. (Strength of Evidence = C)

Repeat determination of EF is usually unnecessary in patients with previously documented LV dilation and low EF who manifest worsening signs or symptoms of HF. Repeat measurement should be considered when it is likely to prompt a change in patient management, such as cardiac transplantation. (Strength of Evidence = C)

4.20 It is recommended that reevaluation of electrolytes and renal function occur at least every 6 months in clinically stable patients and more frequently after changes in therapy or with evidence of change in volume status. More frequent assessment of electrolytes and renal function is recommended in patients with severe HF, those receiving high doses of diuretics, and those who are clinically unstable. (Strength of Evidence = C) (See Section 7 for recommendations regarding patients on angiotensin receptor blockers.)

Section 5: Management of Asymptomatic Patients With Reduced Left Ventricular Ejection Fraction

LV remodeling and reduced EF should be distinguished from the syndrome of clinical HF. When LVEF is reduced (<40%), but there are no signs and symptoms of HF, the condition frequently is referred to as asymptomatic LV dysfunction (ALVD). It is now well recognized that there may

be a latency period when the EF is reduced before the development of symptomatic HF. Although most attention in the HF literature has centered on patients with symptoms, evidence now indicates that ALVD is more common than overt HF. The recent realization that therapies aimed at symptomatic HF may improve outcomes in patients with ALVD has increased the importance of recognizing and treating patients with this condition.

The management of patients with ALVD focuses on controlling cardiovascular risk factors and on the prevention or reduction of progressive ventricular remodeling. Exercise, smoking cessation, hypertension control, as well as treatment with ACE inhibitors (or ARBs) and β-blockers, all have a potential role in the treatment of this syndrome.

5.1 It is recommended that all patients with ALVD exercise regularly according to a physician-directed prescription to avoid general deconditioning; to improve weight, blood pressure, and diabetes control; and to reduce cardiovascular risk. (Strength of Evidence = C)

5.2 Smoking cessation is recommended in all patients, including those with ALVD. (Strength of Evidence = B)

5.3 It is recommended that alcohol consumption be discouraged in patients with ALVD. Abstinence is recommended if there is a current habit or history of excessive alcohol intake. (Strength of Evidence = C)

5.4 It is recommended that all patients with ALVD with hypertension have aggressive blood pressure control. (Strength of Evidence = B)

5.5 ACE inhibitor therapy is recommended for asymptomatic patients with reduced LVEF (<40%). (Strength of Evidence = A)

5.6 ARBs are recommended for asymptomatic patients with reduced LVEF who are intolerant of ACE inhibitors because of cough or angioedema. (Strength of Evidence = C)

Routine use of the combination of ACE inhibitors and ARBs for prevention of HF is not recommended in this population. (Strength of Evidence = C)

5.7 It is recommended that β-blocker therapy be administered to asymptomatic patients with reduced LVEF. (Post MI, Strength of Evidence = B; non–Post MI, Strength of Evidence = C)

Section 6: Nonpharmacologic Management and Health Care Maintenance in Patients With Chronic Heart Failure

Nonpharmacologic management strategies represent an important contribution to HF therapy. They can significantly impact patient stability, functional capacity, mortality, and quality of life.

Diet and Nutrition

In addition to the primary concern of controlling body weight, dietary concerns focus on restricting salt and fluid intake.

6.1 Dietary instruction regarding sodium intake is recommended in all patients with HF. Patients with HF and diabetes, dyslipidemia, or obesity should be given specific instructions regarding carbohydrate or caloric constraints. (Strength of Evidence = B)

6.2 Dietary sodium restriction (2–3 g daily) is recommended for patients with the clinical syndrome of HF and preserved *or* depressed LVEF. Further restriction (<2 g daily) may be considered in moderate to severe HF. (Strength of Evidence = C)

6.3 Restriction of daily fluid intake to <2 L is recommended in patients with severe hyponatremia (serum sodium <130 mEq/L) and should be considered for all patients demonstrating fluid retention that is difficult to control despite high doses of diuretic and sodium restriction. (Strength of Evidence = C)

6.4 It is recommended that specific attention be paid to nutritional management of patients with advanced HF and unintentional weight loss or muscle wasting (cardiac cachexia). Measurement of nitrogen balance, caloric intake, and prealbumin may be useful in determining appropriate nutritional supplementation. Caloric supplementation is recommended. Anabolic steroids are not recommended for such patients. (Strength of Evidence = C)

6.5 Patients with HF, especially those on diuretic therapy and restricted diets, should be considered for daily multivitamin-mineral supplementation to ensure adequate intake of the recommended daily value of essential nutrients. Evaluation for specific vitamin or nutrient deficiencies is rarely necessary. (Strength of Evidence = C)

6.6 Documentation of the type and dose of nutraceutical products used by patients with HF is recommended. (Strength of Evidence = C)

Nutraceutical use is not recommended for relief of symptomatic HF or for the secondary prevention of cardiovascular events. Patients should be instructed to avoid using natural or synthetic products containing ephedra (ma huang), ephedrine, or its metabolites because of an increase risk of mortality and morbidity. Products should be avoided that may have significant drug interactions with digoxin, vasodilators, β-

blockers, antiarrhythmic drugs, and anticoagulants. (Strength of Evidence = B)

Other Therapies

6.7 Continuous positive airway pressure to improve daily functional capacity and quality of life is recommended in patients with HF and obstructive sleep apnea documented by approved methods of polysomnography. (Strength of Evidence = B)

6.8 Supplemental oxygen, either at night or during exertion, is not recommended for patients with HF in the absence of an indication from underlying pulmonary disease. Patients with resting hypoxemia or oxygen desaturation during exercise should be evaluated for residual fluid overload or concomitant pulmonary disease. (Strength of Evidence = B)

6.9 The identification of treatable conditions, such as sleep-disordered breathing, urologic abnormalities, restless leg syndrome, and depression should be considered in patients with HF and chronic insomnia. Pharmacologic aids to sleep induction may be necessary. Agents that do not risk physical dependence are preferred. (Strength of Evidence = C)

Specific Activity and Lifestyle Issues

HF is a syndrome with an enormous impact on the quality of life of patients and families. HF can affect employment, relationships, leisure activities, eating, sleeping, and sexual activity—to name just a few critical areas. Physicians have a significant opportunity to improve their patients' quality of life by initiating discussion regarding these issues and providing education, feedback, and support.

6.10 It is recommended that screening for endogenous or prolonged reactive depression in patients with HF be conducted after diagnosis and at periodic intervals as clinically indicated. For pharmacologic treatment, selective serotonin receptor uptake inhibitors are preferred over tricyclic antidepressants, because the latter have the potential to cause ventricular arrhythmias, but the potential for drug interactions should be considered. (Strength of Evidence = B)

6.11 Nonpharmacologic techniques for stress reduction may be considered as a useful adjunct for reducing anxiety in patients with HF. (Strength of Evidence = C)

6.12 It is recommended that treatment options for sexual dysfunction be discussed openly with both male and female patients with HF.

The use of phosphodiasterase-5 inhibitors such as sildenafil may be considered for use for sexual dysfunction in patients with chronic stable HF. These agents are not recommended in patients taking nitrate preparations. (Strength of Evidence = C)

Health Care Maintenance Issues

6.13 It is recommended that patients with HF be advised to stop smoking and to limit alcohol consumption to ≤2 standard drinks per day in men or ≤1 standard drink per day in women. Patients suspected of having an alcohol-induced cardiomyopathy should be advised to abstain from alcohol consumption. Patients suspected of using illicit drugs should be counseled to discontinue such use. (Strength of Evidence = B).

6.14 Pneumococcal vaccine and annual influenza vaccination are recommended in all patients with HF in the absence of known contraindications. (Strength of Evidence = B)

6.15 Endocarditis prophylaxis is not recommended based on the diagnosis of HF alone. Prophylaxis for dental and other procedures should be given according to standard clinical indications. (Strength of Evidence = C)

6.16 Nonsteroidal anti-inflammatory drugs, including cyclooxygenase-2 inhibitors, are not recommended in patients with chronic HF. The risk of renal failure and fluid retention is markedly increased in the setting of reduced renal function or ACE inhibitor therapy. (Strength of Evidence = B)

6.17 It is recommended that patients with new- or recent-onset HF be assessed for employability after a reasonable period of clinical stabilization. An objective assessment of functional exercise capacity is useful in this determination. (Strength of Evidence = B)

6.18 It is recommended that patients with chronic HF who are employed and whose job description is compatible with their prescribed activity level be encouraged to remain employed, even if a temporary reduction in hours worked or task performed is required. Retraining should be considered and supported for patients with a job demanding a level of physical exertion exceeding recommended levels. (Strength of Evidence = B)

Section 7: Heart Failure in Patients With Left Ventricular Systolic Dysfunction

There are 3 primary issues that must be considered when treating HF patients with LV systolic dysfunction: (1) improving symptoms and quality of life, (2) slowing the progression of cardiac and peripheral dysfunction, and (3) reducing mortality. General measures, such as salt restriction, weight loss, lipids control, and other nonpharmacologic measures are addressed in Section 6. Pharmacologic approaches to symptom control, including diuretics,

vasodilators, intravenous inotropic drugs, anticoagulants, and antiplatelet agents, are discussed at the end of this section.

Two classes of agents have become the recommended cornerstone of therapy to delay or halt progression of cardiac dysfunction and improve mortality: ACE inhibitors and β-blockers. Even though these agents are underused in the treatment of HF, new classes of agents have been added that show an impact on mortality, complicating decisions about optimal pharmacologic therapy. These include ARBs, aldosterone antagonists, and the combination of hydralazine and an oral nitrate.

ACE Inhibitors

There is compelling evidence that ACE inhibitors should be used to inhibit the renin-angiotensin system in all HF patients with LV systolic dysfunction, whether or not they are symptomatic. Several large clinical trials have demonstrated improvement in morbidity and mortality in HF patients with LV dysfunction, both chronically and post-MI.[29–31]

7.1 ACE inhibitors are recommended for routine administration to symptomatic and asymptomatic patients with LVEF ≤40%. (Strength of Evidence = A)
ACE inhibitors should be titrated to doses used in clinical trials, as tolerated during concomitant uptitration of β-blockers. (Strength of Evidence = C)

7.2 It is recommended that other therapy be substituted for ACE inhibitors in the following circumstances:

- In patients who cannot tolerate ACE inhibitors because of cough, ARBs are recommended. (Strength of Evidence = A)
- The combination of hydralazine and an oral nitrate may be considered in such patients not tolerating ARB therapy. (Strength of Evidence = C)
- Patients intolerant to ACE inhibitors because of hyperkalemia or renal insufficiency are likely to experience the same side effects with ARBs. In these cases, the combination of hydralazine and an oral nitrate should be considered. (Strength of Evidence = C)

β-Adrenergic Receptor Blockers

β-blocker therapy remains a major advance in the treatment of patients with LV systolic dysfunction. Along with ACE inhibitors, this class of drug is now established as routine therapy in patients with LV systolic dysfunction. This therapy is well tolerated by a large majority of patients with HF, even those with comorbid conditions such as diabetes mellitus, chronic obstructive lung disease, and peripheral vascular disease.

7.3 β-blockers shown to be effective in clinical trials of patients with HF are recommended for patients with an LVEF ≤40%. (Strength of Evidence = A)

7.4 The combination of a β-blocker and an ACE inhibitor is recommended as routine therapy for asymptomatic patients with an LVEF ≤40%. (Post MI: Strength of Evidence = B; non–post-MI: Strength of Evidence = C)

7.5 β-blocker therapy is recommended for patients with a recent decompensation of HF after optimization of volume status and successful discontinuation of intravenous diuretics and vasoactive agents, including inotropic support. Whenever possible, β-blocker therapy should be initiated in the hospital setting at a low dose before discharge in stable patients. (Strength of Evidence = B)

7.6 β-blocker therapy is recommended in the great majority of patients with LV systolic dysfunction, even if there is concomitant diabetes, chronic obstructive lung disease, or peripheral vascular disease. β-blocker therapy should be used with caution in patients with diabetes with recurrent hypoglycemia, asthma, or resting limb ischemia. Considerable caution should be used if β-blockers are initiated in patients with marked bradycardia (<55 beats/min) or marked hypotension (systolic blood pressure <80 mm Hg). β-blockers are not recommended in patients with asthma with active bronchospasm. (Strength of Evidence = C)

7.7 It is recommended that β-blockade be initiated at low doses and uptitrated gradually, typically no sooner than at 2-week intervals. Doses found to be effective in HF trials generally are achieved in 8 to 12 weeks. Patients developing worsening HF symptoms or other side effects during titration may require a dosage adjustment of diuretic or concomitant vasoactive medications. If side effects resolve with medication adjustment, patients can subsequently be titrated to target or maximally tolerated doses. Some patients may require a more prolonged interval during uptitration, a temporary reduction in β-blocker dose, or, in rare cases, withdrawal of therapy. (Strength of Evidence = B)

7.8 It is recommended that β-blocker therapy be continued in most patients experiencing a symptomatic exacerbation of HF during chronic maintenance treatment. (Strength of Evidence = C)

A temporary reduction of dose in this setting may be considered. Abrupt discontinuation in patients with symptomatic exacerbation should be avoided. (Strength of Evidence = C) If discontinued or reduced, β-blockers should be reinstated or the dose should be gradually increased before the patient is discharged.

7.9 It is recommended that patients in whom difficulty is encountered in initiating, uptitrating or maintaining β-blocker therapy be referred to clinicians with special expertise in HF. (Strength of Evidence = B)

Angiotensin Receptor Blockers (ARBs)

Both ACE inhibitors and ARBs inhibit the renin-angiotensin-aldosterone system, but by different mechanisms. ACE inhibitors block the enzyme responsible for converting angiotensin I to angiotensin II and for degrading various kinins. However, during chronic therapy, angiotensin II levels are not completely suppressed by ACE inhibitors. ARBs block the effects of angiotensin II on the AT1 receptor, independent of the source of angiotensin II production. The addition of ARBs to ACE inhibitors in patients with chronic HF might provide additional blockade of the renin-angiotensin-aldosterone system, and clinical trials demonstrate added therapeutic benefit. ARBs have been demonstrated to be well tolerated in randomized trials of patients judged to be intolerant of ACE inhibitors by their clinicians, although these primarily reflect intolerance from cough, skin rashes, and angioedema. Both drugs have similar effects on blood pressure, renal function, and potassium.

7.10 ARBs are recommended for routine administration to symptomatic and asymptomatic patients with an LVEF ≤40% who are intolerant to ACE inhibitors for reasons other than hyperkalemia or renal insufficiency. (Strength of Evidence = A)

7.11 Individual ARBs may be considered as initial therapy rather than ACE inhibitors for patients with the following conditions:

- HF post MI (Strength of Evidence = A)
- Chronic HF and systolic dysfunction (Strength of Evidence = B)

7.12 ARBs should be considered in patients experiencing angioedema while on ACE inhibitors based on their underlying risk and with recognition that angioedema has been reported infrequently with these agents. (Strength of Evidence = B)

The combination of hydralazine and oral nitrates may be considered in this setting in patients who do not tolerate ARB therapy. (Strength of Evidence = C)

7.13 The routine administration of an ARB is not recommended in addition to ACE inhibitor and β-blocker therapy in patients with recent acute MI and LV dysfunction. (Strength of Evidence = A)

Aldosterone Antagonists

Sustained activation of aldosterone appears to play an important role in the pathophysiology of HF.[32,33] Although ACE inhibition may transiently decrease aldosterone secretion, there are diverse stimuli other than angiotensin II for the production of this hormone.[34] Studies suggest a rapid return of aldosterone to levels similar to those before ACE inhibition.[35] Aldosterone-receptor blockers have been shown to be effective in post MI HF patients already on standard therapy. The selective aldosterone antagonist, eplerenone avoids some of the potential side effects of spironolactone, but creatinine clearance and potassium must be carefully monitored.

7.14 Administration of an aldosterone antagonist is recommended for patients with NYHA class IV or class III, previously class IV, HF from LV systolic dysfunction (LVEF ≤35%) while receiving standard therapy, including diuretics. (Strength of Evidence = A)

7.15 Administration of an aldosterone antagonist should be considered in patients after an acute MI, with clinical HF signs and symptoms and an LVEF <40%. Patients should be on standard therapy, including an ACE inhibitor (or ARB) and a β-blocker. (Strength of Evidence = A)

7.16 Aldosterone antagonists are not recommended when creatinine is >2.5 mg/dL (or creatinine clearance is <30 mL/min) or serum potassium is >5.0 mmol/L or in conjunction with other potassium-sparing diuretics. (Strength of Evidence = A)

7.17 It is recommended that serum potassium concentration be monitored frequently following initiation or change in an aldosterone antagonist. Monitoring should reflect protocols followed in clinical trials. (Strength of Evidence = A)

7.18 In the absence of persistent hypokalemia (<4.0 mmol/L), supplemental potassium is not recommended in patients taking an aldosterone antagonist. (Strength of Evidence = A)

Hydralazine and Oral Nitrates

7.19 A combination of hydralazine and isosorbide dinitrate is recommended as part of standard therapy in addition to β-blockers and ACE inhibitors for African Americans with LV systolic dysfunction.

- NYHA III or IV HF (Strength of Evidence = A)
- NYHA II HF (Strength of Evidence = B) (See Section 15—Special Populations)

7.20 A combination of hydralazine and isosorbide dinitrate may be considered in non–African American patients with LV systolic dysfunction who remain symptomatic despite optimized standard therapy. (Strength of Evidence = C)

Polypharmacy

Polypharmacy is required for optimal management to slow progression and improve outcome in patients with LV systolic dysfunction. An ACE inhibitor plus a β-blocker

is standard background therapy. An ARB can be substituted for an ACE inhibitor if indicated or desired. An ARB can be added to an ACE inhibitor in individuals in whom β-blocker is contraindicated or not tolerated. The optimal choice of additional drug therapy to further improve outcome in patients already treated with 2 of these 3 drugs is not firmly established. The choice among agents may be influenced by the patient's age, renal function, serum potassium, racial background, and severity of the clinical syndrome. Certain combinations require careful monitoring.

7.21 Additional pharmacologic therapy should be considered in patients with HF due to systolic dysfunction who have persistent symptoms or progressive worsening despite optimized therapy with an ACE inhibitor and β-blocker. The choice of specific agent will be influenced by clinical considerations, including renal function status, chronic serum potassium concentration, blood pressure, and volume status. The triple combination of an ACE inhibitor, an ARB, and an aldosterone antagonist is not recommended because of the high risk of hyperkalemia. (Strength of Evidence = C)

- Addition of an ARB. (Strength of Evidence = A)
- Addition of an aldosterone antagonist:
  - For severe HF (Strength of Evidence = A)
  - For moderate HF (Strength of Evidence = C)
- Addition of the combination of hydralazine/isosorbide dinitrate:
  - For African Americans (Strength of Evidence = A)
  - For others (Strength of Evidence = C)

7.22 Additional pharmacological therapy should be considered in patients with HF due to systolic dysfunction *who are unable to tolerate a β blocker* and have persistent symptoms or progressive worsening despite optimized therapy with an ACE inhibitor. The choice of specific agent will be influenced by clinical considerations, including renal function status, chronic serum potassium concentration, blood pressure and volume status. The triple combination of an ACE inhibitor, an ARB, and an aldosterone antagonist is not recommended due to the high risk of hyperkalemia. (Strength of Evidence = C)

- Addition of an ARB. (Strength of Evidence = C)
- Addition of an aldosterone antagonist:
  - for severe HF (Strength of Evidence = C)
  - for moderate HF (Strength of Evidence = C)
- Addition of the combination of hydralazine/isosorbide dinitrate:
  - for African-Americans (Strength of Evidence = C)
  - for others (Strength of Evidence = C)

Diuretic Therapy

Loop and distal tubular diuretics are necessary adjuncts in the medical therapy for HF when symptoms are due to sodium and water retention. Diuretics reduce congestive symptoms and signs and can be titrated as needed to restore euvolemia and to reach an estimated "dry" weight goal for the patient. Relief of signs and symptoms must be achieved without causing side effects, particularly symptomatic hypotension or worsening renal function. Loop diuretics, which act on the ascending limb of the renal medullary loop of Henle, are considered the diuretic class of choice for the treatment of HF.

7.23 Diuretic therapy is recommended to restore and maintain normal volume status in patients with clinical evidence of fluid overload, generally manifested by congestive symptoms (orthopnea, edema, and shortness of breathx) or signs of elevated filling pressures (jugular venous distention, peripheral edema, pulsatile hepatomegaly, and, less commonly, rales). (Strength of Evidence = A)

Loop diuretics rather than thiazide-type diuretics are typically necessary to restore normal volume status in patients with HF. (Strength of Evidence = B)

7.24 The initial dose of diuretic may be increased as necessary to relieve congestion. Restoration of normal volume status may require multiple adjustments over many days and occasionally weeks in patients with severe fluid overload evidenced by massive edema or ascites. After a diuretic effect is achieved with short-acting loop diuretics, increasing administration frequency to twice or even 3 times per day will provide more diuresis with less physiologic perturbation than larger single doses. (Strength of Evidence = B)

Oral torsemide may be considered in patients in whom poor absorption of oral medication or erratic diuretic effect may be present, particularly those with right-sided HF and refractory fluid retention despite high doses of other loop diuretics. (Strength of Evidence = C)

Intravenous administration of diuretics may be necessary to relieve congestion. (Strength of Evidence = A) Diuretic refractoriness may represent patient noncompliance, a direct effect of diuretic use on the kidney, or progression of underlying cardiac dysfunction.

7.25 Addition of chlorothiazides or metolazone, once or twice daily, to loop diuretics should be considered in patients with persistent fluid retention despite high-dose loop diuretic therapy. But chronic daily use, especially of metolazone, should be avoided if possible because of the potential for electrolyte shifts and volume depletion. These drugs may be used periodically (every other day or weekly) to optimize fluid management. Metolazone will generally be more potent and much longer acting in this setting and in patients with chronic renal insufficiency; therefore,

administration should be adjusted accordingly. Volume status and electrolytes must be monitored closely when multiple diuretics are used. (Strength of Evidence = C)

7.26 Careful observation for the development of side effects, including electrolyte abnormalities, symptomatic hypotension, and renal dysfunction, is recommended in patients treated with diuretics, especially when used at high doses and in combination. Patients should undergo routine laboratory studies and clinical examination as dictated by their clinical response. (Strength of Evidence = B)

7.27 Patients requiring diuretic therapy to treat fluid retention associated with HF generally require chronic treatment, although often at lower doses than those required initially to achieve diuresis. Decreasing or even discontinuing diuretics may be considered in patients experiencing significant improvement in clinical status and cardiac function or in those who successfully restrict dietary sodium intake. These patients may undergo cautious weaning of diuretic dose and frequency with careful observation for recurrent fluid retention. (Strength of Evidence = C)

7.28 It is recommended that patients and caregivers be given education that will enable them to demonstrate understanding of the early signs of fluid retention and the plan for initial therapy. (Strength of Evidence = C)

Selected patients may be educated to adjust daily dose of diuretic in response to weight gain from fluid overload (typically short-term weight gain of 2–4 lb). (Strength of Evidence = C)

Digoxin

Although little controversy exists as to the benefit of digoxin in patients with symptomatic LV systolic dysfunction and concomitant atrial fibrillation, the debate continues over its role in patients with normal sinus rhythm.

7.29 Digoxin should be considered for patients with LV systolic dysfunction (LVEF ≤40%) who have signs or symptoms of HF while receiving standard therapy, including ACE inhibitors and β-blockers:

- NYHA class II-III (Strength of Evidence = A)
- NYHA class IV (Strength of Evidence = B)

7.30 It is recommended that the dose of digoxin, which should be based on lean body mass, renal function and concomitant medications, should be 0.125 mg daily in the majority of patients and the serum digoxin level should be <1.0 ng/mL. (Strength of Evidence = C)

7.31 Adequate control of the ventricular response to atrial fibrillation in patients with HF is recommended. (Level of Evidence = B)

7.32 High doses of digoxin (maintenance dose >0.25 mg daily) for the purpose of rate control are not recommended. (Strength of Evidence = C)

Anticoagulants and Antiplatelets

Patients with HF are recognized to be at increased risk for arterial or venous thromboembolic events. In addition to atrial fibrillation and poor ventricular function, which promote stasis and increase the risk of thrombus formation, patients with HF have other manifestations of hypercoagulability. Evidence of heightened platelet activation, increased plasma and blood viscosity, and increased plasma levels of fibrinopeptide A, β-thromboglobulin, D-dimer, and von Willebrand factor have been found in many patients.[36–38] Though data are scarce or conflicting, warfarin, aspirin, and clopidogrel all have potential roles in therapy for HF patients at risk for thromboembolic events.

7.33 Treatment with warfarin (goal INR 2.0–3.0) is recommended for all patients with HF and chronic or documented paroxysmal atrial fibrillation (Strength of Evidence = A) or a history of systemic or pulmonary emboli, including stroke or transient ischemic attack, (Strength of Evidence = C) unless contraindicated.

7.34 It is recommended that patients with symptomatic or asymptomatic ischemic cardiomyopathy and documented recent large anterior MI or recent MI with documented LV thrombus be treated with warfarin (goal INR 2.0–3.0) for the initial 3 months after MI (Strength of Evidence B) unless contraindicated.

Other patients with ischemic or nonischemic cardiomyopathy and LV thrombus should be considered for chronic anticoagulation, depending on the characteristics of the thrombus, such as its size, mobility, and degree of calcification. (Strength of Evidence C)

7.35 In the absence of the indications included in Recommendations 7.33 and 7.34, warfarin anticoagulation may be considered in patients with dilated cardiomyopathy and LVEF ≤35%. Careful assessment of the potential risks and benefits should be undertaken in individual patients. (Strength of Evidence = C)

7.36 Long-term treatment with an antithrombotic agent is recommended for patients with HF from ischemic cardiomyopathy, whether or not they are receiving ACE inhibitors. (Strength of Evidence = B)

Aspirin is recommended in most patients for whom anticoagulation is not specifically indicated because of its proven efficacy in non-HF patients with ischemic

heart disease, its convenience, and lower cost. Lower doses of aspirin (75 or 81 mg) may be preferable because data from 2 trials suggest more frequent worsening of HF at higher doses. (Strength of Evidence = C)

Warfarin (goal INR 2.0–3.5) and clopidogrel (75 mg) have also prevented vascular events in post MI patients and may be considered as alternatives to aspirin. (Strength of Evidence = B)

7.37 Routine use of aspirin is not recommended in patients with HF not from ischemic cardiomyopathy and without other evidence of atherosclerotic vascular disease. (Strength of Evidence = C)

7.38 Aspirin and an ACE inhibitor in combination may be considered for patients with HF where an indication for both drugs exists. (Strength of Evidence = C) Generally the lowest effective aspirin dose (75 or 81 mg/day) should be administered in this setting. (Strength of Evidence = C)

Antiarrhythmic Agents

Ventricular arrhythmias are common in HF patients, and sudden cardiac death continues to account for a significant proportion of the mortality in this syndrome. Despite the obvious clinical need, antiarrhythmic drug therapy remains ineffective at reducing mortality in patients with HF. Furthermore, virtually all antiarrhythmic agents have been shown to have adverse hemodynamic effects sufficient to have negative consequences in patients with HF.

7.39 Antiarrhythmic agents, including amiodarone, are not recommended for the primary prevention of sudden death in patients with HF. (Strength of Evidence = A)

7.40 In patients with HF and an implantable cardioverter defibrillator (ICD), amiodarone may be considered to reduce the frequency of repetitive discharges. (Strength of Evidence = C)

7.41 It is recommended that patients taking amiodarone therapy and digoxin or warfarin generally have their maintenance doses of many commonly used agents, such as digoxin, warfarin, and statins, reduced when amiodarone is initiated and then carefully monitored for the possibility of adverse drug interactions. Adjustment in doses of these drugs and laboratory assessment of drug activity or serum concentration after initiation of amiodarone is recommended. (Strength of Evidence = A)

Section 8: Disease Management in Heart Failure

Education and Counseling

The majority of HF care is done at home by the patient and family or caregiver. If these individuals do not know what is required or fail to see its importance, they will not participate effectively in care. For this reason, comprehensive education and counseling are the foundation for all HF management. The goals of education and counseling are to help patients, their families and caregivers acquire the knowledge, skills, strategies, and motivation necessary for adherence to the treatment plan and effective participation in self-care. The inclusion of family members and other caregivers is especially important, because HF patients often suffer from cognitive impairment, functional disabilities, multiple comorbidities, and other conditions that limit their ability to fully comprehend, appreciate, or enact what they learn.[39–44]

8.1 It is recommended that patients with HF and their family members or caregivers receive individualized education and counseling that emphasizes self-care. This education and counseling should be delivered by providers using a team approach in which nurses with expertise in HF management provide the majority of education and counseling, supplemented by physician input and, when available and needed, input from dietitians, pharmacists, and other health care providers. All HF patients benefit from education and counseling, but patients in NYHA functional class III or IV need the most intensive education, whereas patients in NYHA I or II need less intensive education. (Strength of Evidence = B)

Teaching is not sufficient without skill building and specification of critical target behaviors. Essential elements of patient education to promote self-care with associated skills are shown in Table 8.1. (Strength of Evidence = B)

8.2 It is recommended that patients' literacy, cognitive status, psychologic state, culture, and access to social and financial resources be taken into account for optimal education and counseling. Because cognitive impairment and depression are common in HF and can seriously interfere with learning, patients should be screened for these. Appropriate interventions, such as supportive counseling and pharmacotherapy, are recommended for those patients found to be depressed. Patients found to be cognitively impaired need additional support to manage their HF. (Strength of Evidence = C)

8.3 It is recommended that educational sessions begin with an assessment of current HF knowledge, issues about which the patient wants to learn, and the patient's perceived barriers to change. Address specific issues (eg, medication nonadherence) and their causes (eg, lack of knowledge versus cost versus forgetting) and employ strategies that promote behavior change, including motivational approaches. (Strength of Evidence = B)

Table 8.1. Essential Elements of Patient Education With Associated Skills and Target Behaviors

Elements of Education	Skill Building and Critical Target Behaviors
Definition of HF (linking disease, symptoms, and treatment) and cause of patient's HF	Discuss basic HF information, cause of patient's HF, and how symptoms are related
Recognition of escalating symptoms and selection of appropriate treatments in response to particular symptoms	Monitor for specific signs and symptoms (eg, increasing fatigue doing usual activities, increasing shortness of breath with activity, shortness of breath at rest, need to sleep with increasing number of pillows, waking at night with shortness of breath, edema)
	Perform and document daily weights
	Develop action plan for how and when to notify the provider
	Institute flexible diuretic regimen, if appropriate
Indications and use of each medication	Reiterate medication dosing schedule, basic reason for specific medications, and what to do if a dose is missed
Importance of risk factor modification	Plan for smoking cessation
	State blood pressure goal and know own blood pressure from recent measurement
	Maintain normal HgA1c, if diabetic
	Maintain specific body weight
Specific diet recommendations: individualized low-sodium diet; recommendation for alcohol intake	Reiterate recommended sodium intake
	Demonstrate how to read a food label to check sodium amount per serving and sort foods into high- and low-sodium groups
	Reiterate limits for alcohol consumption or need for abstinence if history of alcohol abuse
Specific activity/exercise recommendations	Reiterate goals for exercise and plan for achieving
	Reiterate ways to increase activity level
Importance of treatment adherence and behavioral strategies to promote	Plan and use a medication system that promotes routine adherence
	Plan for refills

8.4 It is recommended that the frequency and intensity of patient education and counseling vary according to the stage of illness. Patients in advanced HF or with persistent difficulty adhering to the recommended regimen require the most education and counseling. Patients should be offered a variety of options for learning about HF according to their individual preferences:

- videotape
- one-on-one or group discussion
- reading materials, translators, telephone calls, mailed information
- Internet
- visits

Repeated exposure to material is essential because a single session is never sufficient. (Strength of Evidence = B)

8.5 It is recommended that during the care process patients be asked to:

- demonstrate knowledge of the name, dose, and purpose of each medication
- sort foods into high- and low-sodium categories
- demonstrate their preferred method for tracking medication dosing
- show provider daily weight log
- reiterate symptoms of worsening HF
- reiterate when to call the provider because of specific symptoms or weight changes (Strength of Evidence = B)

8.6 During acute care hospitalization, only essential education is recommended, with the goal of assisting patients to understand HF, the goals of its treatment, and post-hospitalization medication and follow up regimen. Education begun during hospitalization should be supplemented and reinforced within 1–2 weeks after discharge, continued for 3–6 months, and reassessed periodically. (Strength of Evidence = B)

Disease Management Programs

HF disease management programs fall into three broad categories: (1) HF clinics,[45–59] (2) care delivered in the home or to patients who are at home,[60–76] and (3) telemonitoring.[77–83] HF clinics are disease management programs in which service is provided primarily in an outpatient clinic setting where patients come to receive care from practitioners with expertise in HF. HF clinics provide optimization of drug therapy, patient and family/caregiver education, and counseling, emphasis on self-care, vigilant follow-up, early attention to signs and symptoms of fluid overload, coordination of care with other providers, and increased access to the health care provider. Studies of HF disease management using the clinic and home-based care models provide convincing evidence that it is possible to significantly reduce rehospitalization rates and costs and improve functional status and quality of life for HF patients.

8.7 Patients recently hospitalized for HF and other patients at high risk should be considered for referral to a comprehensive HF disease management program that delivers individualized care. High-risk patients include those with renal insufficiency, low output state, diabetes, chronic obstructive pulmonary disease, persistent NYHA class III or IV symptoms, frequent hospitalization for any cause, multiple active comorbidities, or a history of depression, cognitive impairment, or

persistent nonadherence to therapeutic regimens. (Strength of Evidence = A)

8.8 It is recommended that HF disease management programs include the components shown in Table 8.3 based on patient characteristics and needs. (Strength of Evidence = B)

Table 8.3. Recommended Components of a HF Disease Management Program

Comprehensive education and counseling individualized to patient needs
Promotion of self care, including self-adjustment of diuretic therapy in appropriate patients (or with family member/caregiver assistance)
Emphasis on behavioral strategies to increase adherence
Vigilant follow-up after hospital discharge or after periods of instability
Optimization of medical therapy
Increased access to providers
Early attention to signs and symptoms of fluid overload
Assistance with social and financial concerns

8.9 It is recommended that HF disease management include integration and coordination of care between the primary care physician and HF care specialists and with other agencies, such as home health and cardiac rehabilitation. (Strength of Evidence = C)

8.10 It is recommended that patients in a HF disease management program be followed until they or their family/caregiver demonstrate independence in following the prescribed treatment plan, adequate or improved adherence to treatment guidelines, improved functional capacity, and symptom stability. Higher risk patients with more advanced HF may need to be followed permanently. Patients who experience increasing episodes of exacerbations or who demonstrate instability after discharge from a program should be referred again to the service. (Strength of Evidence = B)

Advance Directives and End-of-Life Care

Premature death from progressive decompensated HF or sudden cardiac death is frequent in HF, which has a worse prognosis than many common cancers.[84] The high mortality rate in HF makes advance directives and end-of-life care important issues in this population. However, recent advances in HF treatment have resulted in substantial reductions in mortality when proven therapies are applied. These advances apply both to the risk of sudden death and death from progressive heart failure. It is mandatory that discussions about advance directives occur in this context and that utilization of end of life care occur after full and appropriate application of evidence-based pharmacologic and nonpharmacologic treatments. These treatments must be allowed time to be beneficial, and issues such as access to care, compliance, and knowledge about HF must be addressed. Moreover, clinicians must recognize that use of end-of-life care does not mandate abandonment of HF therapies, which may effectively ease symptoms and continue to improve quality of life. Patients with HF and their caregivers often do not appreciate the severity or terminal nature of their illness. HF is a chronic disease, but can progress to a terminal condition. When patients develop a persistent pattern of refractory HF despite aggressive medical therapy, it is important to acknowledge this development.

8.11 Patient and family or caregiver discussions about quality of life and prognosis are recommended as part of the disease management of HF. (Strength of Evidence = C)

8.12 It is recommended that the patient's status be optimized medically and psychologically before discussing the possibility that end-of-life care is indicated. The decision to declare a patient as an appropriate candidate for end-of-life care should be made by physicians experienced in the care of patients with HF. End-of-life management should be coordinated with the patient's primary care physician. As often as possible, discussions regarding end-of-life care should be initiated while the patient is still capable of participating in decision making. (Strength of Evidence = C)

8.13 End-of-life care should be considered in patients who have advanced, persistent HF with symptoms at rest despite repeated attempts to optimize pharmacologic and nonpharmacologic therapy, as evidenced by one or more of the following:

- Frequent hospitalizations (3 or more per year)
- Chronic poor quality of life with inability to accomplish activities of daily living
- Need for intermittent or continuous intravenous support
- Consideration of assist devices as destination therapy (Strength of Evidence = C)

8.14 It is recommended that end-of-life care strategies be individualized, include effective symptom management, and avoid unnecessary testing and interventions. (Strength of Evidence = C)

8.15 It is recommended that, as part of end-of life-care, patients and their families/caregivers be given specific directions concerning their response to clinical events if they decide against resuscitation. Inactivation of an implantable defibrillation device should be discussed. (Strength of Evidence = C)

8.16 It is recommended that patients with severe and unresponsive advanced HF have their wishes concerning treatment options and end-of-life care reassessed often, because decisions about resuscitation and palliative care may change over time. (Strength of Evidence = B)

8.17 Patients with HF undergoing end-of-life care may be considered for hospice services that can be delivered in the home, a hospital setting, or a special hospice unit. (Strength of Evidence = C)

8.18 Discussions about the possibility of sudden unexpected cardiac death are recommended for patients with HF. The extent and intensity of the discussion should vary according to the level of risk present. Discussions about advance directives and cardiopulmonary resuscitation, including education for family members, should be provided on an individualized basis. (Strength of Evidence = C)

Section 9: Electrophysiologic Testing and the Use of Devices in Heart Failure

Perhaps no area of HF therapy has changed more in recent years than the use of implanted devices as a treatment option. Critical issues in the selection of patients to receive these devices include the severity of the disease and the status of underlying medical therapy.

General Considerations

9.1 It is recommended that the decision to undertake electrophysiologic intervention be made in light of functional status and prognosis based on severity of underlying HF and comorbid conditions. If LV dysfunction is a reason for recommending electrophysiologic intervention, LV function should be re-assessed, ideally after 3–6 months of optimal medical therapy. (Strength of Evidence = C)

Electrophysiologic Testing and Evaluation of Syncope

9.2 Immediate evaluation is recommended in patients with HF who present with syncope. In the absence of a clear identifiable noncardiac cause, patients should be referred for electrophysiologic evaluation. (Strength of Evidence = C)

9.3 Routine electrophysiologic testing is not recommended in patients with LV systolic dysfunction who have asymptomatic nonsustained VT in the absence of prior infarction. (Strength of Evidence = B)

Prophylactic ICD Placement

9.4 In patients with or without concomitant coronary artery disease (including a prior MI >1 month ago):

a) Prophylactic ICD placement should be considered (LVEF ≤30%) and may be considered (LVEF 31–35%) for those with mild to moderate HF symptoms (NYHA II-III). (Strength of Evidence = A) See Recommendation 9.1 for additional criteria.

b) Concomitant ICD placement should be considered in patients undergoing implantation of a biventricular pacing device according to the criteria in Recommendations 9.7–9.8. (Strength of Evidence = B) See Recommendation 9.1 for additional criteria.

9.5 ICD placement is not recommended in chronic, severe refractory HF when there is no reasonable expectation for improvement. (Strength of Evidence = C)

9.6 ICD implantation is recommended for survivors of cardiac arrest from ventricular fibrillation or hemodynamically unstable sustained ventricular tachycardia without evidence of acute MI or if the event occurs more than 48 hours after the onset of infarction in the absence of a recurrent ischemic event. (Strength of Evidence = A)

Biventricular Resynchronization Pacing

9.7 Biventricular pacing therapy should be considered for patients with sinus rhythm, a widened QRS interval (≥120 ms) and severe LV systolic dysfunction (LVEF ≤35% with LV dilatation >5.5 cm) who have persistent, moderate to severe HF (NYHA III) despite optimal medical therapy. (Strength of Evidence = A)

9.8 Selected ambulatory NYHA IV patients may be considered for biventricular pacing therapy. (Strength of Evidence = B)

9.9 Biventricular pacing therapy is not recommended in patients who are asymptomatic or have mild HF symptoms. (Strength of Evidence = C)

Dual Chamber Pacemakers

9.10 The routine use of dual (atrioventricular) chamber pacemakers for HF in the absence of symptomatic bradycardia or high grade A–V block is not recommended. (Strength of Evidence = A)

Section 10: Surgical Approaches to the Treatment of Heart Failure

Despite advances in medical management of HF, there remain circumstances in which surgical procedures are the only or the best treatment option. These include heart transplantation, the longest accepted surgical therapy, and procedures that (1) repair the heart, (2) reshape it, or (3) replace all or part of heart function.

10.1 It is recommended that the decision to undertake surgical intervention for severe HF be made in light of

functional status and prognosis based on severity of underlying HF and comorbid conditions. Procedures should be done at centers with demonstrable expertise and multidisciplinary medical and surgical teams experienced in the selection, care, and perioperative and long-term management of high risk patients with severe HF. (Strength of Evidence = C)

10.2 Evaluation for heart transplantation is recommended in selected patients with severe HF, debilitating refractory angina, or ventricular arrhythmia that cannot be controlled despite drug, device, or alternative surgical therapy. (Strength of Evidence = B)

10.3 Isolated mitral valve repair or replacement for severe mitral regurgitation secondary to ventricular dilatation in the presence of severe LV systolic dysfunction is not generally recommended. (Strength of Evidence = C)

10.4 Partial left ventricular resection (''Batista procedure'') is not recommended in nonischemic cardiomyopathy. (Strength of Evidence = B)

10.5 Patients awaiting heart transplantation who have become refractory to all means of medical circulatory support should be considered for a mechanical support device as a bridge to transplant. (Strength of Evidence = B)

10.6 Permanent mechanical assistance using an implantable assist device may be considered in highly selected patients with severe HF refractory to conventional therapy who are not candidates for heart transplantation, particularly those who cannot be weaned from intravenous inotropic support at an experienced HF center. (Strength of Evidence = B)

Section 11: Evaluation and Management of Patients With Heart Failure and Preserved Left Ventricular Ejection Fraction

A substantial number of patients with HF have preserved LVEF, variably defined as an LVEF >40%, >45%, or >50%.[85,86] HF with preserved LVEF is not a distinct condition, but rather a syndrome with numerous possible causative or comorbid conditions, including hypertension, diabetes mellitus, vascular stiffness, renal impairment, and atrial fibrillation. The ventricle in HF with preserved LVEF is characterized by hypertrophy,[87] increased extracellular matrix,[88] and abnormal calcium handling with delayed relaxation.[89,90] Activation of the neurohormonal milieu, including the renin-angiotensin system and the sympathetic nervous system, is common. The diagnosis of HF with preserved LVEF can be made by the combination of (1) clinical signs and symptoms of HF and (2) findings of preserved or relatively preserved LVEF using an imaging method.

11.1 Careful attention to differential diagnosis is recommended in patients with HF and preserved LVEF to distinguish among a variety of cardiac disorders, because treatments may differ. These various entities may be distinguished based on echocardiography, electrocardiography, and stress imaging (via exercise or pharmacologic means using myocardial perfusion or echocardiographic imaging). See algorithm in Figure 11.1 for a detailed approach to differential diagnosis. (Strength of Evidence = C)

11.2 Evaluation for the possibility of ischemic heart disease and inducible myocardial ischemia is recommended in patients with HF and preserved LVEF. (Strength of Evidence = C)

11.3 Aggressive blood pressure management is recommended in patients with HF and preserved LVEF (Section 14, Recommendation 14.15). (Strength of Evidence = C)

11.4 Counseling on the use of a low-sodium diet (Section 6) is recommended for all patients with HF, including those with preserved LVEF. (Strength of Evidence = C)

11.5 Diuretic treatment is recommended in all patients with HF and clinical evidence of volume overload, including those with preserved LVEF. Treatment may begin with either a thiazide or loop diuretic. In more severe volume overload or if response to a thiazide is inadequate, treatment with a loop diuretic should be implemented. Excessive diuresis, which may lead to orthostatic changes in blood pressure and worsening renal function, should be avoided. (Strength of Evidence = C)

11.6 ARBs or ACE inhibitors should be considered in patients with HF and preserved LVEF. (Strength of evidence = B)

- ARBs (Strength of Evidence = B)
- ACE inhibitors (Strength of Evidence = C)

11.7 ACE inhibitors should be considered in all patients with HF and preserved LVEF who have symptomatic atherosclerotic cardiovascular disease or diabetes and 1 additional risk factor. (Strength of Evidence = C) In patients who meet these criteria but are intolerant to ACE inhibitors, ARBs should be considered. (Strength of Evidence = C)

11.8 β-blocker treatment is recommended in patients with HF and preserved LVEF who have:

- Prior MI (Strength of Evidence = A)
- Hypertension (see Section 14) (Strength of Evidence = B)
- Atrial fibrillation requiring control of ventricular rate (Strength of Evidence = B)

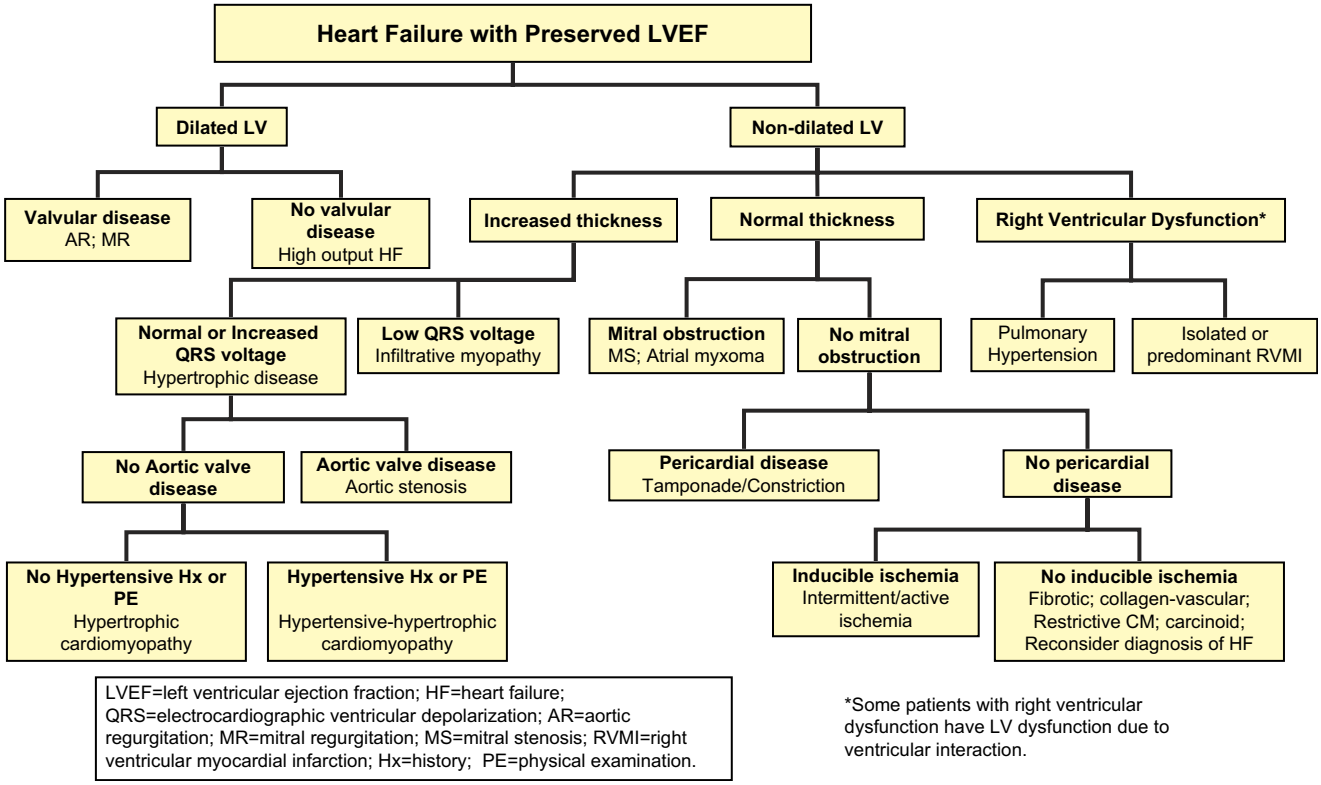

Fig. 11.1. Diagnostic categories of HF with preserved LVEF. This figure provides an algorithm for refining the diagnosis. (Figure courtesy of Marvin A. Konstam, MD, and Marvin W. Kronenberg, MD.)

11.9 Calcium channel blockers should be considered in patients with:

- Atrial fibrillation requiring control of ventricular rate in whom β-blockers have proven inadequate for this purpose because of intolerance. In these patients, diltiazem or verapamil should be considered. (Strength of Evidence = C)
- Symptom-limiting angina. (Strength of Evidence = A)
- Hypertension. Amlodipine should be considered. (Strength of Evidence = C)

11.10 Measures to restore and maintain sinus rhythm should be considered in patients who have symptomatic atrial flutter-fibrillation, but this decision should be individualized. (Strength of Evidence = C)

Section 12: Evaluation and Management of Patients With Acute Decompensated Heart Failure

Studies demonstrate that the majority of patients hospitalized with HF have evidence of systemic hypertension on admission and commonly have preserved LVEF. Most hospitalized patients have significant volume overload, and congestive symptoms predominate. Patients with severely impaired systolic function, reduced blood pressure, and symptoms resulting from poor end-organ perfusion are in the distinct minority. Natural history studies have shown that acute decompensated HF (ADHF) represents a period of high risk for patients, during which their likelihood of death and rehospitalization is significantly greater than for a comparable period of chronic, but stable HF.[91]

There is a paucity of controlled clinical trial data to define optimal treatment for patients with acute HF. The few trials conducted have focused primarily on symptom relief, not outcomes, and have mainly enrolled patients with reduced EF who were not hypertensive.

Relief of congestion and volume overload generally is accomplished with sodium and fluid restriction and the use of diuretics. Intravenous vasodilators may be added. Agents to consider for the improvement of hemodynamic parameters include intravenous nitroglycerin, sodium nitroprusside, and nesiritide. The use of inotropes should be severely limited. Discharge evaluation and planning for follow-up are important factors in reducing readmission.

12.1 The diagnosis of decompensated HF should be based primarily on signs and symptoms. (Strength of Evidence = C)

When the diagnosis is uncertain, determination of BNP or NT-proBNP concentration should be considered in patients being evaluated for dyspnea who have signs and symptoms compatible with HF. (Strength of Evidence = A)

The natriuretic peptide concentration should not be interpreted in isolation, but in the context of all available clinical data bearing on the diagnosis of HF.

12.2 Hospital admission is recommended for patients presenting with ADHF when the clinical circumstances listed in Table 12.1 (a) are present.

Patients presenting with ADHF should be considered for hospital admission when the clinical circumstances listed in Table 12.1 (b) are present. (Strength of Evidence = C)

Table 12.1. Recommendations for Hospitalizing Patients Presenting With ADHF

Recommendation	Clinical Circumstances
(a) Hospitalization Recommended	Evidence of severely decompensated HF, including: • Hypotension • Worsening renal function • Altered mentation Dyspnea at rest • Typically reflected by resting tachypnea • Less commonly reflected by oxygen saturation <90% Hemodynamically significant arrhythmia • Including new onset of rapid atrial fibrillation Acute coronary syndromes
(b) Hospitalization Should Be Considered	Worsened congestion • Even without dyspnea • Typically reflected by a weight gain ≥5 kilograms Signs and symptoms of pulmonary or systemic congestion • Even in the absence of weight gain Major electrolyte disturbance Associated comorbid conditions • Pneumonia • Pulmonary embolus • Diabetic ketoacidosis • Symptoms suggestive of transient ischemic accident or stroke Repeated ICD firings Previously undiagnosed HF with signs and symptoms of systemic or pulmonary congestion

12.3 It is recommended that patients admitted with ADHF be treated to achieve the goals listed in Table 12.3. (Strength of Evidence = C)

Table 12.3. Treatment Goals for Patients Admitted for ADHF

Improve symptoms, especially congestion and low-output symptoms
Optimize volume status
Identify etiology (see Table 4.6)
Identify precipitating factors
Optimize chronic oral therapy
Minimize side effects
Identify patients who might benefit from revascularization
Educate patients concerning medications and self assessment of HF
Consider and, where possible, initiate a disease management program

12.4 Patients admitted with ADHF should be carefully monitored. It is recommended that the items listed in Table 12.4 be assessed at the stated frequencies. (Strength of Evidence = C)

Table 12.4. Monitoring Recommendations for Patients Admitted for ADHF

Frequency	Value	Specifics
At least daily	Weight	Determine after voiding in the morning Account for possible increased food intake due to improved appetite
At least daily	Fluid intake and output	
More than daily	Vital signs	Including orthostatic blood pressure
At least daily	Signs	Edema Ascites Pulmonary rales Hepatomegaly Increased jugular venous pressure Hepatojugular reflux Liver tenderness
At least daily	Symptoms	Orthopnea Paroxysmal nocturnal dyspnea Nocturnal cough Dyspnea Fatigue
At least daily	Electrolytes	Potassium Sodium
At least daily	Renal function	BUN Serum creatinine

12.5 It is recommended that patients admitted with ADHF and evidence of fluid overload be treated initially with loop diuretics—usually given intravenously rather than orally. (Strength of Evidence = B)

12.6 It is recommended that diuretics be administered at doses needed to produce a rate of diuresis sufficient to achieve optimal volume status with relief of signs and symptoms of congestion (edema, elevated JVP, dyspnea), without inducing an excessively rapid reduction in intravascular volume, which may result in symptomatic hypotension and/or worsening renal function. (Strength of Evidence = C)

12.7 Careful repeated assessment of signs and symptoms of congestion and changes in body weight is recommended, because clinical experience suggests it is difficult to determine that congestion has been adequately treated in many patients. (Strength of Evidence = C)

12.8 Monitoring of daily weights, intake, and output is recommended to assess clinical efficacy of diuretic therapy. Routine use of a Foley catheter is not recommended for monitoring volume status. However, placement of a catheter is recommended when close monitoring of urine output is needed. (Strength of Evidence = C)

12.9 Careful observation for development of a variety of side effects, including renal dysfunction, electrolyte abnormalities and symptomatic hypotension, is recommended in patients treated with diuretics, especially when used at high doses and in combination. Patients should undergo routine laboratory studies and clinical examination as dictated by their clinical response. (Strength of Evidence = C)

Serum potassium and magnesium levels should be monitored at least daily and maintained in the normal range. More frequent monitoring may be necessary when diuresis is rapid. (Strength of Evidence = C)

Overly rapid diuresis may be associated with severe muscle cramps, which should be treated with potassium replacement if indicated. (Strength of Evidence = C)

12.10 Careful observation for the development of renal dysfunction is recommended in patients treated with diuretics. Patients with moderate to severe renal dysfunction and evidence of fluid retention should continue to be treated with diuretics. In the presence of severe fluid overload, renal dysfunction may improve with diuresis. (Strength of Evidence = C)

12.11 When congestion fails to improve in response to diuretic therapy, the following options should be considered:

- Sodium and fluid restriction,
- Increased doses of loop diuretic,
- Continuous infusion of a loop diuretic, or
- Addition of a second type of diuretic orally (metolazone or spironolactone) or intravenously (chlorothiazide).

A fifth option, ultrafiltration, may be considered. (Strength of Evidence = C)

12.12 A low-sodium diet (2 g daily) is recommended, as is supplemental oxygen, as needed for hypoxemia. (Strength of Evidence = C)

In patients with recurrent or refractory volume overload, stricter sodium restriction may be considered. (Strength of Evidence = C)

12.13 Fluid restriction (<2 L/day) is recommended in patients with moderate hyponatremia (serum sodium <130 mEq/L) and should be considered to assist in treatment of fluid overload in other patients. (Strength of Evidence = C)

In patients with severe (serum sodium <125 mEq/L) or worsening hyponatremia, stricter fluid restriction may be considered. (Strength of Evidence = C)

12.14 Routine administration of supplemental oxygen in the absence of hypoxia is not recommended. (Strength of Evidence = C)

12.15 In the absence symptomatic hypotension, intravenous nitroglycerin, nitroprusside, or nesiritide may be considered as an addition to diuretic therapy for rapid improvement of congestive symptoms in patients admitted with ADHF. Frequent blood pressure monitoring is recommended with these agents. (Strength of Evidence = B). These agents should be decreased in dosage on discontinued if symptomatic hypotension develops. (Strength of Evidence = B) Reintroduction in increasing doses may be considered once symptomatic hypotension is resolved. (Strength of Evidence = C)

12.16 Intravenous vasodilators (intravenous nitroglycerin or nitroprusside) and diuretics are recommended for rapid symptom relief in patients with acute pulmonary edema or severe hypertension. (Strength of Evidence = C)

12.17 Intravenous vasodilators (nitroprusside, nitroglycerin, or nesiritide) may be considered in patients with ADHF and advanced HF who have persistent severe HF despite aggressive treatment with diuretics and standard oral therapies. (Strength of Evidence = C)

12.18 Intravenous inotropes (milrinone or dobutamine) may be considered to relieve symptoms and improve end-organ function in patients with advanced HF characterized by LV dilation, reduced LVEF, and diminished peripheral perfusion or end-organ dysfunction (low output syndrome), particularly if these patients have marginal systolic blood pressure (<90 mm Hg), have symptomatic hypotension despite adequate filling pressure, or are unresponsive to, or intolerant of, intravenous vasodilators. (Strength of Evidence = C)

These agents may be considered in similar patients with evidence of fluid overload if they respond poorly to intravenous diuretics or manifest diminished or worsening renal function. (Strength of Evidence = C)

When adjunctive therapy is needed in other patients with ADHF, administration of vasodilators should be considered instead of intravenous inotropes (milrinone or dobutamine). (Strength of Evidence = B)
Intravenous inotropes (milrinone or dobutamine) are not recommended unless left heart filling pressures are known to be elevated based on direct measurement or clear clinical signs. (Strength of Evidence = B)

Administration of intravenous inotropes (milrinone or dobutamine) in the setting of ADHF should be accompanied by continuous or frequent blood pressure monitoring and continuous monitoring of cardiac rhythm. (Strength of Evidence = C)

If symptomatic hypotension or worsening tachyarrhythmias develop during administration of these agents, discontinuation or dose reduction should be considered. (Strength of Evidence = C)

12.19 The routine use of invasive hemodynamic monitoring in patients with ADHF is not recommended. (Strength of Evidence = A)

12.20 Invasive hemodynamic monitoring should be considered in a patient:

- Who is refractory to initial therapy,
- Whose volume status and cardiac filling pressures are unclear,
- Who has clinically significant hypotension (typically systolic blood pressure <80 mm Hg) or worsening renal function during therapy, or
- In whom documentation of an adequate hemodynamic response to the inotropic agent is necessary when chronic outpatient infusion is being considered. (Strength of Evidence = C)

12.21 It is recommended that patients admitted with ADHF undergo evaluation for the following precipitating factors: atrial fibrillation or other arrhythmias (eg, atrial flutter, other supraventricular tachycardia or ventricular tachycardia), exacerbation of hypertension, myocardial ischemia/infarction, exacerbation of pulmonary congestion, anemia, thyroid disease, or significant drug interactions, as well as other less common factors. (Strength of Evidence = C)

12.22 It is recommended that every effort be made to use the hospital stay for assessment and improvement of patient compliance via patient and family education and social support services (Section 8). (Strength of Evidence = C)

12.23 It is recommended that criteria in Table 12.7 be met before a patient with HF is discharged from the hospital. (Strength of Evidence = C)
In patients with advanced HF or recurrent admissions for HF, additional criteria listed in Table 12.7 should be considered. (Strength of Evidence = C)

12.24 Discharge planning is recommended as part of the management of patients with ADHF. Discharge planning should address the following issues:

- Details regarding medication, dietary sodium restriction, and recommended activity level
- Follow-up by phone or clinic visit early after discharge to reassess volume status
- Medication and dietary compliance
- Monitoring of body weight, electrolytes, and renal function
- Consideration of referral for formal disease management (Strength of Evidence = C)

Table 12.7. Discharge Criteria for Patients with HF

Recommended for all HF patients	• Exacerbating factors addressed. • At least near optimal volume status achieved. • Transition from intravenous to oral diuretic successfully completed. • Patient and family education completed. • At least near optimal pharmacologic therapy achieved (Sections 7 and 11) • Follow-up clinic visit scheduled, usually for 7–10 days
Should be considered for patients with advanced HF or recurrent admissions for HF	• Oral medication regimen stable for 24 hours • No intravenous vasodilator or inotropic agent for 24 hours • Ambulation before discharge to assess functional capacity after therapy • Plans for postdischarge management (scale present in home, visiting nurse or telephone follow up generally no longer than 3 days after discharge) • Referral for disease management

Section 13: Evaluation and Therapy for Heart Failure in the Setting of Ischemic Heart Disease

The most common cause of chronic heart failure HF is no longer hypertension or valvular heart disease; it is coronary artery disease (CAD). Managing HF in patients with CAD or a history of CAD is significantly different than managing HF from primary cardiomyopathy. Antiplatelet agents, smoking cessation, and lipid-lowering therapy are particularly important interventions in patients with HF from CAD.[92] HF in the setting of CAD is a heterogeneous condition with several factors contributing to LV systolic dysfunction and HF symptoms. After an MI, there is loss of functioning myocytes, development of myocardial fibrosis, and subsequent LV remodeling, resulting in chamber dilatation and neurohormonal activation—all leading to progressive dysfunction of the remaining viable myocardium.[93] This well-recognized process may be ameliorated after an acute MI by myocardial revascularization,[94–96] and by medical therapy with ACE inhibitors or ARBs,[97,98] β-blockers,[99] and aldosterone antagonists.[100]

The majority of patients surviving an MI have significant atherosclerotic disease in coronary arteries other than the infarct-related vessel.[101] Another important mechanism for systolic dysfunction with additive effects on LV performance is myocardial hibernation,[102] a process in which myocardial contraction is downregulated in response to chronic reduction in myocardial blood supply.

In addition to risk factor reduction, therapy is based on the use of antiplatelets, ACE inhibitors (or ARBs), and

β-blockers, with other agents used to relieve symptoms such as angina.

Evaluation for CAD

13.1 Assessment for risk factors for CAD is recommended in all patients with chronic HF regardless of EF. (Strength of Evidence = A)

The diagnostic approach for CAD should be individualized based on patient preference and comorbidities, eligibility and willingness to perform revascularization. (Strength of Evidence = C)

13.2 It is recommended that patients with HF and angina undergo cardiac catheterization with coronary angiography to assess for potential revascularization. (Strength of Evidence = B)

13.3 It is recommended that patients with HF, no angina, and known CAD should undergo noninvasive stress imaging and/or coronary angiography to assess severity of coronary disease and the presence of ischemia. (Strength of Evidence = C)

13.4 It is recommended that patients with HF, no angina, and unknown CAD status who are at high risk for CAD should undergo nonivasive stress imaging and/or coronary angiography to assess severity of coronary disease and the presence of ischemia. (Strength of Evidence = C)

13.5 In patients with HF, no angina, and unknown CAD status who are at low risk for CAD noninvasive evaluation should be considered and coronary angiography may be considered. (Strength of Evidence = C)

13.6 Any of the following imaging tests may be used to identify inducible ischemia or viable but no-contractile myocardium:
- Exercise or pharmacologic stress myocardial perfusion imaging
- Exercise or pharmacologic stress echocardiography
- Cardiac magnetic resonance imaging
- Positron emission tomography scanning (Strength of Evidence = B)

13.7 It is recommended that the following risk factors be managed according to the indicated guidelines:
- Lipids (See National Cholesterol Education Program Adult Treatment Panel III).
- Smoking (Section 3)
- Physical activity (Section 6)
- Weight (Section 3)
- Blood pressure (Section 14 and JNC VII Guidelines)

Therapy for Patients With HF and CAD

13.8 Antiplatelet therapy is recommended in patients with HF and CAD unless contraindicated. (Aspirin, Strength of Evidence = B; Clopidogrel, Strength of Evidence = C)

13.9 ACE inhibitors are recommended in all patients with systolic dysfunction or preserved systolic function after an MI. (Strength of Evidence = A)

13.10 β-blockers are recommended for the management of all patients with reduced LVEF or post-MI. (Strength of Evidence = B)

13.11 It is recommended that ACE-inhibitor and β-blocker therapy be initiated early (<48 hours) during hospitalization in hemodynamically stable post MI patients with LV dysfunction or HF. (Strength of Evidence = A)

13.12 Nitrate preparations should be considered in patients with HF when additional medication is needed for relief of angina. (Strength of Evidence= B)

13.13 Calcium channel blockers should be considered in patients with HF who have angina despite the optimal use of β-blockers and nitrates. Amlodipine and felodipine are the preferred calcium channel blockers in patients with angina and decreased systolic function. (Strength of Evidence= C)

13.14 It is recommended that coronary revascularization be performed in patients with HF and suitable coronary anatomy for relief of refractory angina or acute coronary syndrome. (Strength of Evidence = B)

13.15 Coronary revascularization with coronary artery bypass surgery or percutaneous coronary intervention as appropriate should be considered in patients with HF and suitable coronary anatomy who have demonstrable evidence of myocardial viability in areas of significant obstructive coronary disease or the presence of inducible ischemia. (Strength of Evidence = C)

Section 14: Managing Patients With Hypertension and Heart Failure

Blood pressure is a simple measurement that assesses the interaction of heart function with vascular impedance. When heart function is normal the impedance is the main determinant of blood pressure and therefore pressure (systolic and mean) becomes a powerful risk factor for development of LV hypertrophy, increased myocardial oxygen

consumption, coronary atherosclerosis, and subsequent HF.[103,104] Control of blood pressure in this setting is critical to prevent the development and progression of LV dysfunction.[105]

When LV function is impaired, the relationship between impedance and cardiac function becomes more complex. Increases of impedance may impair LV emptying and thus not be reflected in a higher pressure. Under those circumstances therapy is aimed at lowering impedance, not at the blood pressure. Indeed, blood pressure may rise in response to effective therapy that improves LV emptying or reverses remodeling even if the impedance is reduced.

Asymptomatic or Symptomatic LV Hypertrophy or LV Dysfunction Without LV Dilation (Preserved EF)

14.1 It is recommended that blood pressure be aggressively treated to lower systolic and usually diastolic levels. Target resting levels should be $<130/<80$ mm Hg, if tolerated. (Strength of Evidence = C)

14.2 Treatment with several drugs should be considered, usually including an ACE inhibitor or an ARB, a diuretic and often a β-blocker or calcium antagonist. (Strength of Evidence = A)

Asymptomatic LV Dysfunction With LV Dilation and a Low EF

14.3 Prescription of an ACE inhibitor (dose equivalent to 20 mg daily enalapril) is recommended. (Strength of Evidence = A)

14.4 Addition of a β-blocker (dose equivalent to HF trials) is recommended even if BP is controlled. (Strength of Evidence = C)

14.5 If BP remains >130/80 mm Hg then the addition of a diuretic is recommended, followed by a calcium antagonist or other antihypertensive drugs. (Strength of Evidence = C)

Symptomatic LV Dysfunction With LV Dilation and Low EF

14.6 Prescription of target doses of ACE inhibitors, ARBs, β-blockers, aldosterone inhibitors, and isosorbide dinitrate/hydralazine in various combinations (with a diuretic if needed) is recommended, based on doses used in large-scale outcome trials. (Strength of Evidence = A)

14.7 If blood pressure remains >130/80 mm Hg, a noncardiac-depressing calcium antagonist (eg, amlodipine) may be considered or other antihypertensive medication doses increased. (Strength of Evidence = C)

Section 15: Management of Heart Failure in Special Populations

Heart failure is a major problem in women, African Americans, and the elderly of both sexes and any race. The clinical conclusions based on trial data derived from predominately younger white male study populations generally apply equally to these groups. However, there are etiologic or pathophysiologic considerations specific to some of these groups that warrant attention if care is to be optimized. In the case of African Americans, who previously have been shown to not respond as well to ACE inhibitor therapy as whites, an indication now exists to consider the combination of hydralazine and isosorbide dinitrate as part of standard therapy.

Elderly Patients With HF

15.1 As with younger patients, it is recommended that elderly patients, particularly those age >80 years, be evaluated for HF when presenting with symptoms of dyspnea and fatigue. (Strength of Evidence = C)

15.2 β-blocker and ACE inhibitor therapy is recommended as standard therapy in all elderly patients with HF from LV systolic dysfunction. (Strength of Evidence = B)

In the absence of contraindications, these agents are also recommended in the very elderly (age >80 years). (Strength of Evidence = C)

15.3 As in all patients, but especially in the elderly, careful attention to volume status, the possibility of symptomatic cerebrovascular disease, and the presence of postural hypotension is recommended during therapy with ACE inhibitors and β-blockers. (Strength of Evidence = C)

HF in Women

15.4 β-blocker therapy is recommended for women with HF from:

- symptomatic LV systolic dysfunction (Strength of Evidence = B)
- asymptomatic LV systolic dysfunction (Strength of Evidence = C)

15.5 ACE inhibitor therapy is recommended as standard therapy in all women with symptomatic or asymptomatic LV systolic dysfunction. (Strength of Evidence = B)

HF in African Americans

15.6 β-blockers are recommended as part of standard therapy for African Americans with HF due to:

- symptomatic LV systolic dysfunction (Strength of Evidence = B)

- asymptomatic LV systolic dysfunction (Strength of Evidence = C)

15.7 ACE inhibitors are recommended as part of standard therapy for African-American patients with HF from symptomatic or asymptomatic LV systolic dysfunction. (Strength of Evidence = C)

15.8 ARBs are recommended as substitute therapy for HF in African Americans intolerant of ACE inhibitors. (Strength of Evidence = B)

15.9 A combination of hydralazine and isosorbide dinitrate is recommended as part of standard therapy in addition to β-blockers and ACE inhibitors for African Americans with LV systolic dysfunction and:

- NYHA III or IV HF (Strength of Evidence = A)
- NYHA II HF (Strength of Evidence = B)

Section 16: Myocarditis: Current Treatment

Myocarditis is a distinct clinical entity with a wide variety of cardiac manifestations including HF. Potential etiologies may include toxins, medications, physical agents, and, most importantly, infections. The most common forms appear to be postviral in origin. Ongoing myocardial inflammation may result in dilated cardiomyopathy, restrictive cardiomyopathy, or acute LV failure without dilatation. Controversy continues to surround the best approach to the management of patients considered to have myocarditis.

16.1 Routine use of immunosuppressive therapies is not recommended for patients with myocarditis. (Strength of Evidence = A)

16.2 Endomyocardial biopsy should be considered in patients with an acute deterioration of cardiac function of unknown etiology who are unresponsive to medical therapy. (Strength of Evidence = B)

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