Complete Summary

GUIDELINE TITLE

ACC/AHA 2005 guideline update for the diagnosis and management of chronic heart failure in the adult. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Update the 2001 Guidelines for the Evaluation and Management of Heart Failure).

BIBLIOGRAPHIC SOURCE(S)

Hunt SA, Abraham WT, Chin MH, Feldman AM, Francis GS, Ganiats TG, Jessup M, Konstam MA, Mancini DM, Michl K, Oates JA, Rahko PS, Silver MA, Stevensen LW, Yancy CW. ACC/AHA 2005 guideline update for the diagnosis and management of chronic heart failure in the adult. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines [trunc]. Bethesda (MD): American College of Cardiology Foundation (ACCF); 2005 Aug. 82 p. [694 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Hunt SA, Baker DW, Chin MH, Cinquegrani MP, Feldman AM, Francis GS, Ganiats TG, Goldstein S, Gregoratos G, Jessup ML, Noble RJ, Packer M, Silver MA, Stevenson LW. ACC/AHA guidelines for the evaluation and management of chronic heart failure in the adult. Bethesda (MD): American College of Cardiology Foundation (ACCF); 2001 Sep. 56 p.

**** REGULATORY ALERT ****

FDA WARNING/REGULATORY ALERT

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- February 26, 2008, Avandia (rosiglitazone): A new Medication Guide for Avandia must be provided with each prescription that is dispensed due to the U.S. Food and Drug Administration's (FDA's) determination that this medication could pose a serious and significant public health concern.
- November 14, 2007, Avandia (rosiglitazone): New information has been added to the existing boxed warning in Avandia's prescribing information about potential increased risk for heart attacks.
- August 14, 2007, Thiazolidinedione class of antidiabetic drugs: Addition of a boxed warning to the updated label of the entire thiazolidinedione class of antidiabetic drugs to warn of the risks of heart failure.

COMPLETE SUMMARY CONTENT

** REGULATORY ALERT **
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SCOPE

DISEASE/CONDITION(S)

Chronic heart failure in adults with normal or low left ventricular ejection fraction

Note: This guideline specifically excludes recommendations for treatment of acute heart failure, heart failure in children, heart failure due to primary valvular disease or congenital malformations, as well as recommendations for treatment of specific myocardial disorders.

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Prevention
Risk Assessment
Treatment

CLINICAL SPECIALTY

Cardiology
Family Practice
Geriatrics
Internal Medicine

INTENDED USERS

Health Care Providers
Physicians

GUIDELINE OBJECTIVE(S)

To assist health care providers in clinical decision-making by describing a range of generally acceptable approaches for the prevention, diagnosis, and management of heart failure

TARGET POPULATION

- Adults with chronic heart failure associated with normal or low left ventricular ejection fraction , including consideration of the following special populations:
    - Women and men
    - High-risk ethnic minority groups (e.g., blacks)
    - Elderly patients
- Adults at high risk of developing heart failure

INTERVENTIONS AND PRACTICES CONSIDERED

Initial Assessments

1. Thorough history and physical examination, including history of current and past alcohol and drug use, orthostatic blood pressure changes, weight and height, and calculation of body mass index
2. Assessment of ability to perform routine and desired activities of daily living
3. Laboratory testing: complete blood count, urinalysis, serum electrolytes (including calcium and magnesium), blood urea nitrogen, serum creatinine, fasting blood glucose, lipid profile, liver function tests, and thyroid-stimulating hormone.
4. 12-lead electrocardiography
5. Chest radiography (PA and lateral)
6. Two-dimensional echocardiogram coupled with Doppler flow studies
7. Coronary arteriography in appropriate patients
8. Maximal exercise testing with or without measurement of respiratory gas exchange and/or blood oxygen saturation in appropriate patients
9. Screening for hemochromatosis, sleep-disturbed breathing, or human immunodeficiency virus, in selected patients
10. Diagnostic tests for rheumatologic diseases, amyloidosis, or pheochromocytoma, if indicated
11. Endomyocardial biopsy, when specific diagnosis is suspected that would influence therapy
12. Holter monitoring, if indicated

Pharmacological Management

1. Diuretics and salt restriction in patients with current or prior symptoms of heart failure and reduced left ventricular ejection fraction who have evidence of fluid retention
2. Angiotensin converting enzyme (ACE) inhibitors
3. Beta-adrenergic blockers
4. Angiotensin receptor blockers (ARBs)
5. Digoxin
6. Aldosterone antagonists, such as spironolactone and eplerenone
7. Hydralazine and a nitrate
8. Infusion of a positive inotropic drug only as palliation for patients with end-stage disease

Non-Pharmacological Management

Surgical

1. Coronary revascularization in appropriate patients
2. Valve replacement or repair surgery in patients with significant valvular stenosis or regurgitation in appropriate patients
3. Placement of an implantable cardioverter-defibrillator (ICD) in appropriate patients
4. Cardiac resynchronization therapy in appropriate patients
5. Referral for heart transplantation in appropriate patients

Other

1. Exercise training to improve quality of life
2. Counseling regarding avoidance of behaviors that increase risk of heart failure (smoking, excessive alcohol consumption, drug use)
3. Patient and family counseling and education regarding end-of-life care and treatment options

Note from the National Guideline Clearinghouse: many other interventions, or combination of interventions, are considered in the full-text guideline. Interventions specific to women, men, particular ethnic groups, the elderly, and patients with concomitant disorders are also considered in the original full-text guideline.

MAJOR OUTCOMES CONSIDERED

- Sensitivity and specificity of diagnostic instruments
- Morbidity and mortality due to heart failure
- Symptoms of heart failure
- Cardiovascular events
- Risk of heart failure
- Risk of death and hospitalization
- Survival rates
- Quality of life and sense of well-being
- Adverse effects

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Pertinent medical literature in the English language was identified through a series of computerized literature searches (including Medline and EMBASE) and a manual search of selected articles.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Level of Evidence A: Data derived from multiple randomized clinical trials or meta-analyses

Level of Evidence B: Data derived from a single randomized trial or nonrandomized studies

Level of Evidence C: Only consensus opinion of experts, case studies, or standard-of-care

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Experts in the subject under consideration are selected from the American College of Cardiology (ACC) and American Heart Association (AHA) and charged with examining subject-specific data and writing or updating these guidelines. The process includes additional representatives from other medical practitioner and specialty groups where appropriate. Writing groups are specifically charged to perform a formal literature review, weigh the strength of evidence for or against a particular treatment or procedure, and include estimates of expected health outcomes where data exist. Patient-specific modifiers, comorbidities, and issues of patient preference that might influence the choice of particular tests or therapies are considered, as are frequency of follow-up and cost-effectiveness. When available, information from studies on cost will be considered; however, review of data on efficacy and clinical outcomes will constitute the primary basis for preparing recommendations in these guidelines.

The writing committee was composed of 15 members who represented the ACC and AHA, as well as invited participants from the American College of Chest Physicians, the Heart Failure Society of America, the International Society for

Heart and Lung Transplantation, the American Academy of Family Physicians, and the American College of Physicians. Both the academic and private practice sectors were represented.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Class I: Conditions for which there is evidence and/or general agreement that a given procedure or treatment is beneficial, useful, and effective

Class II: Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment

> **Class IIa**: Weight of evidence/opinion is in favor of usefulness/efficacy.
>
> **Class IIb**: Usefulness/efficacy is less well established by evidence/opinion.

Class III: Conditions for which there is evidence and/or general agreement that a procedure/treatment is not useful/effective and in some cases may be harmful.

COST ANALYSIS

The guideline developers reviewed published cost analyses.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

This document was reviewed by 3 official reviewers nominated by the American College of Cardiology (ACC), 3 official reviewers nominated by the American Heart Association (AHA), 1 reviewer nominated by the American Academy of Family Physicians, 2 reviewers nominated by the American College of Chest Physicians, 1 reviewer nominated by the American College of Physicians, 4 reviewers nominated by the Heart Failure Society of America, and 1 reviewer nominated by the International Society for Heart and Lung Transplantation. In addition, 9 content reviewers and the following committees reviewed the document: ACC/AHA Committee to Develop Performance Measures for Heart Failure, ACC/AHA Committee to Revise Guidelines for the Management of Patients With Acute Myocardial Infarction, ACC/AHA/European Society of Cardiology (ESC) Committee to Update Guidelines on the Management of Patients with Atrial Fibrillation, ACC/AHA Committee to Update Guidelines on Coronary Artery Bypass Graft Surgery, ACC Committee to Develop Data Standards on Heart Failure, AHA Quality of Care and Outcomes Research Interdisciplinary Working Group Steering Committee, and AHA Council on Clinical Cardiology Committee on Heart Failure and Transplantation.

The guideline was approved by the ACC Foundation Board of Trustees in August 2005 and by the AHA Science Advisory and Coordinating Committee in August 2005.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Definitions for the weight of the evidence (A-C) and classes of recommendations (I-III) are provided at the end of the "Major Recommendations" field.

Initial and Serial Clinical Assessment of Patients Presenting with Heart Failure (HF)

Recommendations for the Initial Clinical Assessment of Patients Presenting with HF

Class I

1. A thorough history and physical examination should be obtained/performed in patients presenting with HF to identify cardiac and noncardiac disorders or behaviors that might cause or accelerate the development or progression of HF. *(Level of Evidence: C)*
2. A careful history of current and past use of alcohol, illicit drugs, current or past standard or "alternative therapies," and chemotherapy drugs should be obtained from patients presenting with HF. *(Level of Evidence: C)*
3. In patients presenting with HF, initial and ongoing assessment should be made of the patient's ability to perform routine and desired activities of daily living. *(Level of Evidence: C)*
4. Initial examination of patients presenting with HF should include assessment of the patient's volume status, orthostatic blood pressure changes, measurement of weight and height, and calculation of body mass index. *(Level of Evidence: C)*
5. Initial laboratory evaluation of patients presenting with HF should include complete blood count, urinalysis, serum electrolytes (including calcium and magnesium), blood urea nitrogen, serum creatinine, fasting blood glucose (glycohemoglobin), lipid profile, liver function tests, and thyroid-stimulating hormone. *(Level of Evidence: C)*
6. Twelve-lead electrocardiogram and chest radiograph (posterioanterior [PA] and lateral) should be performed initially in all patients presenting with HF. *(Level of Evidence: C)*
7. Two-dimensional echocardiography with Doppler should be performed during initial evaluation of patients presenting with HF to assess left ventricular ejection fraction (LVEF), left ventricular (LV) size, wall thickness, and valve function. Radionuclide ventriculography can be performed to assess LVEF and volumes. *(Level of Evidence: C)*
8. Coronary arteriography should be performed in patients presenting with HF who have angina or significant ischemia unless the patient is not eligible for revascularization of any kind. *(Level of Evidence: B)*

Class IIa

1. Coronary arteriography is reasonable for patients presenting with HF who have chest pain that may or may not be of cardiac origin who have not had evaluation of their coronary anatomy and who have no contraindications to coronary revascularization. *(Level of Evidence: C)*
2. Coronary arteriography is reasonable for patients presenting with HF who have known or suspected coronary artery disease but who do not have angina unless the patient is not eligible for revascularization of any kind. *(Level of Evidence: C)*
3. Noninvasive imaging to detect myocardial ischemia and viability is reasonable in patients presenting with HF who have known coronary artery disease and no angina unless the patient is not eligible for revascularization of any kind. *(Level of Evidence: B)*
4. Maximal exercise testing with or without measurement of respiratory gas exchange and/or blood oxygen saturation is reasonable in patients presenting with HF to help determine whether HF is the cause of exercise limitation when the contribution of HF is uncertain. *(Level of Evidence: C)*
5. Maximal exercise testing with measurement of respiratory gas exchange is reasonable to identify high-risk patients presenting with HF who are candidates for cardiac transplantation or other advanced treatments. *(Level of Evidence: B)*
6. Screening for hemochromatosis, sleep-disturbed breathing, or human immunodeficiency virus is reasonable in selected patients who present with HF. *(Level of Evidence: C)*
7. Diagnostic tests for rheumatologic diseases, amyloidosis, or pheochromocytoma are reasonable in patients presenting with HF in whom there is a clinical suspicion of these diseases. *(Level of Evidence: C)*
8. Endomyocardial biopsy can be useful in patients presenting with HF when a specific diagnosis is suspected that would influence therapy. *(Level of Evidence: C)*
9. Measurement of B-type natriuretic peptide (BNP) can be useful in the evaluation of patients presenting in the urgent care setting in whom the clinical diagnosis of HF is uncertain. *(Level of Evidence: A)*

Class IIb

1. Noninvasive imaging may be considered to define the likelihood of coronary artery disease in patients with HF and LV dysfunction. *(Level of Evidence: C)*
2. Holter monitoring might be considered in patients presenting with HF who have a history of myocardial infarction (MI) and are being considered for electrophysiologic study to document ventricular tachycardia (VT) inducibility. *(Level of Evidence: C)*

Class III

1. Endomyocardial biopsy should not be performed in the routine evaluation of patients with HF. *(Level of Evidence: C)*
2. Routine use of signal-averaged electrocardiography is not recommended for the evaluation of patients presenting with HF. *(Level of Evidence: C)*
3. Routine measurement of circulating levels of neurohormones (e.g., norepinephrine or endothelin) is not recommended for patients presenting with HF. *(Level of Evidence: C)*

Recommendations for Serial Clinical Assessment of Patients Presenting with HF

Class I

1. Assessment should be made at each visit of the ability of a patient with HF to perform routine and desired activities of daily living. *(Level of Evidence: C)*
2. Assessment should be made at each visit of the volume status and weight of a patient with HF. *(Level of Evidence: C)*

   It is critically important for healthcare providers to evaluate the fluid or volume status of patients with HF during the initial visit and each follow-up examination. This assessment plays a pivotal role in determining the need for diuretic therapy and in detecting sodium excesses or deficiencies that may limit efficacy and decrease the tolerability of drugs used to treat HF. The physical examination is the primary step in evaluating the presence and severity of fluid retention in patients with HF. At each visit, healthcare providers should record the patient's body weight and sitting and standing blood pressures and determine the degree of jugular venous distension and its response to abdominal pressure, the presence and severity of organ congestion (pulmonary rales and hepatomegaly), and the magnitude of peripheral edema in the legs, abdomen, presacral area, and scrotum, as well as ascites in the abdomen.

3. Careful history of current use of alcohol, tobacco, illicit drugs, "alternative therapies," and chemotherapy drugs, as well as diet and sodium intake, should be obtained at each visit of a patient with HF. *(Level of Evidence: C)*

Class IIa

1. Repeat measurement of ejection fraction (EF) and the severity of structural remodeling can provide useful information in patients with HF who have had a change in clinical status or who have experienced or recovered from a clinical event or received treatment that might have had a significant effect on cardiac function. *(Level of Evidence: C)*

Class IIb

1. The value of serial measurements of BNP to guide therapy for patients with HF is not well established. *(Level of Evidence: C)*

Therapy

Patients at High Risk for Developing HF

Class I

1. In patients at high risk for developing HF, systolic and diastolic hypertension should be controlled in accordance with contemporary guidelines. *(Level of Evidence: A)*

Healthcare providers should lower both systolic and diastolic blood pressure in accordance with the recommendations provided in published guidelines, including the most recently published report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; target levels of blood pressure are lower in patients with associated major cardiovascular risk factors, especially those with diabetes mellitus. When an antihypertensive regimen is devised, optimal control of blood pressure should remain as the primary goal, with the choice of drugs determined by the concomitant medical problems (e.g., coronary artery disease, diabetes, or renal disease). Diuretic-based antihypertensive therapy has repeatedly been shown to prevent HF in a wide range of target populations. Angiotensin-converting enzyme (ACE) inhibitors and beta-blockers are also effective in the prevention of HF, whereas calcium antagonists and alpha-blockers are less effective in preventing HF syndrome. However, ACE inhibitors and beta-blockers, as single therapies, are not superior to other antihypertensive drug classes in the reduction of all cardiovascular outcomes. Nevertheless, among patients with diabetes or other cardiovascular complications, ACE inhibitors have been most notable with respect to a reduction in the onset of HF and new-onset diabetes. Ultimately, an appropriate antihypertensive regimen frequently consists of several drugs used in combination.

2. In patients at high risk for developing HF, lipid disorders should be treated in accordance with contemporary guidelines. *(Level of Evidence: A)*
3. For patients with diabetes mellitus (who are all at high risk for developing HF), blood sugar should be controlled in accordance with contemporary guidelines. *(Level of Evidence: C)*
4. Patients at high risk for developing HF should be counseled to avoid behaviors that may increase the risk of HF (e.g., smoking, excessive alcohol consumption, and illicit drug use). *(Level of Evidence: C)*
5. Ventricular rate should be controlled or sinus rhythm restored in patients with supraventricular tachyarrhythmias who are at high risk for developing HF. *(Level of Evidence: B)*
6. Thyroid disorders should be treated in accordance with contemporary guidelines in patients at high risk for developing HF. *(Level of Evidence: C)*
7. Healthcare providers should perform periodic evaluation for signs and symptoms of HF in patients at high risk for developing HF. *(Level of Evidence: C)*
8. In patients at high risk for developing HF who have known atherosclerotic vascular disease, healthcare providers should follow current guidelines for secondary prevention. *(Level of Evidence: C)*
9. Healthcare providers should perform a noninvasive evaluation of left ventricular function (i.e., LVEF) in patients with a strong family history of cardiomyopathy or in those receiving cardiotoxic interventions. *(Level of Evidence: C)*

Class IIa

1. ACE inhibitors can be useful to prevent HF in patients at high risk for developing HF who have a history of atherosclerotic vascular disease, diabetes mellitus, or hypertension with associated cardiovascular risk factors. *(Level of Evidence: A)*

2. Angiotensin II receptor blockers can be useful to prevent HF in patients at high risk for developing HF who have a history of atherosclerotic vascular disease, diabetes mellitus, or hypertension with associated cardiovascular risk factors. *(Level of Evidence: C)*

Class III

1. Routine use of nutritional supplements solely to prevent the development of structural heart disease should not be recommended for patients at high risk for developing HF. *(Level of Evidence: C)*

Patients with Cardiac Structural Abnormalities or Remodeling who Have Not Developed HF Symptoms (Stage B)

Class I

1. All Class I recommendations for Stage A should apply to patients with cardiac structural abnormalities who have not developed HF. *(Levels of Evidence: A, B, and C as appropriate*)
2. Beta-blockers and ACE inhibitors should be used in all patients with a recent or remote history of MI regardless of EF or presence of HF (see the table below titled "Cardiovascular Medications Useful for Treatment of Various Stages of Heart Failure"). *(Level of Evidence: A)*
3. Beta-blockers are indicated in all patients without a history of MI who have a reduced LVEF with no HF symptoms (see the table below titled "Cardiovascular Medications Useful for Treatment of Various Stages of Heart Failure"). *(Level of Evidence: C)*
4. ACE inhibitors should be used in patients with a reduced EF and no symptoms of HF, even if they have not experienced MI. *(Level of Evidence: A)*
5. An angiotensin-receptor blocker (ARB) should be administered to post-MI patients without HF who are intolerant of ACE inhibitors and have a low LVEF. *(Level of Evidence: B)*
6. Patients who have not developed HF symptoms should be treated according to contemporary guidelines after an acute MI. *(Level of Evidence: C)*
7. Coronary revascularization should be recommended in appropriate patients without symptoms of HF in accordance with contemporary guidelines (see American College of Cardiology/American Heart Association [ACC/AHA] Guidelines for the Management of Patients With Chronic Stable Angina). *(Level of Evidence: A)*
8. Valve replacement or repair should be recommended for patients with hemodynamically significant valvular stenosis or regurgitation and no symptoms of HF in accordance with contemporary guidelines. *(Level of Evidence: B)*

Table: Cardiovascular Medications Useful for Treatment of Various Stages of Heart Failure

Drug	Stage A	Stage B	Stage C
ACE Inhibitors			
Benazepril	H	-	-
Captopril	H, DN	Post MI	HF

Drug	Stage A	Stage B	Stage C
Enalapril	H, DN	HF	HF
Fosinopril	H	-	HF
Lisinopril	H, DN	Post MI	HF
Moexipril	H	-	-
Perindopril	H, CV Risk	-	-
Quinapril	H	-	HF
Ramipril	H, CV Risk	Post MI	Post MI
Trandolapril	H	Post MI	Post MI
Angiotensin Receptor Blockers			
Candesartan	H	-	HF
Eprosartan	H	-	-
Irbesartan	H, DN	-	-
Losartan	H, DN	CV Risk	-
Olmesartan	H	-	-
Telmisartan	H	-	-
Valsartan	H, DN	Post MI	Post MI, HF
Aldosterone Blockers			
Eplerenone	H	Post MI	Post MI
Spironolactone	H	-	HF
Beta Blockers			
Acebutolol	H	-	-
Atenolol	H	Post-MI	-
Betaxolol	H	-	-
Bisoprolol	H	-	HF
Carteolol	H	-	-
Carvedilol	H	Post-MI	HF, Post-MI
Labetalol	H	-	-
Metoprolol succinate	H	-	HF
Metoprolol tartrate	H	Post-MI	-
Nadolol	H	-	-
Penbutolol	H	-	-
Pindolol	H	-	-
Propranolol	H	Post-MI	-
Timolol	H	Post-MI	-
Digoxin	-	-	HF

CV risk indicates reduction in future cardiovascular events; DN, diabetic nephropathy; H, hypertension; HF, heart failure and asymptomatic LV dysfunction; Post MI, reduction in heart failure- or other cardiac events following MI

Class IIa

1. ACE inhibitors or ARBs can be beneficial in patients with hypertension and left ventricular hypertrophy (LVH) and no symptoms of HF. *(Level of Evidence B)*

2. Angiotensin II receptor blockers can be beneficial in patients with low EF and no symptoms of HF who are intolerant of ACE inhibitors. *(Level of Evidence: C)*
3. Placement of an implantable cardioverter-defibrillator (ICD) is reasonable in patients with ischemic cardiomyopathy who are at least 40 days post-MI, have an LVEF of 30% or less, are New York Heart Association (NYHA) functional class I on chronic optimal medical therapy, and have reasonable expectation of survival with a good functional status for more than 1 year. *(Level of Evidence: B)*

Class IIb

1. Placement of an ICD might be considered in patients without HF who have non-ischemic cardiomyopathy and an LVEF less than or equal to 30% who are in NYHA functional class I with chronic optimal medical therapy and have a reasonable expectation of survival with good functional status for more than 1 year. *(Level of Evidence: C)*

Class III

1. Digoxin should not be used in patients with low EF, sinus rhythm, and no history of HF symptoms, because in this population, the risk of harm is not balanced by any known benefit. *(Level of Evidence: C)*
2. Use of nutritional supplements to treat structural heart disease or to prevent the development of symptoms of HF is not recommended. *(Level of Evidence: C)*
3. Calcium channel blockers with negative inotropic effects may be harmful in asymptomatic patients with low LVEF and no symptoms of HF after MI (refer to section below titled "Patients with Current or Prior Symptoms of HF (Stage C)"). *(Level of Evidence: C)*

Patients with Current or Prior Symptoms of HF (Stage C)

Patients with Reduced LVEF

Class I

1. Measures listed as Class I recommendations for patients in stages A and B are also appropriate for patients in Stage C. *(Levels of Evidence: A, B, and C as appropriate)*
2. Diuretics and salt restriction are indicated in patients with current or prior symptoms of HF and reduced LVEF who have evidence of fluid retention (see Table 4 of the original guideline document). *(Level of Evidence: C)*

   Please refer to the original guideline document for discussions on the effect of diuretics in the management of HF, selection of patients, initiation and maintenance, and risks of treatment.

3. ACE inhibitors are recommended for all patients with current or prior symptoms of HF and reduced LVEF, unless contraindicated (see the table above titled "Cardiovascular medications useful for treatment of various

stages of heart failure" and text of the original guideline document). *(Level of Evidence: A)*

Because of their favorable effect on survival, treatment with an ACE inhibitor should not be delayed until the patient is found to be resistant to treatment with other drugs. ACE inhibitors are often preferred over the ARBs or direct-acting vasodilators because of the greater experience and weight of evidence supporting their effectiveness.

Clinicians should attempt to use doses that have been shown to reduce the risk of cardiovascular events in clinical trials. If these target doses of an ACE inhibitor cannot be used or are poorly tolerated, intermediate doses should be used with the expectation that there are likely to be only small differences in efficacy between low and high doses. More importantly, clinicians should not delay the institution of beta-blockers in patients because of a failure to reach target ACE inhibitor doses. Once the drug has been titrated to the appropriate dose, patients can generally be maintained on long-term therapy with an ACE inhibitor with little difficulty. Abrupt withdrawal of treatment with an ACE inhibitor can lead to clinical deterioration and should be avoided in the absence of life-threatening complications (e.g., angioedema).

Please refer to the original guideline document for discussions on ACE inhibitors in the management of HF, selection of patients, initiation and maintenance, and risks of treatment.

4. Beta-blockers (using 1 of the 3 proven to reduce mortality, i.e., bisoprolol, carvedilol, and sustained release metoprolol succinate) are recommended for all stable patients with current or prior symptoms of HF and reduced LVEF, unless contraindicated (see the table above titled "Cardiovascular medications useful for treatment of various stages of heart failure"). *(Level of Evidence: A)*

   Because of the favorable effects of beta-blockers on survival and disease progression, treatment with a beta-blocker should be initiated as soon as LV dysfunction is diagnosed. Even when symptoms are mild or have responded to other therapies, beta-blocker therapy is important and should not be delayed until symptoms return or disease progression is documented during treatment with other drugs. Therefore, even if patients do not benefit symptomatically because they have little disability, they should receive treatment with a beta-blocker to reduce the risk of disease progression, future clinical deterioration, and sudden death.

   Please refer to the original guideline document for discussions on effects of beta-blockers in the management of HF, selection of patients, initiation and maintenance, and risks of treatment.

5. Angiotensin II receptor blockers approved for the treatment of HF (see the table above titled "Cardiovascular medications useful for treatment of various stages of heart failure") are recommended in patients with current or prior symptoms of HF and reduced LVEF who are ACE inhibitor-intolerant. *(Level of Evidence: A)*

For patients unable to tolerate ACE inhibitors because of cough, the ARBs valsartan and candesartan have demonstrated benefit by reducing hospitalizations and mortality. The combination of an ACE inhibitor and ARB may produce more reduction of LV size than either agent alone.

Please refer to the original guideline document for discussions on recommendations concerning ARBs and initiation and maintenance.

6. Drugs known to adversely affect the clinical status of patients with current or prior symptoms of HF and reduced LVEF should be avoided or withdrawn whenever possible (e.g., nonsteroidal anti-inflammatory drugs, most antiarrhythmic drugs, and most calcium channel blocking drugs). *(Level of Evidence: B)*

   Three classes of drugs can exacerbate the syndrome of HF and should be avoided in most patients:

   1. Antiarrhythmic agents can exert important cardiodepressant and proarrhythmic effects. Of available agents, only amiodarone and dofetilide have been shown not to adversely affect survival.
   2. Calcium channel blockers can lead to worsening HF and have been associated with an increased risk of cardiovascular events. Of available calcium channel blockers, only the vasoselective ones have been shown not to adversely affect survival.
   3. Nonsteroidal anti-inflammatory drugs can cause sodium retention and peripheral vasoconstriction and can attenuate the efficacy and enhance the toxicity of diuretics and ACE inhibitors.

7. Maximal exercise testing with or without measurement of respiratory gas exchange is recommended to facilitate prescription of an appropriate exercise program for patients presenting with HF. *(Level of Evidence: C)*
8. Exercise training is beneficial as an adjunctive approach to improve clinical status in ambulatory patients with current or prior symptoms of HF and reduced LVEF. *(Level of Evidence: B)*
9. An implantable cardioverter defibrillator (ICD) is recommended as secondary prevention to prolong survival in patients with current or prior symptoms of HF and reduced LVEF who have a history of cardiac arrest, ventricular fibrillation, or hemodynamically destabilizing ventricular tachycardia. *(Level of Evidence: A)*
10. ICD therapy is recommended for primary prevention to reduce total mortality by a reduction in sudden cardiac death in patients with ischemic heart disease who are at least 40 days post-MI, have an LVEF less than or equal to 30%, with NYHA functional class II or III symptoms while undergoing chronic optimal medical therapy, and have reasonable expectation of survival with a good functional status for more than 1 year. *(Level of Evidence: A)*
11. ICD therapy is recommended for primary prevention to reduce total mortality by a reduction in sudden cardiac death in patients with nonischemic cardiomyopathy who have an LVEF less than or equal to 30%, with NYHA functional class II or III symptoms while undergoing chronic optimal medical therapy, and who have reasonable expectation of survival with a good functional status for more than 1 year. *(Level of Evidence: B)*

12. Patients with LVEF less than or equal to 35%, sinus rhythm, and NYHA functional class III or ambulatory class IV symptoms despite recommended, optimal medical therapy and who have cardiac dyssynchrony, which is currently defined as a QRS duration greater than 120 ms, should receive cardiac resynchronization therapy unless contraindicated. *(Level of Evidence: A)*
13. Addition of an aldosterone antagonist is recommended in selected patients with moderately severe to severe symptoms of HF and reduced LVEF who can be carefully monitored for preserved renal function and normal potassium concentration. Creatinine should be less than or equal to 2.5 mg/dL in men or less than or equal to 2.0 mg/dL in women and potassium should be less than 5.0 mEq/L. Under circumstances where monitoring for hyperkalemia or renal dysfunction is not anticipated to be feasible, the risks may outweigh the benefits of aldosterone antagonists. *(Level of Evidence: B)*

Guidelines for Minimizing the Risk of Hyperkalemia in Patients Treated with Aldosterone Antagonists
1. Impaired renal function is a risk factor for hyperkalemia during treatment with aldosterone antagonists. The risk of hyperkalemia increases progressively when serum creatinine exceeds 1.6 mg per dL.* In elderly patients or others with low muscle mass in whom serum creatinine does not accurately reflect glomerular filtration rate, determination that glomerular filtration rate or creatinine clearance exceeds 30 mL per minute is recommended. 2. Aldosterone antagonists should not be administered to patients with baseline serum potassium in excess of 5.0 mEq per liter. 3. An initial dose of spironolactone 12.5 mg or eplerenone 25 mg is recommended, after which the dose may be increased to spironolactone 25 mg or eplerenone 50 mg if appropriate. 4. The risk of hyperkalemia is increased with concomitant use of higher doses of ACE inhibitors (captopril greater than or equal to 75 mg daily; enalapril or lisinopril greater than or equal to 10 mg daily). 5. Nonsteroidal anti-inflammatory drugs and cyclo-oxygenase-2 inhibitors should be avoided. 6. Potassium supplements should be discontinued or reduced. 7. Close monitoring of serum potassium is required; potassium levels and renal function should be checked in 3 days and at 1 week after initiation of therapy and at least monthly for the first 3 months. 8. Diarrhea or other causes of dehydration should be addressed emergently.

* Although the entry criteria for the trials of aldosterone antagonists included creatinine greater than 2.5 mg per dL, the majority of patients had creatinine much lower; in 1 trial, 95% of patients had creatinine less than or equal to 1.7 mg per dL.

Class IIa

1. Angiotensin II receptor blockers are reasonable to use as alternatives to ACE inhibitors as first-line therapy for patients with mild to moderate HF and reduced LVEF, especially for patients already taking ARBs for other indications. *(Level of Evidence: A)*

2. Digitalis can be beneficial in patients with current or prior symptoms of HF and reduced LVEF to decrease hospitalizations for HF. *(Level of Evidence: B)*
3. The addition of a combination of hydralazine and a nitrate is reasonable for patients with reduced LVEF who are already taking an ACE inhibitor and beta-blocker for symptomatic HF and who have persistent symptoms. *(Level of Evidence: B)*

   Note: The combination of hydralazine and isosorbide dinitrate should not be used for the treatment of HF in patients who have no prior use of an ACE inhibitor and should not be substituted for ACE inhibitors in patients who are tolerating ACE inhibitors without difficulty.

4. Placement of an ICD is reasonable in patients with LVEF of 30% to 35% of any origin with NYHA functional class II or III symptoms who are taking chronic optimal medical therapy and who have reasonable expectation of survival with good functional status of more than 1 year. *(Level of Evidence: B)*

Class IIb

1. A combination of hydralazine and a nitrate might be reasonable in patients with current or prior symptoms of HF and reduced LVEF who cannot be given an ACE inhibitor or ARB because of drug intolerance, hypotension, or renal insufficiency. *(Level of Evidence: C)*
2. The addition of an ARB may be considered in persistently symptomatic patients with reduced LVEF who are already being treated with conventional therapy. *(Level of Evidence: B)*

Class III

1. Routine combined use of an ACE inhibitor, ARB, and aldosterone antagonist is not recommended for patients with current or prior symptoms of HF and reduced LVEF. *(Level of Evidence: C)*
2. Calcium channel blocking drugs are not indicated as routine treatment for HF in patients with current or prior symptoms of HF and reduced LVEF. *(Level of Evidence: A)*
3. Long-term use of an infusion of a positive inotropic drug may be harmful and is not recommended for patients with current or prior symptoms of HF and reduced LVEF, except as palliation for patients with end-stage disease who cannot be stabilized with standard medical treatment (see recommendations for Stage D). *(Level of Evidence: C)*
4. Use of nutritional supplements as treatment for HF is not indicated in patients with current or prior symptoms of HF and reduced LVEF (*Level of Evidence: C*)
5. Hormonal therapies other than to replete deficiencies are not recommended and may be harmful to patients with current or prior symptoms of HF and reduced LVEF. *(Level of Evidence: C)*

Patients with HF and Normal LVEF

Class I

1. Physicians should control systolic and diastolic hypertension in patients with HF and normal LVEF, in accordance with published guidelines. *(Level of Evidence: A)*
2. Physicians should control ventricular rate in patients with HF and normal LVEF and atrial fibrillation. *(Level of Evidence: C)*
3. Physicians should use diuretics to control pulmonary congestion and peripheral edema in patients with HF and normal LVEF. *(Level of Evidence: C)*

Class IIa

1. Coronary revascularization is reasonable in patients with HF and normal LVEF and coronary artery disease in whom symptomatic or demonstrable myocardial ischemia is judged to be having an adverse effect on cardiac function. *(Level of Evidence: C)*

Class IIb

1. Restoration and maintenance of sinus rhythm in patients with atrial fibrillation and HF and normal LVEF might be useful to improve symptoms. *(Level of Evidence: C)*
2. The use of beta-adrenergic blocking agents, ACE inhibitors, ARBs, or calcium antagonists in patients with HF and normal LVEF and controlled hypertension might be effective to minimize symptoms of HF. *(Level of Evidence: C)*
3. The usefulness of digitalis to minimize symptoms of HF in patients with HF and normal LVEF is not well established. *(Level of Evidence: C)*

Patients with Refractory End-Stage HF (Stage D)

Class I

1. Meticulous identification and control of fluid retention is recommended in patients with refractory end-stage HF. *(Level of Evidence: B)*
2. Referral for cardiac transplantation in potentially eligible patients is recommended for patients with refractory end-stage HF. *(Level of Evidence: B)*

Table: Indications for Cardiac Transplantation

Absolute Indications in Appropriate Patients

• For hemodynamic compromise due to HF
  • Refractory cardiogenic shock
  • Documented dependence on IV inotropic support to maintain adequate organ perfusion
  • Peak VO_2 less than 10 mL per kg per min with achievement of anaerobic metabolism
• Severe symptoms of ischemia that consistently limit routine activity and are not amenable to coronary artery bypass surgery or percutaneous coronary intervention
• Recurrent symptomatic ventricular arrhythmias refractory to all therapeutic

modalities
Relative Indications • Peak VO_2 11 to 14 mL per kg per min (or 55% of predicted) and major limitation of the patient's daily activities • Recurrent unstable ischemia not amenable to other interventions • Recurrent instability of fluid balance/renal function not due to patient noncompliance with medical regimen
Insufficient Indications • Low left ventricular ejection fraction • History of functional class III or IV symptoms of HF • Peak VO_2 greater than 15 mL per kg per min (and greater than 55% of predicted) without other indications

HF indicates heart failure; IV, intravenous; and VO_2, oxygen consumption per unit time

3. Referral of patients with refractory end-stage HF to an HF program with expertise in the management of refractory HF is useful. *(Level of Evidence: A)*
4. Options for end-of-life care should be discussed with the patient and family when severe symptoms in patients with refractory end-stage HF persist despite application of all recommended therapies. *(Level of Evidence: C)*
5. Patients with refractory end-stage HF and implantable defibrillators should receive information about the option to inactivate defibrillation. *(Level of Evidence: C)*

Class IIa

1. Consideration of an LV assist device as permanent or "destination" therapy is reasonable in highly selected patients with refractory end-stage HF and an estimated 1-year mortality over 50% with medical therapy. *(Level of Evidence: B)*

Class IIb

1. Pulmonary artery catheter placement may be reasonable to guide therapy in patients with refractory end-stage HF and persistently severe symptoms. *(Level of Evidence: C)*
2. The effectiveness of mitral valve repair or replacement is not established for severe secondary mitral regurgitation in refractory end-stage HF. *(Level of Evidence: C)*
3. Continuous intravenous infusion of a positive inotropic agent may be considered for palliation of symptoms in patients with refractory end-stage HF. *(Level of Evidence: C)*

Patients who cannot be weaned from intravenous to oral therapy despite repeated attempts may require placement of an indwelling intravenous catheter to allow for the continuous infusion of dobutamine or milrinone, or as has been used more recently, nesiritide. Such a strategy is commonly used in patients who are awaiting cardiac transplantation, but it may also be used in the outpatient setting in patients who otherwise cannot be discharged from the hospital. The decision to continue intravenous infusions at home should not be made until all alternative attempts to achieve stability have failed repeatedly, because such an approach can present a major burden to the family and health services and may ultimately increase the risk of death. However, continuous intravenous support can provide palliation of symptoms as part of an overall plan to allow the patient to die with comfort at home. The use of continuous intravenous support to allow hospital discharge should be distinguished from the intermittent administration of infusions of such agents to patients who have been successfully weaned from inotropic support.

Class III

1. Partial left ventriculectomy is not recommended in patients with non-ischemic cardiomyopathy and refractory end-stage HF. *(Level of Evidence: C)*
2. Routine intermittent infusions of positive inotropic agents are not recommended for patients with refractory end-stage HF. *(Level of Evidence: B)*

Treatment of Special Populations

Many patients with HF are members of subpopulations who are likely to exhibit unique responses that accelerate the development or progression of HF or complicate the management of HF.

Class I

1. Groups of patients including (a) high-risk ethnic minority groups (e.g., blacks), (b) groups underrepresented in clinical trials, and (c) any groups believed to be underserved should, in the absence of specific evidence to direct otherwise, have clinical screening and therapy in a manner identical to that applied to the broader population. *(Level of Evidence: B)*
2. It is recommended that evidence-based therapy for HF be used in the elderly patient, with individualized consideration of the elderly patient's altered ability to metabolize or tolerate standard medications. *(Level of Evidence: C)*

Class IIa

1. The addition of isosorbide dinitrate and hydralazine to a standard medical regimen for HF, including ACE inhibitors and beta-blockers, is reasonable and can be effective in blacks with NYHA functional class III or IV HF. Others may benefit similarly, but this has not yet been tested. *(Level of Evidence: A)*

Patients with HF who Have Concomitant Disorders

Class I

1. All other recommendations should apply to patients with concomitant disorders unless there are specific exceptions. *(Level of Evidence C)*
2. Physicians should control systolic and diastolic hypertension and diabetes mellitus in patients with HF in accordance with recommended guidelines. *(Level of Evidence: C)*

   Clinical experience has shown that one side effect of newer oral agents of the thiazolidinedione class is weight gain, which is due in part to fluid retention. This effect may have the potential to precipitate or exacerbate HF in patients with reduced cardiac reserve. Thiazolidinediones probably should be used with caution in such patients.

   The risk of developing edema with thiazolidinediones is dose related and is higher in diabetic patients who are taking concomitant insulin therapy. However, the incidence of thiazolidinedione-related fluid retention is low in patients with NYHA functional class I to II symptoms, in whom these drugs can be administered safely with careful monitoring for fluid retention. Initiation of these drugs is not recommended in patients with NYHA functional class III to IV symptoms of HF.

   HF may complicate the management of both hypertension and diabetes mellitus. Some antihypertensive agents should be avoided in patients with HF because of their ability to depress cardiac function or to lead to salt and water retention.

   In addition, HF itself is associated with resistance to the actions of insulin, and the resulting hyperinsulinemia may promote both cardiac and vascular hypertrophy and thus may hasten the progression of HF.

3. Physicians should use nitrates and beta-blockers for the treatment of angina in patients with HF. *(Level of Evidence: B)*
4. Physicians should recommend coronary revascularization according to recommended guidelines in patients who have both HF and angina. *(Level of Evidence: A)*
5. Physicians should prescribe anticoagulants in patients with HF who have paroxysmal or persistent atrial fibrillation or a previous thromboembolic event. *(Level of Evidence: A)*
6. Physicians should control the ventricular response rate in patients with HF and atrial fibrillation with a beta-blocker (or amiodarone, if the beta-blocker is contraindicated or not tolerated). *(Level of Evidence: A)*
7. Patients with coronary artery disease and HF should be treated in accordance with recommended guidelines for chronic stable angina. *(Level of Evidence: C)*
8. Physicians should prescribe antiplatelet agents for prevention of MI and death in patients with HF who have underlying coronary artery disease. *(Level of Evidence: B)*

Class IIa

1. It is reasonable to prescribe digitalis to control the ventricular response rate in patients with HF and atrial fibrillation. *(Level of Evidence: A)*

2. It is reasonable to prescribe amiodarone to decrease recurrence of atrial arrhythmias and to decrease recurrence of ICD discharge for ventricular arrhythmias. *(Level of Evidence: C)*

Class IIb

1. The usefulness of current strategies to restore and maintain sinus rhythm in patients with HF and atrial fibrillation is not well established. *(Level of Evidence: C)*
2. The usefulness of anticoagulation is not well established in patients with HF who do not have atrial fibrillation or a previous thromboembolic event. *(Level of Evidence: B)*
3. The benefit of enhancing erythropoiesis in patients with HF and anemia is not established. *(Level of Evidence: C)*

Class III

1. Class I or III antiarrhythmic drugs are not recommended in patients with HF for the prevention of ventricular arrhythmias. *(Level of Evidence: A)*
2. The use of antiarrhythmic medication is not indicated as primary treatment for asymptomatic ventricular arrhythmias or to improve survival in patients with HF. *(Level of Evidence: A)*

End-of-Life Considerations

Class I

1. Ongoing patient and family education regarding prognosis for functional capacity and survival is recommended for patients with HF at the end of life. *(Level of Evidence: C)*
2. Patient and family education about options for formulating and implementing advance directives and the role of palliative and hospice care services with reevaluation for changing clinical status is recommended for patients with HF at the end of life. *(Level of Evidence: C)*

   The patient should be encouraged to choose in advance a person to assume legal authority (i.e., designated power of attorney or healthcare proxy) for healthcare matters when the patient cannot be involved in decisions. That individual should serve as the contact point for the team.

3. Discussion is recommended regarding the option of inactivating ICDs for patients with HF at the end of life. *(Level of Evidence: C)*
4. It is important to ensure continuity of medical care between inpatient and outpatient settings for patients with HF at the end of life. *(Level of Evidence: C)*
5. Components of hospice care that are appropriate to the relief of suffering, including opiates, are recommended and do not preclude the options for use of inotropes and intravenous diuretics for symptom palliation for patients with HF at the end of life. *(Level of Evidence: C)*

6. All professionals working with HF patients should examine current end-of-life processes and work toward improvement in approaches to palliation and end-of-life care. *(Level of Evidence: C)*

   Professionals caring for patients with advanced HF should have realistic expectations for survival and communicate those accurately to patients and families. Also, the professionals should provide realistic recommendations for procedures being done within the final days of life that do not add to the hope of recovery or improvement in life quality. Finally, greater attention and research need to be devoted to the provision of comfort measures in the final days of life, including relief of pain and dyspnea.

Class III

1. Aggressive procedures performed within the final days of life (including intubation and implantation of a cardioverter-defibrillator in patients with NYHA functional class IV symptoms who are not anticipated to experience clinical improvement from available treatments) are not appropriate. *(Level of Evidence: C)*

Definitions:

Levels of Evidence

Level of Evidence A: Data derived from multiple randomized clinical trials or meta-analyses

Level of Evidence B: Data derived from a single randomized trial or nonrandomized studies

Level of Evidence C: Only consensus opinion of experts, case studies, or standard-of-care

Strength of the Recommendations

Class I: Conditions for which there is evidence and/or general agreement that a given procedure or treatment is beneficial, useful, and effective

Class II: Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment

Class IIa: Weight of evidence/opinion is in favor of usefulness/efficacy.

Class IIb: Usefulness/efficacy is less well established by evidence/opinion.

Class III: Conditions for which there is evidence and/or general agreement that a procedure/treatment is not useful/effective and in some cases may be harmful

CLINICAL ALGORITHM(S)

An algorithm is provided in the original guideline document for the stages in the development of heart failure (HF) and recommended therapy by stage.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for selected recommendations (see the "Major Recommendations" field).

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- The development of heart failure (HF) can be appropriately characterized by considering 4 stages of the disease as described in the original guideline. This staging system recognizes that HF, like coronary artery disease, has established risk factors and structural prerequisites; that the development of HF has asymptomatic and symptomatic phases; and that specific treatments targeted at each stage can reduce the morbidity and mortality of HF.
- Many conditions or behaviors that are associated with an increased risk of structural heart disease can be identified before patients show any evidence of structural abnormalities. Because early modification of many of these factors can reduce the risk of HF, the recommendation of appropriate medical interventions to patients with these risk factors provides the earliest opportunity to reduce the impact of HF on public and individual health.

POTENTIAL HARMS

Diuretics

The principal adverse effects of diuretics include electrolyte and fluid depletion, as well as hypotension and azotemia. Diuretics may also cause rashes and hearing difficulties, but these are generally idiosyncratic or are seen with the use of very large doses, respectively. Diuretics can cause the depletion of important cations (potassium and magnesium), which can predispose patients to serious cardiac arrhythmias, particularly in the presence of digitalis therapy. The risk of electrolyte depletion is markedly enhanced when 2 diuretics are used in combination.

Angiotensin-converting Enzyme (ACE) Inhibitors

- Adverse effects related to angiotensin suppression include hypotension, worsening renal function, and potassium retention.
- Adverse effects related to kinin potentiation include cough and angioedema.
- Other types of side effects may also occur (e.g., rash and taste disturbances).

Beta-blockers

Initiation of treatment with a beta-blocker can produce 4 types of adverse reactions that require attention and management:

- Fluid retention and worsening heart failure
- Fatigue
- Bradycardia and heart block
- Hypotension

Digitalis Glycosides

- The major side effects of digitalis include cardiac arrhythmias (e.g., ectopic and re-entrant cardiac rhythms and heart block), gastrointestinal symptoms (e.g., anorexia, nausea, and vomiting), and neurological complaints (e.g., visual disturbances, disorientation, and confusion). Overt digitalis toxicity is commonly associated with serum digoxin levels greater than 2 ng per mL. However, toxicity may occur with lower digoxin levels, especially if hypokalemia, hypomagnesemia, or hypothyroidism co-exists.
- There is concern that levels of digoxin that previously had been considered to be in the therapeutic range (up to 2 ng per mL) may exert deleterious cardiovascular effects in the long term, even though such levels appear to be well tolerated in the short-term.

Aldosterone Antagonists (Spironolactone and Eplerenone)

- The major risks of aldosterone antagonists are hyperkalemia due to inhibition of potassium excretion and of deterioration renal function.
- Gynecomastia or other antiandrogen effects that can occur during therapy with spironolactone are not generally seen with the newer aldosterone antagonist eplerenone.

Angiotensin Receptor Blockers (ARBs)

- The risks of treatment with angiotensin receptor blockers are those attributed to suppression of angiotensin stimulation, as discussed above for ACE inhibitors. These risks of hypotension, renal dysfunction, and hyperkalemia are greater when combined with another inhibitor of the axis, such as ACE inhibitors or aldosterone antagonists.

Other Drugs

Hydralazine and isosorbide dinitrate produce frequent adverse reactions (primarily headache and gastrointestinal complaints).

Subgroup Most Likely to be Harmed:

ACE Inhibitors

- The frequency of cough is approximately 5% to 10% in white patients of European descent and rises to nearly 50% in Chinese patients.
- Angioedema occurs in fewer than 1% of patients taking an ACE inhibitor but is more frequent in blacks.

Beta-blockers

Patients with fluid retention before treatment are at greatest risk of fluid retention during treatment.

Digitalis Glycosides

- The concomitant use of clarithromycin, erythromycin, amiodarone, itraconazole, cyclosporine, verapamil, or quinidine, can increase serum digoxin levels and may increase the likelihood of digitalis toxicity.
- A low lean body mass and impaired renal function can elevate serum digoxin levels, which may explain the increased risk of digitalis toxicity in elderly patients.

Patients with Refractory End stage Heart Failure

Patients who are at the end stage of their disease are at particular risk of developing hypotension and renal insufficiency after the administration of an angiotensin converting enzyme inhibitor and of experiencing worsening heart failure after treatment with a beta-blocker.

CONTRAINDICATIONS

CONTRAINDICATIONS

- Patients should not be given an angiotensin-converting enzyme (ACE) inhibitor if they have experienced life-threatening adverse reactions (angioedema or anuric renal failure) during previous exposure to the drug or if they are pregnant. They should take an ACE inhibitor with caution if they have very low systemic blood pressures (systolic blood pressure less than 80 mm Hg), markedly increased serum levels of creatinine (greater than 3 mg per dL), bilateral renal artery stenosis, or elevated levels of serum potassium (greater than 5.5 mmol per liter). Finally, treatment with an ACE inhibitor should not be initiated in hypotensive patients who are at immediate risk of cardiogenic shock.
- Beta-blockers may be considered in patients who have reactive airway disease or asymptomatic bradycardia but should be used with great caution or not at all in patients with persistent symptoms of either condition.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These practice guidelines are intended to assist healthcare providers in clinical decision making by describing a range of generally acceptable approaches for the diagnosis, management, or prevention of specific diseases or conditions. These guidelines attempt to define practices that meet the needs of most patients in most circumstances. The ultimate judgment regarding care of a particular patient must be made by the healthcare provider and patient in light of all of the circumstances presented by that patient.

- These guidelines do not address cost-effectiveness from a societal perspective. The guidelines are not meant to assist policy makers faced with the necessity to make decisions regarding the allocation of finite healthcare resources. In fact, these guidelines assume no resource limitation. They do not provide policy makers with sufficient information to be able to choose wisely between options for resource allocation.
- The various therapeutic strategies described in this document can be viewed as a checklist to be considered for each patient in an attempt to individualize treatment for an evolving disease process. Every patient is unique, not only in terms of his or her cause and course of heart failure, but also in terms of his or her personal and cultural approach to the disease. Guidelines can only provide an outline for evidence-based decisions or recommendations for individual care; these guidelines are meant to provide that outline.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Implementation of Practice Guidelines

Class I

1. Academic detailing or educational outreach visits are useful to facilitate the implementation of practice guidelines. (*Level of Evidence: A*)
2. Multidisciplinary disease-management programs for patients at high risk for hospital admission or clinical deterioration are recommended to facilitate the implementation of practice guidelines, to attack different barriers to behavioral change, and to reduce the risk of subsequent hospitalization for heart failure (HF). (*Level of Evidence: A*)

Class IIa

1. Chart audit and feedback of results can be effective to facilitate implementation of practice guidelines. (*Level of Evidence: A*)
2. The use of reminder systems can be effective to facilitate implementation of practice guidelines. (*Level of Evidence: A*)
3. The use of performance measures based on practice guidelines may be useful to improve quality of care. (*Level of Evidence: B*)
4. Statements by and support of local opinion leaders can be helpful to facilitate implementation of practice guidelines. (*Level of Evidence: A*)

Class IIb

1. Multidisciplinary disease management programs for patients at low risk for hospital admission or clinical deterioration may be considered to facilitate implementation of practice guidelines. (*Level of Evidence: B*)

Class III

1. Dissemination of guidelines without more intensive behavioral change efforts is not useful to facilitate implementation of practice guidelines. (*Level of Evidence: A*)
2. Basic provider education alone is not useful to facilitate implementation of practice guidelines. (*Level of Evidence: A*)

Note: Definitions for the weight of the evidence (A-C) and classes of recommendations (I-III) can be found at the end of the "Major Recommendations" field.

IMPLEMENTATION TOOLS

Clinical Algorithm
Personal Digital Assistant (PDA) Downloads
Pocket Guide/Reference Cards
Tool Kits

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

End of Life Care
Living with Illness
Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Hunt SA, Abraham WT, Chin MH, Feldman AM, Francis GS, Ganiats TG, Jessup M, Konstam MA, Mancini DM, Michl K, Oates JA, Rahko PS, Silver MA, Stevensen LW, Yancy CW. ACC/AHA 2005 guideline update for the diagnosis and management of chronic heart failure in the adult. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines [trunc]. Bethesda (MD): American College of Cardiology Foundation (ACCF); 2005 Aug. 82 p. [694 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1995 Nov 1 (revised 2005 Aug 16)

GUIDELINE DEVELOPER(S)

American College of Cardiology Foundation - Medical Specialty Society
American Heart Association - Professional Association

GUIDELINE DEVELOPER COMMENT

Developed in Collaboration with the American College of Chest Physicians and the International Society for Heart and Lung Transplantation

SOURCE(S) OF FUNDING

The American College of Cardiology Foundation and the American Heart Association. No outside funding accepted.

GUIDELINE COMMITTEE

Writing Committee to Update the 2001 Guidelines for the Evaluation and Management of Heart Failure

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

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Writing Committee Members: Sharon Ann Hunt, MD, FACC, *Chair*; William T. Abraham, MD, FACC, FAHA; Marshall H. Chin, MD, MPH, FACP; Arthur M. Feldman, MD, PhD, FACC, FAHA; Gary S. Francis, MD, FACC, FAHA; Theodore G. Ganiats, MD; Mariell Jessup, MD, FACC, FAHA; Marvin A. Konstam, MD, FACC; Donna M. Mancini, MD; Keith Michl, MD, FACP; John A. Oates, MD, FAHA; Peter S. Rahko, MD, FACC, FAHA; Marc A. Silver, MD, FACC, FAHA; Lynne Warner Stevenson, MD, FACC, FAHA; Clyde W. Yancy, MD, FACC, FAHA

Task Force Members: Elliott M. Antman, MD, FACC, FAHA, *Chair*; Sidney C. Smith, Jr., MD, FACC, FAHA, *Vice Chair*; Cynthia D. Adams, MSN, APRN-BC, FAHA; Jeffrey L. Anderson, MD, FACC, FAHA; David P. Faxon, MD, FACC, FAHA*; Valentin Fuster, MD, PhD, FACC, FAHA, FESC*; Jonathan L. Halperin, MD, FACC, FAHA; Loren F. Hiratzka, MD, FACC, FAHA*; Sharon Ann Hunt, MD, FACC, FAHA; Alice K. Jacobs, MD, FACC, FAHA; Rick Nishimura, MD, FACC, FAHA; Joseph P. Ornato, MD, FACC, FAHA; Richard L. Page, MD, FACC, FAHA; Barbara Riegel, DNSc, RN

*Former Task Force Member

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

The American College of Cardiology/American Heart Association (ACC/AHA) Task Force on Practice Guidelines makes every effort to avoid any actual, potential, or perceived conflicts of interest that might arise as a result of an outside relationship or personal interest of a member of the writing committee. Specifically, all members of the writing committee, as well as peer reviewers of the document, are asked to provide disclosure statements of all such relationships that might be perceived as real or potential conflicts of interest. These statements are reviewed by the parent task force, reported orally to all members of the writing panel at each meeting, and updated and reviewed by the writing committee as changes occur.

Table: ACC/AHA Committee to Revise the 2001 Guidelines for the Evaluation and Management of Chronic Heart Failure - Relationship with Industry

Committee Member	Research Grant	Speakers Bureau	Stock Ownership	Board of Directors	Consultant/Advisory Member
Dr. William T. Abraham	Amgen; Biosite; Biotronik; Cardio Dynamics; International Corp; Guidant Corp; Medtronic; Myogen; Orqis Medical; Otsuka Maryland Research Institute; Scios; Vasogen; Yamanouchi	GlaxoSmithKline; Guidant Corp.; Medtronic; Merck & Co.; Pfizer; Scios; St. Jude Medical	None	None	CHF Solutions; GlaxoSmithKline; Medtronic; Scios
Dr. Marshall H. Chin	None	None	None	None	None
Dr. Arthur M. Feldman	Medtronic; Myogen; Orquis; Pfizer; Vasomedical	Astra-Zeneca; Guidant	Cardiokine	Cardiokine	Astra-Zeneca; Guidant; Myogen; Pfizer; Vasomedical
Dr. Gary S. Francis	Pfizer	None	None	None	GlaxoSmithKline; Merck; Novartis
Dr. Theodore G. Ganiats	None	None	None	None	Pfizer
Dr. Sharon Ann Hunt	None	None	None	None	None
Dr. Mariell Jessup	Medtronic; Novartis; Pfizer	GlaxoSmithKline; Medtronic	None	None	ACORN; GlaxoSmithKline; Medtronic
Dr. Marvin A. Konstam	GlaxoSmithKline	Astra-Zeneca; GlaxoSmithKline; Merck; Novartis	None	None	Astra-Zeneca; GlaxoSmithKline; Merck; Novartis
Dr. Donna M. Mancini	None	None	None	None	None

Committee Member	Research Grant	Speakers Bureau	Stock Ownership	Board of Directors	Consultant/Advisory Member
Dr. Keith A. Michl	None	None	None	None	None
Dr. John A. Oates	Merck; McNeil	None	None	None	Merck; McNeil
Dr. Peter S. Rahko	Bristol-Myers Squibb; Myogen; Novartis	Boehringer-Ingelheim; Novartis; Pfizer	None	None	GlaxoSmithKline
Dr. Marc A. Silver	Pfizer; Scios	GlaxoSmithKline	Cardiodynamics	None	None
Dr. Lynne Warner Stevenson	Medtronic	None	None	None	Medtronic; Scios
Dr. Clyde W. Yancy	GlaxoSmithKline; NitroMed; Scios	GlaxoSmithKline; Medtronic; Novartis	None	None	CHF Solutions; GlaxoSmithKline; Medtronic; Scios

Note: This table represents the relationships of committee members with industry that were disclosed at the initial writing committee meeting in November 2003 and updated in conjunction with all meetings and conference calls of the writing committee. It does not necessarily reflect relationships with industry at the time of publication.

Table: External Peer Reviewers for the ACC/AHA 2005 Guideline Update for the Diagnosis and Management of Chronic Heart Failure in the Adult*

Peer Reviewer Name**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/ Boar
Dr. Mihai Gheorghiade	Official Reviewer - AHA	GlaxoSmithKline; Otzuka; Sigma Tau	Pfizer	None	GlaxoSmithKl Medtronic; Ot Sigma Tau
Dr. Jonathan L. Halperin	Official Reviewer - ACC/AHA Task Force Lead Review	None	Astra-Zeneca; Bristol-Myers Squibb/Sanofi Partnership	None	Astra-Zeneca AG Boehringe Ingelheim; Br Myers Squibb Partnership
Dr. Jagat Narula	Official Reviewer - AHA	None	None	None	None
Dr. Milton Packer	Official Reviewer - ACC/AHA	None	None	Discovery Laboratories; Titan Pharmaceuticals	Abbott; Astra Actelion; Cardiodynami Discovery Laboratories; GlaxoSmithKl Orion Pharmaceutic Pharmaceutic Yamanouchi

Peer Reviewer Name**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/ Boar
Dr. Ileana L. Pina	Official Reviewer - AHA	Biosite; CMS; NIH	Astra-Zeneca; GlaxoSmithKline; Novartis; Pfizer	None	Astra-Zeneca CDRH
Dr. Miguel A. Quinones	Official Reviewer - ACCF Board of Trustees	None	None	None	Proctor & Gar
Dr. Richard F. Wright	Official Reviewer - ACCF Board of Governors	None	Astra-Zeneca; Bristol-Myers Squibb; Novartis	Cardiodynamics	Bristol-Myers Cardiodynami Novartis
Nancy M. Albert, CNS	Content Reviewer - AHA HF and Transplantation Committee	None	Medtronic; GlaxoSmithKline; Scios Pharmaceuticals	None	GlaxoSmithKl
Dr. Jeffrey L. Anderson	Content Reviewer - Individual Review	None	Merck; Johnson & Johnson; Merck-Schering-Plough	None	Merck; Johns Johnson; Mer Schering; Plo
Dr. Elliott M. Antman	Content Reviewer - Individual Review	Astra-Zeneca; Biosite; Boehringer-Mannheim; Bristol-Myers Squibb; Centocor; CV Therapeutics; Dade; Dendrion; Eli Lilly; Genentech; Merck; Millennium; Sanofi-Aventis; Sunol Molecular	None	None	None
Dr. Malcolm O. Arnold	Content Reviewer - ACC HF Data Standards Committee	None	Aventis; Merck-Frosst; Novartis; Pfizer	None	Aventis; Merc Novartis; Pfiz
Dr. John P. Boehmer	Content Reviewer - Individual Review	Acorn Cardiovascular; Amgen Cardiovascular; Bio Therapeutics; Guidant; Medtronic; Myogen; Orion Pharmaceuticals	None	None	None
Dr. Michael R. Bristow	Content Reviewer - Individual	None	None	None	Astra-Zeneca Divisions; Co C2R; CVRx; G

Peer Reviewer Name**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/ Boar
	Review				GlaxoSmithKl Guidant; Merc Mitsubishi; My Myogen; Nova Scios Pharma
Dr. Alfred E. Buxton	Content Reviewer - ACC/AHA Ventricular Arrhythmias and Sudden Cardiac Death Guideline Committee	Medtronic; Guidant; St. Jude	None	None	Medtronic
Dr. Charles E. Canter	Content Reviewer - AHA Committee on HF and Transplantation	Novartis	None	None	None
Dr. Donald E. Casey	Content Reviewer - ACC HF Performance Measures Committee	None	None	None	None
Dr. Michael P. Cinquegrani	Content Reviewer - ACC HF Data Standards Committee	None	None	Medtronic; Pfizer	None
Dr. Teresa De Marco	Content Reviewer - Individual Review	Scios Pharmaceuticals	Guidant; Medtronic; Scios Pharmaceuticals	None	Guidant; Med Scios Pharma
Dr. Gordon A. Ewy	Content Reviewer - ACC/AHA Coronary Artery Bypass Graft Surgery Guideline Writing Committee	None	Astra-Zeneca; Kos; GlaxoSmithKline; Merck; Pfizer; Schering-Plough; Wyeth-Ayerst	None	None
Dr. Gregg C. Fonarow	Content Reviewer - AHA Quality of Care and Outcomes Committee	Amgen; Biosite; Bristol-Myers Squibb; GlaxoSmithKline; Guidant; Medtronic; Merck; Pfizer; Scios Pharmaceuticals	Amgen; Biosite; Bristol-Myers Squibb; GlaxoSmithKline; Guidant; Medtronic; Merck; Pfizer; Scios Pharmaceuticals	None	Amgen; Biosi Bristol-Myers GlaxoSmithKl Guidant; Med Merck; Pfizer; Pharmaceutic

Peer Reviewer Name**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/ Boar
Dr. Michael M. Givertz	Content Reviewer - AHA Committee on HF and Transplantation	None	None	None	None
Dr. David C. Goff	Content Reviewer - AHA Quality of Care and Outcomes Committee	None	Pfizer	None	Johnson & Joh Pfizer
Dr. Edward P. Havranek	Content Reviewer - ACC HF Data Standards Committee	None	None	None	None
Dr. Paul A. Heidenreich	Content Reviewer - ACC HF Data Standards Committee	None	None	None	None
Dr. Mark A. Hlatky	Content Reviewer - ACC HF Performance Measures Committee	None	None	None	None
Dr. Judith S. Hochman	Content Reviewer - ACC/AHA ST-Elevation Myocardial Infarction Guideline Writing Committee	Arginox; Eli Lilly	None	None	Datascope; D Millennium; P and Gamble; Aventis
Dr. Marrick L. Kuckin	Content Reviewer - Individual Review	Astra-Zeneca; Myogen; Vasogen	Astra-Zeneca; Myogen; Vasogen	None	Astra-Zeneca
Dr. Barry M. Massie	Content Reviewer - Individual Review	None	None	None	None
Debra Moser, MN, RN	Content Reviewer - AHA Quality of Care and Outcomes Committee	None	None	None	None
Dr. Erik	Content	Bristol-Myers	None	Medtronic	None

Peer Reviewer Name**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/ Boar
Magnus Ohman	Reviewer - Individual Review	Squibb/Sanofi; Millennium; Schering-Plough; Berlex			
Dr. Eric N. Prystowsky	Content Reviewer - ACC/AHA/ESC Atrial Fibrillation Guideline Writing Group	None	None	None	Guidant
Dr. Andrew L. Smith	Content Reviewer - ACC HF Performance Measures Committee	Guidant/Medtronic; Nitromed	Guidant; Nitromed	None	None
Dr. George Sopko	Content Reviewer - AHA Committee on HF and Transplantation	None	None	None	None
Dr. Karl T. Weber	Content Reviewer - Individual Review	None	None	None	None
Dr. William S. Weintraub	Content Reviewer - AHA Quality of Care and Outcomes Committee	Pfizer	None	None	Pfizer
Dr. Deborah Allen	Organizational Reviewer - American Academy of Family Physicians	None	None	None	None
Dr. Denise Barnard	Organizational Reviewer - Heart Failure Society of America	None	None	None	None
Dr. Jonathan Howlett	Organizational Reviewer - Heart Failure Society of America	Astra-Zeneca	None	None	Astra-Zeneca Novartis; Ser Merck; Bristol Squibb/Sanof
Dr. Ijaz A. Kahn	Organizational Reviewer - American College of Chest Physicians	None	None	None	None

Peer Reviewer Name**	Representation	Research Grant	Speakers Bureau/Honoraria	Stock Ownership	Consultant/ Boar
Dr. JoAnn Lindenfeld	Organizational Reviewer - Heart Failure Society of America	Bristol-Myers Squibb/Sanofi; Medtronic; Myogen; Novocardia; Pfizer; Scios Pharmaceuticals	None	None	None
Dr. Mandeep R. Mehra	Organizational Reviewer - International Society for Heart and Lung Transplantation	Astra-Zeneca; Biosite Diagnostics; Guidant; Medtronic; Merck; Scios Pharmaceuticals	Astra-Zeneca; Biosite Diagnostics; Guidant; Medtronic; Merck; Novartis; Scios Pharmaceuticals	Hommed	Astra-Zeneca Diagnostics; Medtronic; Me Novartis; Scio Pharmaceutic
Dr. Alan Miller	Organizational Reviewer - Heart Failure Society of America	Amgen; Astra-Zeneca; GlaxoSmithKline; Myogen; NitroMed; Novartis; Pfizer	Astra-Zeneca; Bristol-Myers Squibb/Sanofi; GlaxoSmithKline; Novartis; Pfizer; Wyeth	None	GlaxoSmithKl Pfizer
Dr. K. Vijayaraghavan	Organizational Reviewer - American College of Chest Physicians	Amgen; Astra-Zeneca; Cardiodynamics; Kos; Merck-Schering-Plough; Myogen; Pfizer	GlaxoSmithKline; Guidant; Merck; Medtronic; Novartis; Pfizer; Scios Pharmaceuticals	None	None

Notes: This table represents the relationships of peer reviewers with industry that were disclosed at the time of peer review of this guideline. It does not necessarily reflect relationships with industry at the time of publication.

*Participation in the peer review process does not imply endorsement of the document.

**Names are listed in alphabetical order within each category of review.

ENDORSER(S)

Heart Failure Society of America, Inc - Disease Specific Society

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Hunt SA, Baker DW, Chin MH, Cinquegrani MP, Feldman AM, Francis GS, Ganiats TG, Goldstein S, Gregoratos G, Jessup ML, Noble RJ, Packer M, Silver MA, Stevenson LW. ACC/AHA guidelines for

the evaluation and management of chronic heart failure in the adult. Bethesda (MD): American College of Cardiology Foundation (ACCF); 2001 Sep. 56 p.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the American College of Cardiology (ACC) Web site, and from the American Heart Association (AHA) Web site.

Print copies: Available from the American College of Cardiology, 9111 Old Georgetown Road, Bethesda, Maryland 20814-1699.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- ACC/AHA 2005 guideline update for the diagnosis and management of chronic heart failure in the adult: summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Update the 2001 Guidelines for the Evaluation and Management of Heart Failure). Electronic copies: Available in from the American College of Cardiology (ACC) Web site.
- ACC/AHA Pocket Guideline. Diagnosis and management of chronic heart failure in the adult. Electronic copies available from the ACC Web site: a Pocket Guideline; or Pocket Guideline Palm Download are available.

Print copies: Available from the American College of Cardiology, Resource Center, 9111 Old Georgetown Rd, Bethesda, MD 20814-1699; (800) 253-4636 (US only).

Get With the Guidelines (GWTG) provides disease-specific process documents and tools for in-house quality improvement. See the American Heart Association Web site for more information. See the related QualityTool summary on the Health Care Innovations Exchange Web site.

PATIENT RESOURCES

None available

NGC STATUS

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