General

Guideline Title

2013 ACCF/AHA guideline for the management of heart failure. A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines.

Bibliographic Source(s)

Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JJ, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WH, Tsai EJ, Wilkoff BL. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2013 Oct 15;62(16):e147-239. [924 references] PubMed

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: 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, Stevenson LW, Yancy CW, American College of Cardiology Foundation, American Heart Association. 2009 focused update incorporated into the ACC/AHA 2005 guidelines for the diagnosis and management of heart failure in adults [trunc]. J Am Coll Cardiol. 2009 Apr 14;53(15):e1-e90.

Recommendations

Major Recommendations

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

Initial and Serial Evaluation of the Heart Failure (HF) Patient

Clinical Evaluation

History and Physical Examinations

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. In patients with idiopathic dilated cardiomyopathy (DCM), a 3-generational family history should be obtained to aid in establishing the diagnosis of familial DCM. (*Level of Evidence: C*)

3. Volume status and vital signs should be assessed at each patient encounter. This includes serial assessment of weight, as well as estimates of jugular venous pressure and the presence of peripheral edema or orthopnea (Butman et al., 1993; Drazner et al., 2001; Drazner et al., 2008; Stevenson & Perloff, 1989). (*Level of Evidence: B*)

Risk Scoring

Class IIa

1. Validated multivariable risk scores can be useful to estimate subsequent risk of mortality in ambulatory or hospitalized patients with HF (Aaronson et al., 1997; Fonarow et al., 2005; Komajda et al., 2011; Lee et al., 2003; Levy et al., 2006; O'Connor et al., 2008; Peterson et al., 2010; Pocock et al., 2006; Wedel et al., 2009). (*Level of Evidence: B*)

Diagnostic Tests

Class I

1. 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, glucose, fasting lipid profile, liver function tests, and thyroid-stimulating hormone. (*Level of Evidence: C*)
2. Serial monitoring, when indicated, should include serum electrolytes and renal function. (*Level of Evidence: C*)
3. A 12-lead electrocardiogram (ECG) should be performed initially on all patients presenting with HF. (*Level of Evidence: C*)

Class IIa

1. Screening for hemochromatosis or human immunodeficiency virus (HIV) is reasonable in selected patients who present with HF (Okonko et al., 2011). (*Level of Evidence: C*)
2. 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*)

Biomarkers

Ambulatory/Outpatient

Class I

1. In ambulatory patients with dyspnea, measurement of B-type natriuretic peptide (BNP) or N-terminal pro-B-type natriuretic peptide (NT-proBNP) is useful to support clinical decision making regarding the diagnosis of HF, especially in the setting of clinical uncertainty (Costello-Boerrigter et al., 2006; de Lemos et al., 2009; Goetze et al., 2006; Ng et al., 2005; Richards et al., 2001; Tang et al., 2003; Vasan et al., 2002). (*Level of Evidence: A*)
2. Measurement of BNP or NT-proBNP is useful for establishing prognosis or disease severity in chronic HF (Tang et al., 2003; Berger et al., 2002; Anand et al., 2003; Forfia et al., 2005; Taub, Daniels, & Maisel, 2009; Maeda et al., 2000; Neuhold et al., 2008). (*Level of Evidence: A*)

Class IIa

1. BNP- or NT-proBNP–guided HF therapy can be useful to achieve optimal dosing of guideline-directed medical therapy (GDMT) in select clinically euvolemic patients followed in a well-structured HF disease management program (Januzzi et al., 2011; Porapakkham et al., 2010; Felker et al., 2009; Jourdain et al., 2007; Pfisterer et al., 2009; Berger et al., 2010; Troughton et al., 2000; Lainchbury et al., 2009). (*Level of Evidence: B*)

Class IIb

1. The usefulness of serial measurement of BNP or NT-proBNP to reduce hospitalization or mortality in patients with HF is not well established (Januzzi et al., 2011; Porapakkham et al., 2010; Felker et al., 2009; Jourdain et al., 2007; Pfisterer et al., 2009; Berger et al., 2010; Troughton et al., 2000; Lainchbury et al., 2009). (*Level of Evidence: B*)
2. Measurement of other clinically available tests such as biomarkers of myocardial injury or fibrosis may be considered for additive risk stratification in patients with chronic HF (Horwich et al., 2003; Sato et al., 2001; Setsuta et al., 1999; Hudson et al., 2004; Tang et al., 2011; de Boer et al., 2011; Lok et al., 2010). (*Level of Evidence: B*)

Hospitalized/Acute

Class I

1. Measurement of BNP or NT-proBNP is useful to support clinical judgment for the diagnosis of acutely decompensated HF, especially in the setting of uncertainty for the diagnosis (Januzzi et al., 2006; Dao et al., 2001; Davis et al., 1994; Maisel et al., 2002; van Kimmenade et al., 2006; Moe et al., 2007; Mueller et al., 2004). (*Level of Evidence: A*)
2. Measurement of BNP or NT-proBNP and/or cardiac troponin is useful for establishing prognosis or disease severity in acutely decompensated HF (van Kimmenade et al., 2006; Bettencourt et al., 2004; Cheng et al., 2001; Fonarow et al. "Usefulness," 2008; Logeart et al., 2004; Maisel et al., 2004; Zairis et al., 2010; Peacock et al., 2008; Lee et al., 2012). (*Level of Evidence: A*)

Class IIb

1. The usefulness of BNP- or NT-proBNP–guided therapy for acutely decompensated HF is not well established (Bayes-Genis et al., 2005; Dhaliwal et al., 2009). (*Level of Evidence: C*)
2. Measurement of other clinically available tests such as biomarkers of myocardial injury or fibrosis may be considered for additive risk stratification in patients with acutely decompensated HF (van Kimmenade et al., 2006; Fonarow et al. "Influence," 2008; Zairis et al., 2010; Peacock et al., 2008; Alonso-Martinez et al., 2002; Dieplinger et al., 2010; Ilva et al., 2008; Januzzi et al., 2007; Manzano-Fernandez et al., 2011; Rehman et al., 2008; Shah et al., 2010). (*Level of Evidence:* A)

Noninvasive Cardiac Imaging

Class I

1. Patients with suspected or new-onset HF, or those presenting with acute decompensated HF, should undergo a chest x-ray to assess heart size and pulmonary congestion and to detect alternative cardiac, pulmonary, and other diseases that may cause or contribute to the patient's symptoms. (*Level of Evidence: C*)
2. A 2-dimensional echocardiogram with Doppler should be performed during initial evaluation of patients presenting with HF to assess ventricular function, size, wall thickness, wall motion, and valve function. (*Level of Evidence: C*)
3. Repeat measurement of ejection fraction (EF) and measurement of the severity of structural remodeling are useful to provide information in patients with HF who have had a significant change in clinical status; who have experienced or recovered from a clinical event; or who have received treatment, including GDMT, that might have had a significant effect on cardiac function; or who may be candidates for device therapy. (*Level of Evidence: C*)

Class IIa

1. Noninvasive imaging to detect myocardial ischemia and viability is reasonable in patients presenting with de novo HF, who have known coronary artery disease (CAD) and no angina, unless the patient is not eligible for revascularization of any kind. (*Level of Evidence: C*)
2. Viability assessment is reasonable in select situations when planning revascularization in HF patients with CAD (Rizzello et al., 2009; Allman et al., 2002; Beanlands et al., 2002; Pagley et al. 1997; Senior, Kaul, & Lahiri, 1999). (*Level of Evidence: B*)
3. Radionuclide ventriculography or magnetic resonance imaging can be useful to assess left ventricular ejection fraction (LVEF) and volume when echocardiography is inadequate. (*Level of Evidence: C*)
4. Magnetic resonance imaging is reasonable when assessing myocardial infiltrative processes or scar burden (Kwon et al., 2009; Ordovas & Higgins, 2011; Syed et al., 2010). (*Level of Evidence:* B)

Class III: No Benefit

1. Routine repeat measurement of LV function assessment in the absence of clinical status change or treatment interventions should not be performed (Bellar, 2012; American College of Cardiology Foundation Appropriate Use Criteria Task Force et al., 2011). (*Level of Evidence: B*)

Invasive Evaluation

Class I

1. Invasive hemodynamic monitoring with a pulmonary artery catheter should be performed to guide therapy in patients who have respiratory distress or clinical evidence of impaired perfusion in whom the adequacy or excess of intracardiac filling pressures cannot be determined from clinical assessment. (*Level of Evidence: C*)

Class IIa

1. Invasive hemodynamic monitoring can be useful for carefully selected patients with acute HF who have persistent symptoms despite empiric adjustment of standard therapies and
    a. Whose fluid status, perfusion, or systemic or pulmonary vascular resistance is uncertain
    b. Whose systolic pressure remains low, or is associated with symptoms, despite initial therapy
    c. Whose renal function is worsening with therapy
    d. Who require parenteral vasoactive agents
    e. Who may need consideration for mechanical circulatory support (MCS) or transplantation (*Level of Evidence: C*)
2. When ischemia may be contributing to HF, coronary arteriography is reasonable for patients eligible for revascularization. (*Level of Evidence: C*)
3. Endomyocardial biopsy can be useful in patients presenting with HF when a specific diagnosis is suspected that would influence therapy. (*Level of Evidence: C*)

Class III: No Benefit

1. Routine use of invasive hemodynamic monitoring is not recommended in normotensive patients with acute decompensated HF and congestion with symptomatic response to diuretics and vasodilators (Binanay et al., 2005). (*Level of Evidence: B*)

Class III: Harm

1. Endomyocardial biopsy should not be performed in the routine evaluation of patients with HF. (*Level of Evidence: C*)

Treatment of Stages A to D

Stage A

Class I

1. Hypertension and lipid disorders should be controlled in accordance with contemporary guidelines to lower the risk of HF (Chobanian et al., 2003; Kostis et al., 1997; Beckett et al., 2008; Sciarretta et al., 2011; Staessen, Wang, & Thijs, 2003; Verdecchia et al., 2009). (*Level of Evidence: A*)
2. Other conditions that may lead to or contribute to HF, such as obesity, diabetes mellitus, tobacco use, and known cardiotoxic agents, should be controlled or avoided. (*Level of Evidence: C*)

Stage B

Class I

1. In all patients with a recent or remote history of myocardial infarction (MI) or acute coronary syndrome (ACS) and reduced EF, angiotensin-converting-enzyme (ACE) inhibitors should be used to prevent symptomatic HF and reduce mortality (Pfeffer et al., 1992; CONSENSUS Trial Study Group, 1987; "Effect of enalapril on mortality," 1992). In patients intolerant of ACE inhibitors, angiotensin receptor blockers (ARBs) are appropriate unless contraindicated (Verdecchia et al., 2009; Pfeffer et al., "Valsartan," 2003). (*Level of Evidence: A*)
2. In all patients with a recent or remote history of MI or ACS and reduced EF, evidence-based beta blockers should be used to reduce mortality (Dargie, 2001; Vantrimpont et al., 1997; Exner et al., 1999). (*Level of Evidence: B*)
3. In all patients with a recent or remote history of MI or ACS, statins should be used to prevent symptomatic HF and cardiovascular events (Grundy et al., 2004; Scirica et al., 2006; Afilalo, Majdan, & Eisenberg, 2007; Ho et al., 2012; Strandberg et al., 2009; Kjekshus et al., 1997; Sacks et al., 1996). (*Level of Evidence: A*)
4. In patients with structural cardiac abnormalities, including LV hypertrophy, in the absence of a history of MI or ACS, blood pressure should be controlled in accordance with clinical practice guidelines for hypertension to prevent symptomatic HF (Chobanian et al., 2003; Kostis et al., 1997; Beckett et al., 2008; Sciarretta et al., 2011; Staessen, Wang, & Thijs, 2003). (*Level of Evidence: A*)
5. ACE inhibitors should be used in all patients with a reduced EF to prevent symptomatic HF, even if they do not have a history of MI (Jong et al., 2003; "Effect of enalapril on mortality," 1992). (*Level of Evidence: A*)
6. Beta blockers should be used in all patients with a reduced EF to prevent symptomatic HF, even if they do not have a history of MI. (*Level of Evidence: C*)

Class IIa

1. To prevent sudden death, placement of an implantable cardioverter-defibrillator (ICD) is reasonable in patients with asymptomatic ischemic

cardiomyopathy who are at least 40 days post-MI, have an LVEF of 30% or less, are on appropriate medical therapy, and have reasonable expectation of survival with a good functional status for more than 1 year (Moss et al., 2002). (*Level of Evidence: B*)

Class III: Harm

1. Nondihydropyridine calcium channel blockers with negative inotropic effects may be harmful in asymptomatic patients with low LVEF and no symptoms of HF after MI. (*Level of Evidence: C*)

Stage C

Nonpharmacological Interventions—Education

Class I

1. Patients with HF should receive specific education to facilitate HF self-care (Boren et al., 2009; Gwadry-Sridhar et al., 2005; Koelling et al., 2005; VanSuch et al., 2006; Aguado et al., 2010; Riegel et al., 2009). (*Level of Evidence: B*)

Nonpharmacological Interventions—Sodium Restriction

Class IIa

1. Sodium restriction is reasonable for patients with symptomatic HF to reduce congestive symptoms. (*Level of Evidence: C*)

Nonpharmacological Interventions—Treatment of Sleep Disorders

Class IIa

1. Continuous positive airway pressure can be beneficial to increase LVEF and improve functional status in patients with HF and sleep apnea (Arzt et al., 2007; Bradley et al., 2005; Kaneko et al., 2003; Mansfield et al., 2004). (*Level of Evidence: B*)

Nonpharmacological Interventions—Activity, Exercise Prescription, and Cardiac Rehabilitation

Class I

1. Exercise training (or regular physical activity) is recommended as safe and effective for patients with HF who are able to participate to improve functional status (Davies et al., 2010; McKelvie, 2008; O'Connor et al., 2009; Pina et al., 2003). (*Level of Evidence: A*)

Class IIa

1. Cardiac rehabilitation can be useful in clinically stable patients with HF to improve functional capacity, exercise duration, health-related quality of life (HRQOL), and mortality (Davies et al., 2010; O'Connor et al., 2009; Pina et al., 2003; Smart & Marwick, 2004; Piepoli et al., 2004; Austin et al., 2005; Austin et al., 2008). (*Level of Evidence: B*)

Pharmacological Treatment for Stage C Heart Failure with Reduced Ejection Fraction (HFrEF)

Class I

1. Measures listed as Class I recommendations for patients in stages A and B are recommended where appropriate for patients in stage C. (*Levels of Evidence: A, B, and C as appropriate*)
2. GDMT as depicted in Figure 1 in the original guideline document should be the mainstay of pharmacological therapy for HF*r*EF (Cohn & Tognoni, 2001; CONSENSUS Trial Study Group, 1987; Pfeffer et al., "Valsartan," 2003; Dargie, 2001; Cohn et al., 1991; SOLVD Investigators, 1991; Garg & Yusuf, 1995; Maggioni et al., 2002; "Xamoterol in severe heart failure," 1990; "Effects of carvedilol," 1995; Beta-Blocker Evaluation of Survival Trial Investigators, 2001; Poole-Wilson et al., 2003; Pfeffer et al., "Effects," 2003; Konstam et al., 2009; Pitt et al., 1997; Carson et al., 1999; Taylor et al., 2004; Pitt et al., 1999; Zannad et al., 2011). (*Level of Evidence: A*)

Pharmacological Treatment for Stage C HFrEF—Diuretics

Class I

1. Diuretics are recommended in patients with HF*r*EF who have evidence of fluid retention, unless contraindicated, to improve symptoms. (*Level of Evidence: C*)

Pharmacological Treatment for Stage C HFrEF—ACE Inhibitors

Class I

1. ACE inhibitors are recommended in patients with HF*r*EF and current or prior symptoms, unless contraindicated, to reduce morbidity and mortality (CONSENSUS Trial Study Group, 1987; Cohn et al., 1991; SOLVD Investigators, 1991; Garg & Yusuf, 1995). (*Level of Evidence: A*)

Pharmacological Treatment for Stage C HFrEF—ARBs

Class I

1. ARBs are recommended in patients with HF*r*EF with current or prior symptoms who are ACE inhibitor intolerant, unless contraindicated, to reduce morbidity and mortality (Cohn & Tognoni, 2001; Pfeffer et al., "Valsartan," 2003; Maggioni et al., 2002; Granger et al., 2003). (*Level of Evidence: A*)

Class IIa

1. ARBs are reasonable to reduce morbidity and mortality as alternatives to ACE inhibitors as first-line therapy for patients with HF*r*EF, especially for patients already taking ARBs for other indications, unless contraindicated (Crozier et al., 1995; Gottlieb et al., 1993; Mazayev et al., 1998; McKelvie et al., 1999; Riegger et al., 1999; Sharma et al., 2000). (*Level of Evidence: A*)

Class IIb

1. Addition of an ARB may be considered in persistently symptomatic patients with HF*r*EF who are already being treated with an ACE inhibitor and a beta blocker in whom an aldosterone antagonist is not indicated or tolerated (Pfeffer et al., "Effects," 2003; Velazquez et al., 2003). (*Level of Evidence: A*)

Class III: Harm

1. Routine combined use of an ACE inhibitor, ARB, and aldosterone antagonist is potentially harmful for patients with HF*r*EF. (*Level of Evidence: C*)

Pharmacological Treatment for Stage C HFrEF—Beta Blockers

Class I

1. Use of 1 of the 3 beta blockers proven to reduce mortality (e.g., bisoprolol, carvedilol, and sustained-release metoprolol succinate) is recommended for all patients with current or prior symptoms of HF*r*EF, unless contraindicated, to reduce morbidity and mortality (Dargie, 2001; "Xamoterol in severe heart failure," 1990; "Effects of carvedilol," 1995; Beta-Blocker Evaluation of Survival Trial Investigators, 2001; Poole-Wilson et al., 2003; "Effect of metoprolol CR/XL in chronic heart failure," 1999). (*Level of Evidence: A*)

Pharmacological Treatment for Stage C HFrEF—Aldosterone Receptor Antagonists

Class I

1. Aldosterone receptor antagonists (or mineralocorticoid receptor antagonists) are recommended in patients with New York Heart Association (NYHA) class II–IV HF and who have LVEF of 35% or less, unless contraindicated, to reduce morbidity and mortality. Patients with NYHA class II HF should have a history of prior cardiovascular hospitalization or elevated plasma natriuretic peptide levels to be considered for aldosterone receptor antagonists. Creatinine should be 2.5 mg/dL or less in men or 2.0 mg/dL or less in women (or estimated glomerular filtration rate >30 mL/min/1.73 m^2), and potassium should be less than 5.0 mEq/L. Careful monitoring of potassium, renal function, and diuretic dosing should be performed at initiation and closely followed thereafter to minimize risk of hyperkalemia and renal insufficiency (Pitt et al., 1999; Zannad et al., 2011; Vizzardi et al., 2010). (*Level of Evidence: A*)
2. Aldosterone receptor antagonists are recommended to reduce morbidity and mortality following an acute MI in patients who have LVEF of 40% or less who develop symptoms of HF or who have a history of diabetes mellitus, unless contraindicated (Pitt et al., 2003). (*Level of Evidence: B*)

Class III: Harm

1. Inappropriate use of aldosterone receptor antagonists is potentially harmful because of life-threatening hyperkalemia or renal insufficiency when serum creatinine is greater than 2.5 mg/dL in men or greater than 2.0 mg/dL in women (or estimated glomerular filtration rate <30

mL/min/1.73 m^2), and/or potassium greater than 5.0 mEq/L (Juurlink et al., 2004; Bozkurt, Agoston, & Knowlton, 2003). (*Level of Evidence: B*)

Pharmacological Treatment for Stage C HFrEF—Hydralazine and Isosorbide Dinitrates

Class I

1. The combination of hydralazine and isosorbide dinitrate is recommended to reduce morbidity and mortality for patients self-described as African Americans with NYHA class III–IV HF*r*EF receiving optimal therapy with ACE inhibitors and beta blockers, unless contraindicated (Carson et al., 1999; Taylor et al., 2004). (*Level of Evidence: A*)

Class IIa

1. A combination of hydralazine and isosorbide dinitrate can be useful to reduce morbidity or mortality in patients with current or prior symptomatic HF*r*EF who cannot be given an ACE inhibitor or ARB because of drug intolerance, hypotension, or renal insufficiency, unless contraindicated (Cohn et al., 1986). (*Level of Evidence: B*)

Pharmacological Treatment for Stage C HFrEF—Digoxin

Class IIa

1. Digoxin can be beneficial in patients with HF*r*EF, unless contraindicated, to decrease hospitalizations for HF (Digitalis Investigation Group, 1997; "Comparative effects of therapy," 1988; Dobbs, Kenyon, & Dobbs, 1977; Lee et al., 1982; Guyatt et al., 1988; DiBianco et al., 1989; Uretsky et al., 1993; Packer et al., 1993). (*Level of Evidence: B*)

Pharmacological Treatment for Stage C HFrEF—Other Drug Treatment: Anticoagulation

Class I

1. Patients with chronic HF with permanent/persistent/paroxysmal atrial fibrillation (AF) and an additional risk factor for cardioembolic stroke (history of hypertension, diabetes mellitus, previous stroke or transient ischemic attack, or ≥75 years of age) should receive chronic anticoagulant therapy* (Granger et al., 2011; Cairns et al., 2011; "Risk factors for stroke and efficacy of antithrombotic therapy in atrial fibrillation," 1994; Hughes & Lip, 2008; Connolly et al., 2009; Connolly et al., 2010; Patel et al., 2011). (*Level of Evidence: A*)
2. The selection of an anticoagulant agent (warfarin, dabigatran, apixaban, or rivaroxaban) for permanent/persistent/paroxysmal AF should be individualized on the basis of risk factors, cost, tolerability, patient preference, potential for drug interactions, and other clinical characteristics, including time in the international normalized ratio therapeutic range if the patient has been taking warfarin. (*Level of Evidence: C*)

Class IIa

1. Chronic anticoagulation is reasonable for patients with chronic HF who have permanent/persistent/paroxysmal AF but are without an additional risk factor for cardioembolic stroke* (Cairns et al., 2011; "Risk factors for stroke and efficacy of antithrombotic therapy in atrial fibrillation," 1994; Hughes & Lip, 2008; Dries et al., 1997; European Heart Rhythm Association et al., 2010; Freudenberger et al., 2007). (*Level of Evidence: B*)

*In the absence of contraindications to anticoagulation.

Class III: No Benefit

1. Anticoagulation is not recommended in patients with chronic HF*r*EF without AF, a prior thromboembolic event, or a cardioembolic source (Loh et al., 1997; Massie et al., 2009; Homma et al., 2012). (*Level of Evidence: B*)

Pharmacological Treatment for Stage C HFrEF—Other Drug Treatment: Statins

Class III: No Benefit

1. Statins are not beneficial as adjunctive therapy when prescribed solely for the diagnosis of HF in the absence of other indications for their use (Horwich, MacLellan, & Fonarow, 2004; Anker et al., 2006; Go et al., 2006; Foody et al., 2006; Kjekshus et al., 2007; GISSI-HF Investigators et al., "Effect of rosuvastatin," 2008). (*Level of Evidence: A*)

Pharmacological Treatment for Stage C HFrEF—Other Drug Treatment: Omega-3 Fatty Acids

Class IIa

1. Omega-3 polyunsaturated fatty acid (PUFA) supplementation is reasonable to use as adjunctive therapy in patients with NYHA class II–IV symptoms and HF*r*EF or heart failure with preserved ejection fraction (HF*p*EF), unless contraindicated, to reduce mortality and cardiovascular hospitalizations (Macchia et al., 2005; GISSI-HF Investigators et al., "Effect of n-3," 2008). (*Level of Evidence: B*)

Pharmacological Treatment for Stage C HFrEF—Other Drug Treatment: Drugs of Unproven Value or That May Worsen HF

Class III: No Benefit

1. Nutritional supplements as treatment for HF are not recommended in patients with current or prior symptoms of HF*r*EF (McMurray et al., 2010; Soukoulis et al., 2009). (*Level of Evidence: B*)
2. Hormonal therapies other than to correct deficiencies are not recommended for patients with current or prior symptoms of HF*r*EF. (*Level of Evidence: C*)

Class III: Harm

1. Drugs known to adversely affect the clinical status of patients with current or prior symptoms of HF*r*EF are potentially harmful and should be avoided or withdrawn whenever possible (e.g., most antiarrhythmic drugs, most calcium channel–blocking drugs [except amlodipine], nonsteroidal anti-inflammatory drugs [NSAIDs], or thiazolidinediones) ("Effect of verapamil on mortality and major events," 1990; Goldstein et al., 1991; Waldo et al., 1996; Kober et al., 2008; "Preliminary report," 1989; "The effect of diltiazem," 1988; Figulla et al., 1996; Elkayam et al., 1990; Gislason et al., 2009; Heerdink et al., 1998; Hudson, Richard, & Pilote, 2005; Lipscombe et al., 2007). (*Level of Evidence: B*)
2. Long-term use of infused positive inotropic drugs is potentially harmful for patients with HF*r*EF, 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*)

Pharmacological Treatment for Stage C HFrEF—Other Drug Treatment: Calcium Channel Blockers

Class III: No Benefit

1. Calcium channel–blocking drugs are not recommended as routine treatment for patients with HF*r*EF ("The effect of diltiazem," 1988; Setaro et al., 1990; Packer et al., 1996). (*Level of Evidence: A*)

Pharmacological Treatment for Stage C HFpEF

Class I

1. Systolic and diastolic blood pressure should be controlled in patients with HF*p*EF in accordance with published clinical practice guidelines to prevent morbidity (Chobanian et al., 2003; Levy et al., 1996). (*Level of Evidence: B*)
2. Diuretics should be used for relief of symptoms due to volume overload in patients with HF*p*EF. (*Level of Evidence: C*)

Class IIa

1. Coronary revascularization is reasonable in patients with CAD in whom symptoms (angina) or demonstrable myocardial ischemia is judged to be having an adverse effect on symptomatic HF*p*EF despite GDMT. (*Level of Evidence: C*)
2. Management of AF according to published clinical practice guidelines in patients with HF*p*EF is reasonable to improve symptomatic HF (see Section 9.1 in the original guideline document). (*Level of Evidence: C*)
3. The use of beta-blocking agents, ACE inhibitors, and ARBs in patients with hypertension is reasonable to control blood pressure in patients with HF*p*EF. (*Level of Evidence: C*)

Class IIb

1. The use of ARBs might be considered to decrease hospitalizations for patients with HF*p*EF (Yusuf et al., 2003). (*Level of Evidence: B*)

Class III: No Benefit

1. Routine use of nutritional supplements is not recommended for patients with HF*p*EF. (*Level of Evidence: C*)

Device Therapy for Stage C HFrEF

Class I

1. ICD therapy is recommended for primary prevention of sudden cardiac death (SCD) to reduce total mortality in selected patients with nonischemic DCM or ischemic heart disease at least 40 days post-MI with LVEF of 35% or less and NYHA class II or III symptoms on chronic GDMT, who have reasonable expectation of meaningful survival for more than 1 year† (Moss et al., 2002; Bardy et al., 2005). (*Level of Evidence: A*)
2. Cardiac resynchronization therapy (CRT) is indicated for patients who have LVEF of 35% or less, sinus rhythm, left bundle-branch block (LBBB) with a QRS duration of 150 ms or greater, and NYHA class II, III, or ambulatory IV symptoms on GDMT. (*Level of Evidence: A for NYHA class III/IV* [Hunt et al., 2009; Cleland et al., 2005; Bristow et al., 2004; Abraham et al., 2002]; *Level of Evidence: B for NYHA class II* [Moss et al., 2009; Tang et al., 2010]).
3. ICD therapy is recommended for primary prevention of SCD to reduce total mortality in selected patients at least 40 days post-MI with LVEF of 30% or less, and NYHA class I symptoms while receiving GDMT, who have reasonable expectation of meaningful survival for more than 1 year† (Moss et al., 1996; Buxton et al., 1999; Hohnloser et al., 2004). (*Level of Evidence: B*)

†Counseling should be specific to each individual patient and should include documentation of a discussion about the potential for sudden death and nonsudden death from HF or noncardiac conditions. Information should be provided about the efficacy, safety, and potential complications of an ICD and the potential for defibrillation to be inactivated if desired in the future, notably when a patient is approaching end of life. This will facilitate shared decision making between patients, families, and the medical care team about ICDs (Allen et al., 2012).

Class IIa

1. CRT can be useful for patients who have LVEF of 35% or less, sinus rhythm, a non-left bundle branch block (LBBB) pattern with a QRS duration of 150 ms or greater, and NYHA class III/ambulatory class IV symptoms on GDMT (Cleland et al., 2005; Bristow et al., 2004; Abraham et al., 2002; Tang et al., 2010). (*Level of Evidence: A*)
2. CRT can be useful for patients who have LVEF of 35% or less, sinus rhythm, LBBB with a QRS duration of 120 to 149 ms, and NYHA class II, III, or ambulatory IV symptoms on GDMT (Cleland et al., 2005; Bristow et al., 2004; Abraham et al., 2002; Moss et al., 2009; Tang et al., 2010; Linde et al., 2008). (*Level of Evidence: B*)
3. CRT can be useful in patients with AF and LVEF of 35% or less on GDMT if a) the patient requires ventricular pacing or otherwise meets CRT criteria and b) atrioventricular nodal ablation or pharmacological rate control will allow near 100% ventricular pacing with CRT (Brignole et al., 2005; Brignole et al., 2011; Doshi et al., 2005; Gasparini et al., 2006; Wilton et al., 2011; Upadhyay et al., 2008). (*Level of Evidence: B*)
4. CRT can be useful for patients on GDMT who have LVEF of 35% or less and are undergoing placement of a new or replacement device implantation with anticipated requirement for significant (>40%) ventricular pacing (Wilkoff et al., 2002; Doshi et al., 2005; Adelstein et al., 2011; Vatankulu et al., 2009) . (*Level of Evidence: C*)

Class IIb

1. The usefulness of implantation of an ICD is of uncertain benefit to prolong meaningful survival in patients with a high risk of nonsudden death as predicted by frequent hospitalizations, advanced frailty, or comorbidities such as systemic malignancy or severe renal dysfunction† (Setoguchi et al., 2009; Carson et al., 2005; Zareba et al., 2005; Mozaffarian et al., 2007). (*Level of Evidence: B*)
2. CRT may be considered for patients who have LVEF of 35% or less, sinus rhythm, a non-LBBB pattern with QRS duration of 120 to 149 ms, and NYHA class III/ambulatory class IV on GDMT (Tang et al., 2010; Rickard et al., 2011). (*Level of Evidence: B*)
3. CRT may be considered for patients who have LVEF of 35% or less, sinus rhythm, a non-LBBB pattern with a QRS duration of 150 ms or greater, and NYHA class II symptoms on GDMT (Moss et al., 2009; Tang et al., 2010). (*Level of Evidence: B*)
4. CRT may be considered for patients who have LVEF of 30% or less, ischemic etiology of HF, sinus rhythm, LBBB with a QRS duration of 150 ms or greater, and NYHA class I symptoms on GDMT (Moss et al., 2009; Tang et al., 2010). (*Level of Evidence: C*)

†Counseling should be specific to each individual patient and should include documentation of a discussion about the potential for sudden death and nonsudden death from HF or noncardiac conditions. Information should be provided about the efficacy, safety, and potential complications of an ICD and the potential for defibrillation to be inactivated if desired in the future, notably when a patient is approaching end of life. This will facilitate shared decision making between patients, families, and the medical care team about ICDs (Allen et al., 2012).

Class III: No Benefit

1. CRT is not recommended for patients with NYHA class I or II symptoms and non-LBBB pattern with QRS duration less than 150 ms (Moss et al., 2009; Tang et al., 2010; Rickard et al., 2011). (*Level of Evidence: B*)
2. CRT is not indicated for patients whose comorbidities and/or frailty limit survival with good functional capacity to less than 1 year (Hunt et al., 2009). (*Level of Evidence: C*)

See Figure 2, "Indications for CRT therapy algorithm," in the original guideline document.

Stage D

Water Restriction

Class IIa

1. Fluid restriction (1.5 to 2 L/d) is reasonable in stage D, especially in patients with hyponatremia, to reduce congestive symptoms. (*Level of Evidence: C*)

Inotropic Support

Class I

1. Until definitive therapy (e.g., coronary revascularization, MCS, heart transplantation) or resolution of the acute precipitating problem, patients with cardiogenic shock should receive temporary intravenous inotropic support to maintain systemic perfusion and preserve end-organ performance. (*Level of Evidence: C*)

Class IIa

1. Continuous intravenous inotropic support is reasonable as "bridge therapy" in patients with stage D HF refractory to GDMT and device therapy who are eligible for and awaiting MCS or cardiac transplantation (Aranda et al., 2003; Brozena et al., 2004). (*Level of Evidence: B*)

Class IIb

1. Short-term, continuous intravenous inotropic support may be reasonable in those hospitalized patients presenting with documented severe systolic dysfunction who present with low blood pressure and significantly depressed cardiac output to maintain systemic perfusion and preserve end-organ performance (Abraham et al., 2005; Cuffe et al., 2002; Elkayam et al., 2007). (*Level of Evidence: B*)
2. Long-term, continuous intravenous inotropic support may be considered as palliative therapy for symptom control in select patients with stage D HF despite optimal GDMT and device therapy who are not eligible for either MCS or cardiac transplantation (O'Connor et al., 1999; Hershberger et al., 2003; Gorodeski et al., 2009). (*Level of Evidence: B*)

Class III: Harm

1. Long-term use of either continuous or intermittent, intravenous parenteral positive inotropic agents, in the absence of specific indications or for reasons other than palliative care, is potentially harmful in the patient with HF ("Xamoterol in severe heart failure, 1990; Cohn et al., 1998; Hampton et al., 1997; Lubsen et al., 1996; Packer et al., 1991; Metra et al., 2009; Oliva et al., 2009). (*Level of Evidence: B*)
2. Use of parenteral inotropic agents in hospitalized patients without documented severe systolic dysfunction, low blood pressure, or impaired perfusion and evidence of significantly depressed cardiac output, with or without congestion, is potentially harmful (Abraham et al., 2005; Cuffe et al., 2002; Elkayam et al., 2007). (*Level of Evidence: B*)

Mechanical Circulatory Support

Class IIa

1. MCS is beneficial in carefully selected‡ patients with stage D HF*r*EF in whom definitive management (e.g., cardiac transplantation) or cardiac recovery is anticipated or planned (Pagani et al., 2009; Alba et al., 2010; Elhenawy et al., 2011; Nair et al., 2010; Miller et al.,2007; Lahpor et al., 2010; Starling et al., 2011; Grady et al., 2004). (*Level of Evidence: B*)
2. Nondurable MCS, including the use of percutaneous and extracorporeal ventricular assist devices (VADs), is reasonable as a "bridge to recovery" or "bridge to decision" for carefully selected‡ patients with HF*r*EF with acute, profound hemodynamic compromise (Burkhoff et al., 2006; Greenberg et al., 2008; Seyfarth et al., 2008; Thiele et al., 2005). (*Level of Evidence: B*)
3. Durable MCS is reasonable to prolong survival for carefully selected‡ patients with stage D HF*r*EF (Rose et al., 2001; Stevenson et al., 2004; Rogers et al., 2007; Slaughter et al., 2009). (*Level of Evidence: B*)

‡Although optimal patient selection for MCS remains an active area of investigation, general indications for referral for MCS therapy include patients with LVEF <25% and NYHA class III–IV functional status despite GDMT, including, when indicated, CRT, with either high predicted 1- to 2-year mortality (e.g., as suggested by markedly reduced peak oxygen consumption and clinical prognostic scores) or dependence on continuous parenteral inotropic support. Patient selection requires a multidisciplinary team of experienced advanced HF and transplantation cardiologists, cardiothoracic surgeons, nurses, and ideally, social workers and palliative care clinicians.

Cardiac Transplantation

Class I

1. Evaluation for cardiac transplantation is indicated for carefully selected patients with stage D HF despite GDMT, device, and surgical

management (Mehra et al., 2006). (*Level of Evidence: C*)

The Hospitalized Patient

Precipitating Causes of Decompensated HF

Class I

1. ACS precipitating acute HF decompensation should be promptly identified by ECG and serum biomarkers, including cardiac troponin testing, and treated optimally as appropriate to the overall condition and prognosis of the patient. (*Level of Evidence: C*)
2. Common precipitating factors for acute HF should be considered during initial evaluation, as recognition of these conditions is critical to guide appropriate therapy. (*Level of Evidence: C*)

Maintenance of GDMT during Hospitalizations

Class I

1. In patients with HF*r*EF experiencing a symptomatic exacerbation of HF requiring hospitalization during chronic maintenance treatment with GDMT, it is recommended that GDMT be continued in the absence of hemodynamic instability or contraindications (Fonarow et al. "Influence," 2008; Metra et al., 2007; Butler et al., 2006). (*Level of Evidence: B*)
2. Initiation of beta-blocker therapy is recommended after optimization of volume status and successful discontinuation of intravenous diuretics, vasodilators, and inotropic agents. Beta-blocker therapy should be initiated at a low dose and only in stable patients. Caution should be used when initiating beta blockers in patients who have required inotropes during their hospital course (Fonarow et al. "Influence," 2008; Metra et al., 2007; Butler et al., 2006). (*Level of Evidence: B*)

Diuretics in Hospitalized Patients

Class I

1. Patients with HF admitted with evidence of significant fluid overload should be promptly treated with intravenous loop diuretics to reduce morbidity (Maisel et al., 2008; Peacock et al., 2007). (*Level of Evidence: B*)
2. If patients are already receiving loop diuretic therapy, the initial intravenous dose should equal or exceed their chronic oral daily dose and should be given as either intermittent boluses or continuous infusion. Urine output and signs and symptoms of congestion should be serially assessed, and the diuretic dose should be adjusted accordingly to relieve symptoms, reduce volume excess, and avoid hypotension (Felker et al., 2011). (*Level of Evidence: B*)
3. The effect of HF treatment should be monitored with careful measurement of fluid intake and output, vital signs, body weight that is determined at the same time each day, and clinical signs and symptoms of systemic perfusion and congestion. Daily serum electrolytes, urea nitrogen, and creatinine concentrations should be measured during the use of intravenous diuretics or active titration of HF medications. (*Level of Evidence: C*)

Class IIa

1. When diuresis is inadequate to relieve symptoms, it is reasonable to intensify the diuretic regimen using either:
    a. Higher doses of intravenous loop diuretics (Hunt et al., 2009; Felker et al., 2011) (*Level of Evidence: B*); or
    b. Addition of a second (e.g., thiazide) diuretic (Grosskopf, Rabinovitz, & Rosenfeld, 1986; Channer et al., 1994; Sigurd, Olesen, & Wennevold, 1975; Rosenberg et al., 2005). (*Level of Evidence: B*).

Class IIb

1. Low-dose dopamine infusion may be considered in addition to loop diuretic therapy to improve diuresis and better preserve renal function and renal blood flow (Giamouzis et al., 2010; Elkayam et al., 2008). (*Level of Evidence: B*)

Renal Replacement Therapy—Ultrafiltration

Class IIb

1. Ultrafiltration may be considered for patients with obvious volume overload to alleviate congestive symptoms and fluid weight (Costanzo et al., 2007). (*Level of Evidence: B*)
2. Ultrafiltration may be considered for patients with refractory congestion not responding to medical therapy. (*Level of Evidence: C*)

Parenteral Therapy in Hospitalized HF

Class IIb

1. If symptomatic hypotension is absent, intravenous nitroglycerin, nitroprusside, or nesiritide may be considered an adjuvant to diuretic therapy for relief of dyspnea in patients admitted with acutely decompensated HF (Colucci et al., 2000; Cioffi et al., 2003; O'Connor et al., 2011; Publication Committee for the VMAC Investigators, 2002). (*Level of Evidence: A*)

Venous Thromboembolism Prophylaxis in Hospitalized Patients

Class I

1. A patient admitted to the hospital with decompensated HF should receive venous thromboembolism prophylaxis with an anticoagulant medication if the risk–benefit ratio is favorable (Guyatt et al., 2012; Alikhan et al., 2003). (*Level of Evidence: B*)

Arginine Vasopressin Antagonists

Class IIb

1. In patients hospitalized with volume overload, including HF, who have persistent severe hyponatremia and are at risk for or having active cognitive symptoms despite water restriction and maximization of GDMT, vasopressin antagonists may be considered in the short term to improve serum sodium concentration in hypervolemic, hyponatremic states with either a V2 receptor selective or a nonselective vasopressin antagonist (Ghali et al., 2006; Schrier et al., 2006). (*Level of Evidence: B*)

Inpatient and Transitions of Care

Class I

1. The use of performance improvement systems and/or evidence-based systems of care is recommended in the hospital and early post discharge outpatient setting to identify appropriate HF patients for GDMT, provide clinicians with useful reminders to advance GDMT, and assess the clinical response (McAlister et al., 2004; Koelling et al., 2005; Fonarow et al., "Temporal," 2007; Naylor et al., 1994; Naylor et al., 2004; Fonarow et al., "Influence," 2007; Lappe et al., 2004; Phillips et al., 2004). (*Level of Evidence: B*)
2. Throughout the hospitalization as appropriate, before hospital discharge, at the first postdischarge visit, and in subsequent follow-up visits, the following should be addressed (O'Connor et al., 2008; Lappe et al., 2004; Gislason et al., 2007; Masoudi et al., 2004; Braunstein et al., 2003). (*Level of Evidence: B*):
    a. Initiation of GDMT if not previously established and not contraindicated
    b. Precipitant causes of HF, barriers to optimal care transitions, and limitations in postdischarge support
    c. Assessment of volume status and supine/upright hypotension with adjustment of HF therapy as appropriate
    d. Titration and optimization of chronic oral HF therapy
    e. Assessment of renal function and electrolytes where appropriate
    f. Assessment and management of comorbid conditions
    g. Reinforcement of HF education, self-care, emergency plans, and need for adherence
    h. Consideration for palliative care or hospice care in selected patients

3. Multidisciplinary HF disease-management programs are recommended for patients at high risk for hospital readmission, to facilitate the implementation of GDMT, to address different barriers to behavioral change, and to reduce the risk of subsequent rehospitalization for HF (McAlister et al., 2004; Windham, Bennett, & Gottlieb, 2003; Fonarow et al., 2010; Fonarow et al., "Association," 2007). (*Level of Evidence: B*)

Class IIa

1. Scheduling an early follow-up visit (within 7 to 14 days) and early telephone follow-up (within 3 days) of hospital discharge are reasonable (Krumholz et al., 2000; Hernandez et al., 2010). (*Level of Evidence: B*)
2. Use of clinical risk-prediction tools and/or biomarkers to identify patients at higher risk for postdischarge clinical events is reasonable (Kociol et al., 2011). (*Level of Evidence: B*)

Surgical/Percutaneous/Transcatheter Interventional Treatments of HF

Class I

1. Coronary artery revascularization via coronary artery bypass graft surgery (CABG) or percutaneous intervention is indicated for patients (HF*p*EF and HF*r*EF) on GDMT with angina and suitable coronary anatomy, especially for a left main stenosis (>50%) or left main equivalent disease (American College of Cardiology Foundation et al. "ACCF/AHA/SCAI guideline for coronary artery bypass graft surgery," 2011; American College of Cardiology Foundation et al. "2011 ACCF/AHA/SCAI guideline for percutaneous coronary intervention," 2011; Filn et al., 2012; Caracciolo et al., 1995). (*Level of Evidence: C*)

Class IIa

1. CABG to improve survival is reasonable in patients with mild to moderate LV systolic dysfunction (EF 35% to 50%) and significant (≥70% diameter stenosis) multivessel CAD or proximal left anterior descending coronary artery stenosis when viable myocardium is present in the region of intended revascularization (Caracciolo et al., 1995; VA Coronary Artery Bypass Surgery Cooperative Study Group, 1992;"Eleven-year survival," 1984). (*Level of Evidence: B*)
2. CABG or medical therapy is reasonable to improve morbidity and cardiovascular mortality for patients with severe LV dysfunction (EF <35%), HF, and significant CAD (Velazquez et al., 2011; Cleland et al., 2011). (*Level of Evidence: B*)
3. Surgical aortic valve replacement is reasonable for patients with critical aortic stenosis and a predicted surgical mortality of no greater than 10% (Smith et al., "Transcatheter," 2011). (*Level of Evidence: B*)
4. Transcatheter aortic valve replacement after careful candidate consideration is reasonable for patients with critical aortic stenosis who are deemed inoperable (Leon et al., 2010). (*Level of Evidence: B*)

Class IIb

1. CABG may be considered with the intent of improving survival in patients with ischemic heart disease with severe LV systolic dysfunction (EF <35%) and operable coronary anatomy whether or not viable myocardium is present (Alderman et al., 1983; Patel et al., 2009; Velazquez et al., 2011). (*Level of Evidence: B*)
2. Transcatheter mitral valve repair or mitral valve surgery for functional mitral insufficiency is of uncertain benefit and should only be considered after careful candidate selection and with a background of GDMT (Feldman et al., 2011; Chan et al., 2012; Fattouch et al., 2009; Franzen et al., 2011). (*Level of Evidence: B*)
3. Surgical reverse remodeling or LV aneurysmectomy may be considered in carefully selected patients with HF*r*EF for specific indications, including intractable HF and ventricular arrhythmias (Jones et al., 2009). (*Level of Evidence: B*)

Coordinating Care for Patients with Chronic HF

Class I

1. Effective systems of care coordination with special attention to care transitions should be deployed for every patient with chronic HF that facilitate and ensure effective care that is designed to achieve GDMT and prevent hospitalization (Inglis et al., 2010; McAlister et al., 2004; Naylor et al., 2004; Coleman, Boult & American Geriatrics Society Health Care Systems Committee, 2003; Stewart, Person, & Horowitz, 1998; Stewart, Marley, & Horowitz, 1999; Sochalski et al., 2009; Laramee et al., 2003; Clark et al., 2007; Chaudhry et al., 2007; Riegel et al., 2002; Riegel et al., 2006; Krumholz et al., 2006; Faxon et al., 2004; Rich et al.,1995; McAlister et al., 2001; Riegel & LePetri, 2001; Coleman, Mahoney, & Parry, 2005). (*Level of Evidence: B*)
2. Every patient with HF should have a clear, detailed, and evidence-based plan of care that ensures the achievement of GDMT goals, effective management of comorbid conditions, timely follow-up with the healthcare team, appropriate dietary and physical activities, and compliance with secondary prevention guidelines for cardiovascular disease. This plan of care should be updated regularly and made readily available to all members of each patient's healthcare team (Smith et al., "AHA/ACCF," 2011). (*Level of Evidence: C*)
3. Palliative and supportive care is effective for patients with symptomatic advanced HF to improve quality of life (Allen et al., 2012; Lorenz et al., 2008; Hauptman & Havranek, 2005; Adler et al., 2009; Qaseem et al., 2008). (*Level of Evidence: B*)

Quality Metrics/Performance Measures

Class I

1. Performance measures based on professionally developed clinical practice guidelines should be used with the goal of improving quality of care for HF (Fonarow et al., "Temporal trends," 2007; Fonarow et al., 2010; Jencks, Huff, & Cuerdon, 2003). (*Level of Evidence: B*)

Class IIa

1. Participation in quality improvement programs and patient registries based on nationally endorsed, clinical practice guideline–based quality and performance measures can be beneficial in improving the quality of HF care (Fonarow et al., "Temporal trends," 2007; Fonarow et al.,

2010). (*Level of Evidence: B*)

Definitions:

Applying Classification of Recommendations and Level of Evidence

		Size of Treatment Effect					
		CLASS I *Benefit >>> Risk* Procedure/Treatment SHOULD be performed/ administered	CLASS IIa *Benefit >> Risk* *Additional studies with focused objectives needed* IT IS REASONABLE to perform procedure/administer treatment	CLASS IIb *Benefit ≥ Risk* *Additional studies with broad objectives needed; additional registry data would be helpful* Procedure/Treatment MAY BE CONSIDERED	CLASS III *No Benefit* or Class III *Harm*		
						Procedure/Test	**Treatment**
					COR III: No Benefit	Not helpful	No proven benefit
					COR III: Harm	Excess cost without benefit or harmful	Harmful to patients
Estimate of Certainty (Precision) of Treatment Effect	LEVEL A Multiple populations evaluated* Data derived frommultiple randomized clinical trials or meta-analyses	• Recommendation that procedure or treatment is useful/effective • Sufficient evidence frommultiple randomized trials or meta-analyses	• Recommendation in favor oftreatment or procedure being useful/effective • Some conflicting evidence fommultiple randomized trials or meta-analyses	• Recommendation's usefulness/efficacy less well established • Greater conflicting evidence fommultiple randomized trials or meta-analyses	• Recommendation that procedure or treatment is not useful/effective and may be harmful • Sufficient evidence fommultiple randomized trials or meta-analyses		
	LEVEL B Limited populations evaluated* Data derived froma single randomized clinical trials or nonrandomized studies	• Recommendation that procedure or treatment is useful/effective • Evidence from single randomized trial or nonrandomized studies	• Recommendation in favor oftreatment or procedure being useful/effective • Some conflicting evidence fromsingle randomized trial or nonrandomized studies	• Recommendation's usefulness/efficacy less well established • Greater conflicting evidence fromsingle randomized trial or nonrandomized studies	• Recommendation that procedure or treatment is not useful/effective and may be harmful • Evidence fromsingle randomized trial or nonrandomized studies		
	LEVEL C Very limited populations evaluated* Only consensus opinion of experts, case studies or standard ofcare	• Recommendation that procedure or treatment is useful/effective • Only expert opinion, case studies, or standard ofcare	• Recommendation in favor oftreatment or procedure being useful/effective • Only diverging expert opinion, case studies, or standard ofcare	• Recommendation's usefulness/efficacy less well established • Only diverging expert opinion, case studies, or standard ofcare	• Recommendation that procedure or treatment is not useful/effective and may be harmful • Only expert opinion, case studies, or standard ofcare		

A recommendation with Level of Evidence B or C does not imply that the recommendation is weak. Many important clinical questions addressed in the guidelines do not lend themselves to clinical trials. Although randomized trials are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

*Data available from clinical trials or registries about the usefulness/efficacy in different subpopulations, such as gender, age, history of diabetes, history of prior myocardial infarction, history of heart failure, and prior aspirin use.

Clinical Algorithm(s)

The following algorithms are provided in the original guideline document:

- Stage C HF*r*EF: evidence-based, guideline-directed medical therapy
- Indications for CRT
- Stages in the development of HF and recommended therapy by stage
- Pharmacological management of patients with newly discovered AF
- Pharmacological management of patients with recurrent paroxysmal AF

Scope

Disease/Condition(s)

Heart failure (HF) including heart failure with reduced ejection fraction (HF*r*EF) and heart failure with preserved ejection fraction (HF*p*EF)

Other Disease/Condition(s) Addressed

Sleep disorders

Guideline Category

Diagnosis

Evaluation

Management

Prevention

Risk Assessment

Treatment

Clinical Specialty

Cardiology

Family Practice

Geriatrics

Internal Medicine

Thoracic Surgery

Intended Users

Advanced Practice Nurses

Health Care Providers

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

- To assist clinicians in clinical decision making by describing a range of generally acceptable approaches to the diagnosis, management, and prevention of heart failure (HF)
- To define practices that meet the needs of most patients in most circumstances

Target Population

Adults with heart failure (HF)

Note: Although of increasing importance, HF in children and congenital heart lesions in adults are not specifically addressed in this guideline.

Interventions and Practices Considered

Diagnosis/Evaluation

1. Thorough history and physical examination, including family history, vital signs, and volume status

2. Risk assessment
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. Serial monitoring to include serum electrolytes and renal function during treatment
5. 12-lead electrocardiography
6. Screening for hemochromatosis or human immunodeficiency virus (HIV) in selected patients
7. Diagnostic tests for rheumatologic diseases, amyloidosis, or pheochromocytoma, if indicated
8. Measurement of B-type natriuretic peptide (BNP) and N-terminal pro-B-type natriuretic peptide (NT-proBNP) and/or cardiac troponin
9. Measurement of other biomarkers of myocardial injury or fibrosis
10. Chest x-ray
11. Two-dimensional echocardiogram with Doppler
12. Radionuclide ventriculography, if echocardiogram not available
13. Magnetic resonance imaging in selected patients
14. Invasive hemodynamic monitoring (catheterization) to guide therapy in selected patients
15. Coronary arteriography in selected patients
16. Endomyocardial biopsy when a specific diagnosis is suspected that would influence therapy

Treatment/Management*

1. General management
    - Recognition and treatment of elevated blood pressure
    - Management of dyslipidemia and vascular risk
    - Management of obesity and diabetes mellitus
    - Recognition and control of other conditions that may lead to heart failure (HF) (e.g., tobacco use, known cardiotoxic agents, sleep apnea)
2. Pharmacological interventions
    - Diuretics
    - Angiotensin-converting-enzyme (ACE) inhibitors
    - Angiotensin receptor blockers (ARBs)
    - Beta blockers
    - Hydralazine and isosorbide dinitrate
    - Digoxin
    - Anticoagulant therapy
    - Omega-3 polyunsaturated fatty acid (PUFA) supplementation
    - Aldosterone receptor antagonists
    - Infusion of a positive inotropic drug only as palliation for patients with end-stage disease or while waiting for heart transplantation
    - Nutritional supplements and hormonal therapy (of no benefit and not recommended)
    - Calcium channel–blocking drugs (not recommended as routine treatment for patients with heart failure with reduced ejection fraction [HF*r*EF])
3. Nonpharmacological management
    - Patient education on self-care
    - Sodium restriction
    - Treatment of sleep disorders
    - Activity, exercise prescription, and cardiac rehabilitation
    - Fluid restriction (in stage D HF)
4. Device therapy
    - Implantable cardioverter-defibrillator (ICD) therapy
    - Cardiac resynchronization therapy
5. Surgical/percutaneous/transcatheter interventional treatments of HF
    - Coronary artery bypass graft (CABG) surgery or percutaneous coronary artery intervention
    - Surgical aortic valve replacement in selected patients
    - Transcatheter aortic valve replacement in selected patients
    - Transcatheter mitral valve repair in selected patients
    - Surgical reverse remodeling or left ventricular aneurysmectomy in selected patients
    - Heart transplantation

- Mechanical circulatory support (MCS)

*See the "Major Recommendations" field for interventions for the hospitalized patient, coordination of care for chronic HF, and quality metrics/performance measures.

Major Outcomes Considered

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

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

An extensive evidence review was conducted through October 2011 and includes selected other references through April 2013. Searches were extended to studies, reviews, and other evidence conducted in human subjects and that were published in English from PubMed, EMBASE, Cochrane, Agency for Healthcare Research and Quality Reports, and other selected databases relevant to this guideline. Key search words included but were not limited to the following: *heart failure, cardiomyopathy, quality of life, mortality, hospitalizations, prevention, biomarkers, hypertension, dyslipidemia, imaging, cardiac catheterization, endomyocardial biopsy, angiotensin-converting enzyme inhibitors, angiotensin-receptor antagonists/blockers, beta blockers, cardiac, cardiac resynchronization therapy, defibrillator, device-based therapy, implantable cardioverter defibrillator, device implantation, medical therapy, acute decompensated heart failure, preserved ejection fraction, terminal care and transplantation, quality measures*, and *performance measures*. Additionally, the committee reviewed documents related to the subject matter previously published by the American College of Cardiology Foundation (ACCF) and American Heart Association (AHA). References elected and published in this document are representative and not all-inclusive.

Number of Source Documents

1365

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

Applying Classification of Recommendations and Level of Evidence

	Size of Treatment Effect				
	CLASS I *Benefit >>> Risk*	CLASS IIa *Benefit >> Risk* *Additional studies with focused*	CLASS IIb *Benefit ≥ Risk* *Additional studies with broad*	CLASS III *No Benefit* or Class III *Harm*	
				Procedure/Test	**Treatment**

		Procedure/Treatment SHOULD be performed/ administered	*objectives needed* IT IS REASONABLE to perform procedure/administer treatment	*objectives needed; additional* Procedure/Treatment MAY BE CONSIDERED	COR III: No Benefit	Not helpful	No proven benefit
					COR III: Harm	Excess cost without benefit or harmful	Harmful to patients
Estimate of Certainty (Precision) of Treatment Effect	LEVEL A Multiple populations evaluated* Data derived from multiple randomized clinical trials or meta-analyses	• Recommendation that procedure or treatment is useful/effective • Sufficient evidence from multiple randomized trials or meta-analyses	• Recommendation in favor of treatment or procedure being useful/effective • Some conflicting evidence from multiple randomized trials or meta-analyses	• Recommendation's usefulness/efficacy less well established • Greater conflicting evidence from multiple randomized trials or meta-analyses	• Recommendation that procedure or treatment is not useful/effective and may be harmful • Sufficient evidence from multiple randomized trials or meta-analyses		
	LEVEL B Limited populations evaluated* Data derived from a single randomized trials or nonrandomized studies	• Recommendation that procedure or treatment is useful/effective • Evidence from single randomized trial or nonrandomized studies	• Recommendation in favor of treatment or procedure being useful/effective • Some conflicting evidence from single randomized trial or nonrandomized studies	• Recommendation's usefulness/efficacy less well established • Greater conflicting evidence from single randomized trial or nonrandomized studies	• Recommendation that procedure or treatment is not useful/effective and may be harmful • Evidence from single randomized trial or nonrandomized studies		
	LEVEL C Very limited populations evaluated* Only consensus opinion of experts, case studies, or standard of care	• Recommendation that procedure or treatment is useful/effective • Only expert opinion, case studies, or standard of care	• Recommendation in favor of treatment or procedure being useful/effective • Only diverging expert opinion, case studies, or standard of care	• Recommendation's usefulness/efficacy less well established • Only diverging expert opinion, case studies, or standard of care	• Recommendation that procedure or treatment is not useful/effective and may be harmful • Only expert opinion, case studies, or standard of care		

Size of Treatment Effect

A recommendation with Level of Evidence B or C does not imply that the recommendation is weak. Many important clinical questions addressed in the guidelines do not lend themselves to clinical trials. Although randomized trials are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

*Data available from clinical trials or registries about the usefulness/efficacy in different subpopulations, such as sex, age, history of diabetes, history of prior myocardial infarction, history of heart failure, and prior aspirin use.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

In analyzing the data and developing recommendations and supporting text, the writing committee uses evidence-based methodologies developed by the Task Force. The Level of Evidence (LOE) is an estimate of the certainty or precision of the treatment effect. The writing committee reviews and ranks evidence supporting each recommendation with the weight of evidence ranked as LOE A, B, or C according to specific definitions that are included in the "Rating Scheme for the Strength of the Evidence" field. Studies are identified as observational, retrospective, prospective, or randomized where appropriate.

To provide clinicians with a representative evidence base, whenever deemed appropriate or when published, the absolute risk difference and number needed to treat or harm are provided in the guideline (within tables), along with confidence intervals and data related to the relative treatment effects such as odds ratio, relative risk, hazard ratio, and incidence rate ratio.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

Experts in the subject under consideration are selected by the American College of Cardiology Foundation (ACCF) and American Heart Association (AHA) to examine subject-specific data and write guidelines in partnership with representatives from other medical organizations and specialty groups. Writing committees are asked to perform a literature review; weigh the strength of evidence for or against particular tests,

treatments, or procedures; and include estimates of expected outcomes where such data exist. Patient-specific modifiers, comorbidities, and issues of patient preference that may influence the choice of tests or therapies are considered. When available, information from studies on cost is considered, but data on efficacy and outcomes constitute the primary basis for the recommendations contained herein.

In analyzing the data and developing recommendations and supporting text, the writing committee uses evidence-based methodologies developed by the Task Force. The Class of Recommendation (COR) is an estimate of the size of the treatment effect considering risks versus benefits in addition to evidence and/or agreement that a given treatment or procedure is or is not useful/effective or in some situations may cause harm. The writing committee reviews and ranks evidence supporting each recommendation with the weight of evidence ranked as LOE A, B, or C according to specific definitions that are included in the "Rating Scheme for the Strength of the Evidence" field. Studies are identified as observational, retrospective, prospective, or randomized where appropriate. For certain conditions for which inadequate data are available, recommendations are based on expert consensus and clinical experience and are ranked as LOE C. When recommendations at LOE C are supported by historical clinical data, appropriate references (including clinical reviews) are cited if available.

For issues for which sparse data are available, a survey of current practice among the clinicians on the writing committee is the basis for LOE C recommendations and no references are cited. The schema for COR and LOE are summarized in the "Rating Scheme for the Strength of the Evidence" field. Table 1 in the original guideline document provides suggested phrases for writing recommendations within each COR. A new addition to this methodology is separation of the Class III recommendations to delineate whether the recommendation is determined to be of "no benefit" or is associated with "harm" to the patient. In addition, in view of the increasing number of comparative effectiveness studies, comparator verbs and suggested phrases for writing recommendations for the comparative effectiveness of one treatment or strategy versus another have been added for COR I and IIa, LOE A or B only.

In view of the advances in medical therapy across the spectrum of cardiovascular diseases, the Task Force has designated the term *guideline-directed medical therapy (GDMT)* to represent optimal medical therapy as defined by ACCF/AHA guideline–recommended therapies (primarily Class I). This new term, *GDMT*, will be used herein and throughout all future guidelines.

Because the ACCF/AHA practice guidelines address patient populations (and clinicians) residing in North America, drugs that are not currently available in North America are discussed in the text without a specific COR. For studies performed in large numbers of subjects outside North America, each writing committee reviews the potential influence of different practice patterns and patient populations on the treatment effect and relevance to the ACCF/AHA target population to determine whether the findings should inform a specific recommendation.

Organization of the Writing Committee

The committee was composed of physicians and a nurse with broad expertise in the evaluation, care, and management of patients with heart failure (HF). The authors included general cardiologists, HF and transplant specialists, electrophysiologists, general internists, and physicians with methodological expertise. The committee included representatives from the ACCF, AHA, American Academy of Family Physicians, American College of Chest Physicians, American College of Physicians, Heart Rhythm Society, and International Society for Heart and Lung Transplantation.

Scope of This Guideline with Reference to Other Relevant Guidelines or Statements

This guideline covers multiple management issues for the adult patient with HF. Although there is an abundance of evidence addressing HF, for many important clinical considerations, this writing committee was unable to identify sufficient data to properly inform a recommendation. The writing committee actively worked to reduce the number of LOE "C" recommendations, especially for Class I-recommended therapies. Despite these limitations, it is apparent that much can be done for HF. Adherence to the clinical practice guidelines herein reproduced should lead to improved patient outcomes.

Although of increasing importance, HF in children and congenital heart lesions in adults are not specifically addressed in this guideline. The reader is referred to publicly available resources to address questions in these areas. However, this guideline does address HF with preserved ejection fraction (EF) in more detail and similarly revisits patients hospitalized with HF. Additional areas of renewed interest are in stage D HF, palliative care, transition of care, and quality of care for HF. Certain management strategies appropriate for the patient at risk for HF or already affected by HF are also reviewed in numerous relevant clinical practice guidelines and scientific statements published by the ACCF/AHA Task Force on Practice Guidelines, AHA, ACCF Task Force on Appropriate Use Criteria, European Society of Cardiology, Heart Failure Society of America, and the National Heart, Lung, and Blood Institute. The writing committee saw no need to reiterate the recommendations contained in those guidelines and chose to harmonize recommendations when appropriate and eliminate discrepancies. This is especially the case for device-based therapeutics, where complete alignment between the HF guideline and the device-based therapy guideline was deemed imperative. Some recommendations from earlier guidelines have been updated as warranted by new evidence or a better understanding of earlier evidence, whereas others that were no longer accurate or relevant or which were overlapping were modified; recommendations from previous guidelines that were similar or redundant were eliminated or consolidated when possible.

The present document recommends a combination of lifestyle modifications and medications that constitute GDMT. GDMT is specifically referenced in the recommendations for the treatment of HF (Section 7.3.2 in the original guideline document). Both for GDMT and other recommended drug treatment regimens, the reader is advised to confirm dosages with product insert material and to evaluate carefully for contraindications and drug-drug interactions. Table 2 in the original guideline document is a list of documents deemed pertinent to this effort and is intended for use as a resource; it obviates the need to repeat already extant guideline recommendations. Additional other HF guideline statements are highlighted as well for the purpose of comparison and completeness.

Rating Scheme for the Strength of the Recommendations

See "Rating Scheme for the Strength of the Evidence" field, above.

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 2 official reviewers each nominated by both the American College of Cardiology Foundation (ACCF) and the American Heart Association (AHA), as well as 1 to 2 reviewers each from the American Academy of Family Physicians, American College of Chest Physicians, Heart Rhythm Society, and International Society for Heart and Lung Transplantation, as well as 32 individual content reviewers (including members of the ACCF Adult Congenital and Pediatric Cardiology Council, ACCF Cardiovascular Team Council, ACCF Council on Cardiovascular Care for Older Adults, ACCF Electrophysiology Committee, ACCF Heart Failure and Transplant Council, ACCF Imaging Council, ACCF Prevention Committee, ACCF Surgeons' Scientific Council, and ACCF Task Force on Appropriate Use Criteria).

This document was approved for publication by the governing bodies of the ACCF and AHA and endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation, American College of Chest Physicians, Heart Rhythm Society, and International Society for Heart and Lung Transplantation.

This document was approved by the American College of Cardiology Foundation Board of Trustees and the American Heart Association Science Advisory and Coordinating Committee in May 2013.

Evidence Supporting the Recommendations

References Supporting the Recommendations

Aaronson KD, Schwartz JS, Chen TM, Wong KL, Goin JE, Mancini DM. Development and prospective validation of a clinical index to predict survival in ambulatory patients referred for cardiac transplant evaluation. Circulation. 1997 Jun 17;95(12):2660-7. PubMed

Abraham WT, Adams KF, Fonarow GC, Costanzo MR, Berkowitz RL, LeJemtel TH, Cheng ML, Wynne J, ADHERE Scientific Advisory Committee and Investigators, ADHERE Study Group. In-hospital mortality in patients with acute decompensated heart failure requiring intravenous vasoactive medications: an analysis from the Acute Decompensated Heart Failure National Registry (ADHERE). J Am Coll Cardiol. 2005 Jul 5;46(1):57-64. PubMed

Abraham WT, Fisher WG, Smith AL, Delurgio DB, Leon AR, Loh E, Kocovic DZ, Packer M, Clavell AL, Hayes DL, Ellestad M, Trupp RJ, Underwood J, Pickering F, Truex C, McAtee P, Messenger J. Cardiac resynchronization in chronic heart failure. N Engl J Med. 2002 Jun 13;346(24):1845-53. PubMed

Adelstein E, Schwartzman D, Gorcsan J 3rd, Saba S. Predicting hyperresponse among pacemaker-dependent nonischemic cardiomyopathy patients upgraded to cardiac resynchronization. J Cardiovasc Electrophysiol. 2011 Aug;22(8):905-11. PubMed

Adler ED, Goldfinger JZ, Kalman J, Park ME, Meier DE. Palliative care in the treatment of advanced heart failure. Circulation. 2009 Dec 22;120(25):2597-606. [109 references] PubMed

Afilalo J, Majdan AA, Eisenberg MJ. Intensive statin therapy in acute coronary syndromes and stable coronary heart disease: a comparative meta-analysis of randomised controlled trials. Heart. 2007 Aug;93(8):914-21. PubMed

Aguado O, Morcillo C, Delas J, Rennie M, Bechich S, Schembari A, Fernandez F, Rosell F. Long-term implications of a single home-based educational intervention in patients with heart failure. Heart Lung. 2010 Nov-Dec;39(6 Suppl):S14-22. PubMed

Alba AC, Rao V, Ross HJ, Jensen AS, Sander K, Gustafsson F, Delgado DH. Impact of fixed pulmonary hypertension on post-heart transplant outcomes in bridge-to-transplant patients. J Heart Lung Transplant. 2010 Nov;29(11):1253-8. PubMed

Alderman EL, Fisher LD, Litwin P, Kaiser GC, Myers WO, Maynard C, Levine F, Schloss M. Results of coronary artery surgery in patients with poor left ventricular function (CASS). Circulation. 1983 Oct;68(4):785-95. PubMed

Alikhan R, Cohen AT, Combe S, Samama MM, Desjardins L, Eldor A, Janbon C, Leizorovicz A, Olsson CG, Turpie AG. Prevention of venous thromboembolism in medical patients with enoxaparin: a subgroup analysis of the MEDENOX study. Blood Coagul Fibrinolysis. 2003 Jun;14(4):341-6. PubMed

Allen LA, Stevenson LW, Grady KL, Goldstein NE, Matlock DD, Arnold RM, Cook NR, Felker GM, Francis GS, Hauptman PJ, Havranek EP, Krumholz HM, Mancini D, Riegel B, Spertus JA, American Heart Association, Council on Quality of Care and Outcomes Research, Council on Cardiovascular Nursing, Council on Clinical Cardiology, Council on Cardiovascular Radiology and Intervention, Council on Cardiovascular Surgery and Anesthesia. Decision making in advanced heart failure: a scientific statement from the American Heart Association. Circulation. 2012 Apr 17;125(15):1928-52. PubMed

Allman KC, Shaw LJ, Hachamovitch R, Udelson JE. Myocardial viability testing and impact of revascularization on prognosis in patients with coronary artery disease and left ventricular dysfunction: a meta-analysis. J Am Coll Cardiol. 2002 Apr 3;39(7):1151-8. PubMed

Alonso-Martinez JL, Llorente-Diez B, Echegaray-Agara M, Olaz-Preciado F, Urbieta-Echezarreta M, Gonzalez-Arencibia C. C-reactive protein as a predictor of improvement and readmission in heart failure. Eur J Heart Fail. 2002 Jun;4(3):331-6. PubMed

American College of Cardiology Foundation Appropriate Use Criteria Task Force, American Society of Echocardiography, American Heart Association, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Critical Care Medicine, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, Douglas PS, Garcia MJ, Haines DE, Lai WW, Manning WJ, Patel AR, Picard MH, Polk DM, Ragosta M, Ward RP, Weiner RB. ACCF/ASE/AHA/ASNC/HFSA/HRS/SCAI/SCCM/SCCT/SCMR 2011 appropriate use criteria for echocardiography: a report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force [trunc]. J Am Coll Cardiol. 2011 Mar 1;57(9):1126-66. PubMed

American College of Cardiology Foundation, American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, Society of Cardiovascular Anesthesiologists, Society of Thoracic Surgeons, Hillis LD, Smith PK, Anderson JL, Bittl JA, Bridges CR, Byrne JG, Cigarroa JE, DiSesa VJ, Hiratzka LF, Hutter AM Jr, Jessen ME, Keeley EC, Lahey SJ, Lange RA, London MJ, Mack MJ, Patel MR, Puskas JD, Sabik JF, Selnes O, Shahian DM, Trost JC, Winniford MD. 2011 ACCF/AHA guideline for coronary artery bypass graft surgery: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines [trunc]. J Am Coll Cardiol. 2011 Dec 6;58(24):e123-210. [1264 references] PubMed

American College of Cardiology Foundation, American Heart Association Task Force on Practice Guidelines, Society for Cardiovascular Angiography and Interventions, Levine GN, Bates ER, Blankenship JC, Bailey SR, Bittl JA, Cercek B, Chambers CE, Ellis SG, Guyton RA, Hollenberg SM, Khot UN, Lange RA, Mauri L, Mehran R, Moussa ID, Mukherjee D, Nallamothu BK, Ting HH. 2011 ACCF/AHA/SCAI guideline for percutaneous coronary intervention. A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. J Am Coll Cardiol. 2011 Dec 6;58(24):e44â€“122. [879 references] PubMed

Anand IS, Fisher LD, Chiang YT, Latini R, Masson S, Maggioni AP, Glazer RD, Tognoni G, Cohn JN. Changes in brain natriuretic peptide and norepinephrine over time and mortality and morbidity in the Valsartan Heart Failure Trial (Val-HeFT). Circulation. 2003 Mar 11;107(9):1278-83. PubMed

Anker SD, Clark AL, Winkler R, Zugck C, Cicoira M, Ponikowski P, Davos CH, Banasiak W, Zardini P, Haass M, Senges J, Coats AJ, Poole-Wilson PA, Pitt B. Statin use and survival in patients with chronic heart failure--results from two observational studies with 5200 patients. Int J Cardiol. 2006 Sep 20;112(2):234-42. PubMed

Aranda JM Jr, Schofield RS, Pauly DF, Cleeton TS, Walker TC, Monroe VS Jr, Leach D, Lopez LM, Hill JA. Comparison of dobutamine versus milrinone therapy in hospitalized patients awaiting cardiac transplantation: a prospective, randomized trial. Am Heart J. 2003 Feb;145(2):324-9. PubMed

Arzt M, Floras JS, Logan AG, Kimoff RJ, Series F, Morrison D, Ferguson K, Belenkie I, Pfeifer M, Fleetham J, Hanly P, Smilovitch M, Ryan C, Tomlinson G, Bradley TD, CANPAP Investigators. Suppres. Circulation. 2007 Jun 26;115(25):3173-80. PubMed

Austin J, Williams R, Ross L, Moseley L, Hutchison S. Randomised controlled trial of cardiac rehabilitation in elderly patients with heart failure. Eur J Heart Fail. 2005 Mar 16;7(3):411-7. PubMed

Austin J, Williams WR, Ross L, Hutchison S. Five-year follow-up findings from a randomized controlled trial of cardiac rehabilitation for heart failure. Eur J Cardiovasc Prev Rehabil. 2008 Apr;15(2):162-7. PubMed

Bardy GH, Lee KL, Mark DB, Poole JE, Packer DL, Boineau R, Domanski M, Troutman C, Anderson J, Johnson G, McNulty SE, Clapp-Channing N, Davidson-Ray LD, Fraulo ES, Fishbein DP, Luceri RM, Ip JH. Amiodarone or an implantable cardioverter-defibrillator for congestive heart failure. N Engl J Med. 2005 Jan 20;352(3):225-37. PubMed

Bayes-Genis A, Lopez L, Zapico E, Cotes C, Santalo M, Ordonez-Llanos J, Cinca J. NT-ProBNP reduction percentage during admission for acutely decompensated heart failure predicts long-term cardiovascular mortality. J Card Fail. 2005 Jun;11(5 Suppl):S3-8. PubMed

Beanlands RS, Ruddy TD, deKemp RA, Iwanochko RM, Coates G, Freeman M, Nahmias C, Hendry P, Burns RJ, Lamy A, Mickleborough L, Kostuk W, Fallen E, Nichol G, PARR Investigators. Positron emission tomography and recovery following revascularization (PARR-1): the importance of scar and the development of a prediction rule for the degree of recovery of left ventricular function. J Am Coll Cardiol. 2002 Nov 20;40(10):1735-43. PubMed

Beckett NS, Peters R, Fletcher AE, Staessen JA, Liu L, Dumitrascu D, Stoyanovsky V, Antikainen RL, Nikitin Y, Anderson C, Belhani A, Forette F, Rajkumar C, Thijs L, Banya W, Bulpitt CJ, HYVET Study Group. Treatment of hypertension in patients 80 years of age or older. N Engl J Med. 2008 May 1;358(18):1887-98. PubMed

Beller GA. Tests that may be overused or misused in cardiology: the Choosing Wisely campaign. J Nucl Cardiol. 2012 Jun;19(3):401-3. PubMed

Berger R, Huelsman M, Strecker K, Bojic A, Moser P, Stanek B, Pacher R. B-type natriuretic peptide predicts sudden death in patients with chronic heart failure. Circulation. 2002 May 21;105(20):2392-7. PubMed

Berger R, Moertl D, Peter S, Ahmadi R, Huelsmann M, Yamuti S, Wagner B, Pacher R. N-terminal pro-B-type natriuretic peptide-guided, intensive patient management in addition to multidisciplinary care in chronic heart failure a 3-arm, prospective, randomized pilot study. J Am Coll Cardiol. 2010 Feb 16;55(7):645-53. PubMed

Beta-Blocker Evaluation of Survival Trial Investigators. A trial of the beta-blocker bucindolol in patients with advanced chronic heart failure. N Engl J Med. 2001 May 31;344(22):1659-67. PubMed

Bettencourt P, Azevedo A, Pimenta J, Frioes F, Ferreira S, Ferreira A. N-terminal-pro-brain natriuretic peptide predicts outcome after hospital discharge in heart failure patients. Circulation. 2004 Oct 12;110(15):2168-74. PubMed

Binanay C, Califf RM, Hasselblad V, O'Connor CM, Shah MR, Sopko G, Stevenson LW, Francis GS, Leier CV, Miller LW, ESCAPE Investigators and ESCAPE Study Coordinators. Evaluation study of congestive heart failure and pulmonary artery catheterization effectiveness: the ESCAPE trial. JAMA. 2005 Oct 5;294(13):1625-33. PubMed

Boren SA, Wakefield BJ, Gunlock TL, Wakefield DS. Heart failure self-management education: a systematic review of the evidence. Int J Evid Based Healthc. 2009 Sep;7(3):159-68. PubMed

Bozkurt B, Agoston I, Knowlton AA. Complications of inappropriate use of spironolactone in heart failure: when an old medicine spirals out of new guidelines. J Am Coll Cardiol. 2003 Jan 15;41(2):211-4. PubMed

Bradley TD, Logan AG, Kimoff RJ, Series F, Morrison D, Ferguson K, Belenkie I, Pfeifer M, Fleetham J, Hanly P, Smilovitch M, Tomlinson G, Floras JS, CANPAP Investigators. Continuous positive airway pressure for central sleep apnea and heart failure. N Engl J Med. 2005 Nov 10;353(19):2025-33. PubMed

Braunstein JB, Anderson GF, Gerstenblith G, Weller W, Niefeld M, Herbert R, Wu AW. Noncardiac comorbidity increases preventable hospitalizations and mortality among Medicare beneficiaries with chronic heart failure. J Am Coll Cardiol. 2003 Oct 1;42(7):1226-33. PubMed

Brignole M, Botto G, Mont L, Iacopino S, De Marchi G, Oddone D, Luzi M, Tolosana JM, Navazio A, Menozzi C. Cardiac resynchronization therapy in patients undergoing atrioventricular junction ablation for permanent atrial fibrillation: a randomized trial. Eur Heart J. 2011 Oct;32(19):2420-9. PubMed

Brignole M, Gammage M, Puggioni E, Alboni P, Raviele A, Sutton R, Vardas P, Bongiorni MG, Bergfeldt L, Menozzi C, Musso G, Optimal Pacing SITE (OPSITE) Study Investigators. Comparative assessment of right, left, and biventricular pacing in patients with permanent atrial fibrillation. Eur Heart J. 2005 Apr;26(7):712-22. PubMed

Bristow MR, Saxon LA, Boehmer J, Krueger S, Kass DA, De Marco T, Carson P, DiCarlo L, DeMets D, White BG, DeVries DW, Feldman AM. Cardiac-resynchronization therapy with or without an implantable defibrillator in advanced chronic heart failure. N Engl J Med. 2004 May 20;350(21):2140-50. [20 references] PubMed

Brozena SC, Twomey C, Goldberg LR, Desai SS, Drachman B, Kao A, Popjes E, Zimmer R, Jessup M. A prospective study of continuous intravenous milrinone therapy for status IB patients awaiting heart transplant at home. J Heart Lung Transplant. 2004 Sep;23(9):1082-6. PubMed

Burkhoff D, Cohen H, Brunckhorst C, O'Neill WW, TandemHeart Investigators Group. A randomized multicenter clinical study to evaluate the safety and efficacy of the TandemHeart percutaneous ventricular assist device versus conventional therapy with intraaortic balloon pumping for treatment of cardiogenic shock. Am Heart J. 2006 Sep;152(3):469.e1-8. PubMed

Butler J, Young JB, Abraham WT, Bourge RC, Adams KF Jr, Clare R, O'Connor C, ESCAPE Investigators. Beta-blocker use and outcomes among hospitalized heart failure patients. J Am Coll Cardiol. 2006 Jun 20;47(12):2462-9. PubMed

Butman SM, Ewy GA, Standen JR, Kern KB, Hahn E. Bedside cardiovascular examination in patients with severe chronic heart failure: importance of rest or inducible jugular venous distension. J Am Coll Cardiol. 1993 Oct;22(4):968-74. PubMed

Buxton AE, Lee KL, Fisher JD, Josephson ME, Prystowsky EN, Hafley G, Multicenter Unsustained Tachycardia Trial Investigators. A randomized study of the prevention of sudden death in patients with coronary artery disease. Multicenter Unsustained Tachycardia Trial Investigators. N Engl J Med. 1999 Dec 16;341(25):1882-90. PubMed

Cairns JA, Connolly S, McMurtry S, Stephenson M, Talajic M, CCS Atrial Fibrillation Guidelines Committee. Canadian cardiovascular society atrial fibrillation guidelines 2010: prevention of stroke and systemic thromboembolism in atrial fibrillation and flutter. Can J Cardiol. 2011 Jan-Feb;27(1):74-90. PubMed

Caracciolo EA, Davis KB, Sopko G, Kaiser GC, Corley SD, Schaff H, Taylor HA, Chaitman BR. Comparison of surgical and medical group survival in patients with left main equivalent coronary artery disease. Long-term CASS experience. Circulation. 1995 May 1;91(9):2335-44. PubMed

Carson P, Anand I, O'Connor C, Jaski B, Steinberg J, Lwin A, Lindenfeld J, Ghali J, Barnet JH, Feldman AM, Bristow MR. Mode of death in advanced heart failure: the Comparison of Medical, Pacing, and Defibrillation Therapies in Heart Failure (COMPANION) trial. J Am Coll Cardiol. 2005 Dec 20;46(12):2329-34. PubMed

Carson P, Ziesche S, Johnson G, Cohn JN. Racial differences in response to therapy for heart failure: analysis of the vasodilator-heart failure trials. Vasodilator-Heart Failure Trial Study Group. J Card Fail. 1999 Sep;5(3):178-87. PubMed

Chan KM, Punjabi PP, Flather M, Wage R, Symmonds K, Roussin I, Rahman-Haley S, Pennell DJ, Kilner PJ, Dreyfus GD, Pepper JR, RIME Investigators. Coronary artery bypass surgery with or without mitral valve annuloplasty in moderate functional ischemic mitral regurgitation: final results of the Randomized Ischemic Mitral Evaluation (RIME) trial. Circulation. 2012 Nov 20;126(21):2502-10. PubMed

Channer KS, McLean KA, Lawson-Matthew P, Richardson M. Combination diuretic treatment in severe heart failure: a randomised controlled trial. Br Heart J. 1994 Feb;71(2):146-50. PubMed

Chaudhry SI, Phillips CO, Stewart SS, Riegel B, Mattera JA, Jerant AF, Krumholz HM. Telemonitoring for patients with chronic heart failure: a systematic review. J Card Fail. 2007 Feb;13(1):56-62. PubMed

Cheng V, Kazanagra R, Garcia A, Lenert L, Krishnaswamy P, Gardetto N, Clopton P, Maisel A. A rapid bedside test for B-type peptide predicts treatment outcomes in patients admitted for decompensated heart failure: a pilot study. J Am Coll Cardiol. 2001 Feb;37(2):386-91. PubMed

Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, Jones DW, Materson BJ, Oparil S, Wright JT Jr, Roccella EJ. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension. 2003 Dec;42(6):1206-52. [386 references] PubMed

Cioffi G, Stefenelli C, Tarantini L, Opasich C. Hemodynamic response to intensive unloading therapy (furosemide and nitroprusside) in patients >70 years of age with left ventricular systolic dysfunction and decompensated chronic heart failure. Am J Cardiol. 2003 Nov 1;92(9):1050-6. PubMed

Clark RA, Inglis SC, McAlister FA, Cleland JG, Stewart S. Telemonitoring or structured telephone support programmes for patients with chronic heart failure: systematic review and meta-analysis. BMJ. 2007 May 5;334(7600):942. PubMed

Cleland JG, Calvert M, Freemantle N, Arrow Y, Ball SG, Bonser RS, Chattopadhyay S, Norell MS, Pennell DJ, Senior R. The Heart Failure Revascularisation Trial (HEART). Eur J Heart Fail. 2011 Feb;13(2):227-33. PubMed

Cleland JG, Daubert JC, Erdmann E, Freemantle N, Gras D, Kappenberger L, Tavazzi L, Cardiac Resynchronization-Heart Failure (CARE-HF) Study Investigators. The effect of cardiac resynchronization on morbidity and mortality in heart failure. N Engl J Med. 2005 Apr 14;352(15):1539-49. PubMed

Cohn JN, Archibald DG, Ziesche S, Franciosa JA, Harston WE, Tristani FE, Dunkman WB, Jacobs W, Francis GS, Flohr KH, et al. Effect of vasodilator therapy on mortality in chronic congestive heart failure. Results of a Veterans Administration Cooperative Study. N Engl J Med. 1986 Jun 12;314(24):1547-52. PubMed

Cohn JN, Goldstein SO, Greenberg BH, Lorell BH, Bourge RC, Jaski BE, Gottlieb SO, McGrew F 3rd, DeMets DL, White BG. A dose-dependent increase in mortality with vesnarinone among patients with severe heart failure. Vesnarinone Trial Investigators. N Engl J Med. 1998 Dec 17;339(25):1810-6. PubMed

Cohn JN, Johnson G, Ziesche S, Cobb F, Francis G, Tristani F, Smith R, Dunkman WB, Loeb H, Wong M, et al.. A comparison of enalapril with hydralazine-isosorbide dinitrate in the treatment of chronic congestive heart failure. N Engl J Med. 1991 Aug 1;325(5):303-10. PubMed

Cohn JN, Tognoni G. A randomized trial of the angiotensin-receptor blocker valsartan in chronic heart failure. N Engl J Med. 2001 Dec 6;345(23):1667-75. PubMed

Coleman EA, Boult C, American Geriatrics Society Health Care Systems Committee. Improving the quality of transitional care for persons with complex care needs. J Am Geriatr Soc. 2003 Apr;51(4):556-7. PubMed

Coleman EA, Mahoney E, Parry C. Assessing the quality of preparation for posthospital care from the patient's perspective: the care transitions measure. Med Care. 2005 Mar;43(3):246-55. PubMed

Colucci WS, Elkayam U, Horton DP, Abraham WT, Bourge RC, Johnson AD, Wagoner LE, Givertz MM, Liang CS, Neibaur M, Haught WH, LeJemtel TH. Intravenous nesiritide, a natriuretic peptide, in the treatment of decompensated congestive heart failure. Nesiritide Study Group. N Engl J Med. 2000 Jul 27;343(4):246-53. PubMed

Comparative effects of therapy with captopril and digoxin in patients with mild to moderate heart failure. The Captopril-Digoxin Multicenter Research Group. JAMA. 1988 Jan 22-29;259(4):539-44. PubMed

Connolly SJ, Ezekowitz MD, Yusuf S, Eikelboom J, Oldgren J, Parekh A, Pogue J, Reilly PA, Themeles E, Varrone J, Wang S, Alings M, Xavier D, Zhu J, Diaz R, Lewis BS, Darius H, Diener HC, Joyner CD, Wallentin L, RE-LY Steering Committee and Investigators. Dabigatran versus warfarin in patients with atrial fibrillation. N Engl J Med. 2009 Sep 17;361(12):1139-51. PubMed

Connolly SJ, Ezekowitz MD, Yusuf S, Reilly PA, Wallentin L, Randomized Evaluation of Long-Term Anticoagulation Therapy Investigators. Newly identified events in the RE-LY trial. N Engl J Med. 2010 Nov 4;363(19):1875-6. PubMed

CONSENSUS Trial Study Group. Effects of enalapril on mortality in severe congestive heart failure. Results of the Cooperative North Scandinavian Enalapril Survival Study (CONSENSUS). N Engl J Med. 1987 Jun 4;316(23):1429-35. PubMed

Costanzo MR, Guglin ME, Saltzberg MT, Jessup ML, Bart BA, Teerlink JR, Jaski BE, Fang JC, Feller ED, Haas GJ, Anderson AS, Schollmeyer MP, Sobotka PA, UNLOAD Trial Investigators. Ultrafiltration versus intravenous diuretics for patients hospitalized for acute decompensated heart failure. J Am Coll Cardiol. 2007 Feb 13;49(6):675-83. PubMed

Costello-Boerrigter LC, Boerrigter G, Redfield MM, Rodeheffer RJ, Urban LH, Mahoney DW, Jacobsen SJ, Heublein DM, Burnett JC Jr. Amino-terminal pro-B-type natriuretic peptide and B-type natriuretic peptide in the general community: determinants and detection of left ventricular dysfunction. J Am Coll Cardiol. 2006 Jan 17;47(2):345-53. PubMed

Crozier I, Ikram H, Awan N, Cleland J, Stephen N, Dickstein K, Frey M, Young J, Klinger G, Makris L, et al. Losartan in heart failure. Hemodynamic effects and tolerability. Losartan Hemodynamic Study Group. Circulation. 1995 Feb 1;91(3):691-7. PubMed

Cuffe MS, Califf RM, Adams KF Jr, Benza R, Bourge R, Colucci WS, Massie BM, O'Connor CM, Pina I, Quigg R, Silver MA, Gheorghiade M, Outcomes of a Prospective Trial of Intravenous Milrinone for Exacerbations of. Short-term intravenous milrinone for acute exacerbation of chronic heart failure: a randomized controlled trial. JAMA. 2002 Mar 27;287(12):1541-7. PubMed

Dao Q, Krishnaswamy P, Kazanegra R, Harrison A, Amirnovin R, Lenert L, Clopton P, Alberto J, Hlavin P, Maisel AS. Utility of b-type natriuretic peptide in the diagnosis of congestive heart failure in an urgent-care setting. J Am Coll Cardiol. 2001;37(2):379-85. PubMed

Dargie HJ. Effect of carvedilol on outcome after myocardial infarction in patients with left-ventricular dysfunction: the CAPRICORN randomised trial. Lancet. 2001 May 5;357(9266):1385-90. PubMed

Davies EJ, Moxham T, Rees K, Singh S, Coats AJ, Ebrahim S, Lough F, Taylor RS. Exercise training for systolic heart failure: Cochrane systematic review and meta-analysis. Eur J Heart Fail. 2010 Jul;12(7):706-15. [40 references] PubMed

Davis M, Espiner E, Richards G, Billings J, Town I, Neill A, Drennan C, Richards M, Turner J, Yandle T. Plasma brain natriuretic peptide in assessment of acute dyspnoea. Lancet. 1994 Feb 19;343(8895):440-4. PubMed

de Boer RA, Lok DJ, Jaarsma T, van der Meer P, Voors AA, Hillege HL, van Veldhuisen DJ. Predictive value of plasma galectin-3 levels in heart failure with reduced and preserved ejection fraction. Ann Med. 2011 Feb;43(1):60-8. PubMed

de Lemos JA, McGuire DK, Khera A, Das SR, Murphy SA, Omland T, Drazner MH. Screening the population for left ventricular hypertrophy and left ventricular systolic dysfunction using natriuretic peptides: results from the Dallas Heart Study. Am Heart J. 2009 Apr;157(4):746-53.e2. PubMed

Dhaliwal AS, Deswal A, Pritchett A, Aguilar D, Kar B, Souchek J, Bozkurt B. Reduction in BNP levels with treatment of decompensated heart failure and future clinical events. J Card Fail. 2009 May;15(4):293-9. PubMed

DiBianco R, Shabetai R, Kostuk W, Moran J, Schlant RC, Wright R. A comparison of oral milrinone, digoxin, and their combination in the treatment of patients with chronic heart failure. N Engl J Med. 1989 Mar 16;320(11):677-83. PubMed

Dieplinger B, Gegenhuber A, Kaar G, Poelz W, Haltmayer M, Mueller T. Prognostic value of established and novel biomarkers in patients with shortness of breath attending an emergency department. Clin Biochem. 2010 Jun;43(9):714-9. PubMed

Digitalis Investigation Group. The effect of digoxin on mortality and morbidity in patients with heart failure. N Engl J Med. 1997 Feb 20;336(8):525-33. PubMed

Dobbs SM, Kenyon WI, Dobbs RJ. Maintenance digoxin after an episode of heart failure: placebo-controlled trial in outpatients. Br Med J. 1977 Mar 19;1(6063):749-52. PubMed

Doshi RN, Daoud EG, Fellows C, Turk K, Duran A, Hamdan MH, Pires LA, PAVE Study Group. Left ventricular-based cardiac stimulation post AV nodal ablation evaluation (the PAVE study). J Cardiovasc Electrophysiol. 2005 Nov;16(11):1160-5. PubMed

Drazner MH, Hellkamp AS, Leier CV, Shah MR, Miller LW, Russell SD, Young JB, Califf RM, Nohria A. Value of clinician assessment of hemodynamics in advanced heart failure: the ESCAPE trial. Circ Heart Fail. 2008 Sep;1(3):170-7. PubMed

Drazner MH, Rame JE, Stevenson LW, Dries DL. Prognostic importance of elevated jugular venous pressure and a third heart sound in patients with heart failure. N Engl J Med. 2001 Aug 23;345(8):574-81. PubMed

Dries DL, Rosenberg YD, Waclawiw MA, Domanski MJ. Ejection fraction and risk of thromboembolic events in patients with systolic dysfunction and sinus rhythm: evidence for gender differences in the studies of left ventricular dysfunction trials. J Am Coll Cardiol. 1997 Apr;29(5):1074-80. PubMed

Effect of enalapril on mortality and the development of heart failure in asymptomatic patients with reduced left ventricular ejection fractions. The SOLVD Investigators. N Engl J Med. 1992 Sep 3;327(10):685-91. PubMed

Effect of metoprolol CR/XL in chronic heart failure: Metoprolol CR/XL Randomised Intervention Trial in Congestive Heart Failure (MERIT-HF). Lancet. 1999 Jun 12;353(9169):2001-7. PubMed

Effect of verapamil on mortality and major events after acute myocardial infarction (the Danish Verapamil Infarction Trial II--DAVIT II. Am J Cardiol. 1990 Oct 1;66(10):779-85. PubMed

Effects of carvedilol, a vasodilator-beta-blocker, in patients with congestive heart failure due to ischemic heart disease. Australia-New Zealand Heart Failure Research Collaborative Group. Circulation. 1995 Jul 15;92(2):212-8. PubMed

Eleven-year survival in the Veterans Administration randomized trial of coronary bypass surgery for stable angina. The Veterans Administration Coronary Artery Bypass Surgery Cooperative Study Group. N Engl J Med. 1984 Nov 22;311(21):1333-9. PubMed

Elhenawy AM, Algarni KD, Rodger M, Maciver J, Maganti M, Cusimano RJ, Yau TM, Delgado DH, Ross HJ, Rao V. Mechanical circulatory support as a bridge to transplant candidacy. J Card Surg. 2011 Sep;26(5):542-7. PubMed

Elkayam U, Amin J, Mehra A, Vasquez J, Weber L, Rahimtoola SH. A prospective, randomized, double-blind, crossover study to compare the efficacy and safety of chronic nifedipine therapy with that of isosorbide dinitrate and their combination in the treatment of chronic congestive heart failure. Circulation. 1990 Dec;82(6):1954-61. PubMed

Elkayam U, Ng TM, Hatamizadeh P, Janmohamed M, Mehra A. Renal Vasodilatory Action of Dopamine in Patients With Heart Failure: Magnitude of Effect and Site of Action. Circulation. 2008 Jan 15;117(2):200-205. PubMed

Elkayam U, Tasissa G, Binanay C, Stevenson LW, Gheorghiade M, Warnica JW, Young JB, Rayburn BK, Rogers JG, DeMarco T, Leier CV. Use and impact of inotropes and vasodilator therapy in hospitalized patients with severe heart failure. Am Heart J. 2007 Jan;153(1):98-104. PubMed

European Heart Rhythm Association, European Association for Cardio-Thoracic Surgery, Camm AJ, Kirchhof P, Lip GY, Schotten U, Savelieva I, Ernst S, Van Gelder IC, Al-Attar N, Hindricks G, Prendergast B, Heidbuchel H, Alfieri O, Angelini A, Atar D, Colonna P, De Caterina R, De Sutter J, Goette A, Gorenek B, Heldal M, Hohloser SH, Kolh P, Le Heuzey JY, Ponikowski P, Rutten FH. Guidelines for the management of atrial fibrillation: the Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC). Eur Heart J. 2010 Oct;31(19):2369-429. PubMed

Exner DV, Dries DL, Waclawiw MA, Shelton B, Domanski MJ. Beta-adrenergic blocking agent use and mortality in patients with asymptomatic and symptomatic left ventricular systolic dysfunction: a post hoc analysis of the Studies of Left Ventricular Dysfunction. J Am Coll Cardiol. 1999 Mar 15;33(4):916-23. PubMed

Fattouch K, Guccione F, Sampognaro R, Panzarella G, Corrado E, Navarra E, Calvaruso D, Ruvolo G. POINT: Efficacy of adding mitral valve restrictive annuloplasty to coronary artery bypass grafting in patients with moderate ischemic mitral valve regurgitation: a randomized trial. J Thorac Cardiovasc Surg. 2009 Aug;138(2):278-85. PubMed

Faxon DP, Schwamm LH, Pasternak RC, Peterson ED, McNeil BJ, Bufalino V, Yancy CW, Brass LM, Baker DW, Bonow RO, Smaha LA, Jones DW, Smith SC Jr, Ellrodt G, Allen J, Schwartz SJ, Fonarow G, Duncan P, Horton K, Smith R, Stranne S, Shine K, American Heart Association's Expert Panel on Disease Management. Improving quality of care through disease management: principles and recommendations

from the American Heart Association's Expert Panel on Disease Management. Circulation. 2004 Jun 1;109(21):2651-4. [21 references] PubMed

Feldman T, Foster E, Glower DG, Kar S, Rinaldi MJ, Fail PS, Smalling RW, Siegel R, Rose GA, Engeron E, Loghin C, Trento A, Skipper ER, Fudge T, Letsou GV, Massaro JM, Mauri L, the EVEREST II Investigators. Percutaneous Repair or Surgery for Mitral Regurgitation. N Engl J Med. 2011 Apr 14;364(15):1395-406. PubMed

Felker GM, Hasselblad V, Hernandez AF, O'Connor CM. Biomarker-guided therapy in chronic heart failure: a meta-analysis of randomized controlled trials. Am Heart J. 2009 Sep;158(3):422-30. PubMed

Felker GM, Lee KL, Bull DA, Redfield MM, Stevenson LW, Goldsmith SR, LeWinter MM, Deswal A, Rouleau JL, Ofili EO, Anstrom KJ, Hernandez AF, McNulty SE, Velazquez EJ, Kfoury AG, Chen HH, Givertz MM, Semigran MJ, Bart BA, Mascette AM, Braunwald E, O'Connor CM, NHLBI Heart Failure Clinical Research Network. Diuretic strategies in patients with acute decompensated heart failure. N Engl J Med. 2011 Mar 3;364(9):797-805. PubMed

Figulla HR, Gietzen F, Zeymer U, Raiber M, Hegselmann J, Soballa R, Hilgers R. Diltiazem improves cardiac function and exercise capacity in patients with idiopathic dilated cardiomyopathy. Results of the Diltiazem in Dilated Cardiomyopathy Trial. Circulation. 1996 Aug 1;94(3):346-52. PubMed

Fihn SD, Gardin JM, Abrams J, Berra K, Blankenship JC, Dallas AP, Douglas PS, Foody JM, Gerber TC, Hinderliter AL, King SB 3rd, Kligfield PD, Krumholz HM, Kwong RY, Lim MJ, Linderbaum JA, Mack MJ, Munger MA, Prager RL, Sabik JF, Shaw LJ, Sikkema JD, Smith CR Jr, Smith SC Jr, Spertus JA, Williams SV. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS guideline for the diagnosis and management of patients with stable ischemic heart disease. J Am Coll Cardiol. 2012 Dec 18;60(24):e44-e164. [1266 references] PubMed

Fonarow GC, Abraham WT, Albert NM, Gattis Stough W, Gheorghiade M, Greenberg BH, O'Connor CM, Pieper K, Sun JL, Yancy CW, Young JB, OPTIMIZE-HF Investigators and Hospitals. Influence of a performance-improvement initiative on quality of care for patients hospitalized with heart failure: results of the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure (OPTIMIZE-HF). Arch Intern Med. 2007 Jul 23;167(14):1493-502. PubMed

Fonarow GC, Abraham WT, Albert NM, Stough WG, Gheorghiade M, Greenberg BH, O'Connor CM, Pieper K, Sun JL, Yancy C, Young JB, OPTIMIZE-HF Investigators and Hospitals. Association between performance measures and clinical outcomes for patients hospitalized with heart failure. JAMA. 2007 Jan 3;297(1):61-70. [33 references] PubMed

Fonarow GC, Abraham WT, Albert NM, Stough WG, Gheorghiade M, Greenberg BH, O'Connor CM, Sun JL, Yancy CW, Young JB, OPTIMIZE-HF Investigators and Coordinators. Influence of beta-blocker continuation or withdrawal on outcomes in patients hospitalized with heart failure: findings from the OPTIMIZE-HF program. J Am Coll Cardiol. 2008 Jul 15;52(3):190-9. PubMed

Fonarow GC, Adams KF Jr, Abraham WT, Yancy CW, Boscardin WJ, ADHERE Scientific Advisory Committee, Study Group, and Investigators. Risk stratification for in-hospital mortality in acutely decompensated heart failure: classification and regression tree analysis. JAMA. 2005 Feb 2;293(5):572-80. PubMed

Fonarow GC, Albert NM, Curtis AB, Stough WG, Gheorghiade M, Heywood JT, McBride ML, Inge PJ, Mehra MR, O'Connor CM, Reynolds D, Walsh MN, Yancy CW. Improving evidence-based care for heart failure in outpatient cardiology practices: primary results of the Registry to Improve the Use of Evidence-Based Heart Failure Therapies in the Outpatient Setting (IMPROVE HF). Circulation. 2010 Aug 10;122(6):585-96. PubMed

Fonarow GC, Heywood JT, Heidenreich PA, Lopatin M, Yancy CW, ADHERE Scientific Advisory Committee and Investigators. Temporal trends in clinical characteristics, treatments, and outcomes for heart failure hospitalizations, 2002 to 2004: findings from Acute Decompensated Heart Failure National Registry (ADHERE). Am Heart J. 2007 Jun;153(6):1021-8. PubMed

Fonarow GC, Peacock WF, Horwich TB, Phillips CO, Givertz MM, Lopatin M, Wynne J, ADHERE Scientific Advisory Committee and Investigators. Usefulness of B-type natriuretic peptide and cardiac troponin levels to predict in-hospital mortality from ADHERE. Am J

Cardiol. 2008 Jan 15;101(2):231-7. PubMed

Foody JM, Shah R, Galusha D, Masoudi FA, Havranek EP, Krumholz HM. Statins and mortality among elderly patients hospitalized with heart failure. Circulation. 2006 Feb 28;113(8):1086-92. PubMed

Forfia PR, Watkins SP, Rame JE, Stewart KJ, Shapiro EP. Relationship between B-type natriuretic peptides and pulmonary capillary wedge pressure in the intensive care unit. J Am Coll Cardiol. 2005 May 17;45(10):1667-71. PubMed

Franzen O, van der Heyden J, Baldus S, Schluter M, Schillinger W, Butter C, Hoffmann R, Corti R, Pedrazzini G, Swaans MJ, Neuss M, Rudolph V, Surder D, Grunenfelder J, Eulenburg C, Reichenspurner H, Meinertz T, Auricchio A. MitraClip therapy in patients with end-stage systolic heart failure. Eur J Heart Fail. 2011 May;13(5):569-76. PubMed

Freudenberger RS, Hellkamp AS, Halperin JL, Poole J, Anderson J, Johnson G, Mark DB, Lee KL, Bardy GH, SCD-HeFT Investigators. Risk of thromboembolism in heart failure: an analysis from the Sudden Cardiac Death in Heart Failure Trial (SCD-HeFT). Circulation. 2007 May 22;115(20):2637-41. PubMed

Garg R, Yusuf S. Overview of randomized trials of angiotensin-converting enzyme inhibitors on mortality and morbidity in patients with heart failure. Collaborative Group on ACE Inhibitor Trials. JAMA. 1995 May 10;273(18):1450-6. PubMed

Gasparini M, Auricchio A, Regoli F, Fantoni C, Kawabata M, Galimberti P, Pini D, Ceriotti C, Gronda E, Klersy C, Fratini S, Klein HH. Four-year efficacy of cardiac resynchronization therapy on exercise tolerance and disease progression: the importance of performing atrioventricular junction ablation in patients with atrial fibrillation. J Am Coll Cardiol. 2006 Aug 15;48(4):734-43. PubMed

Ghali JK, Koren MJ, Taylor JR, Brooks-Asplund E, Fan K, Long WA, Smith N. Efficacy and safety of oral conivaptan: a V1A/V2 vasopressin receptor antagonist, assessed in a randomized, placebo-controlled trial in patients with euvolemic or hypervolemic hyponatremia. J Clin Endocrinol Metab. 2006 Jun;91(6):2145-52. PubMed

Giamouzis G, Butler J, Starling RC, Karayannis G, Nastas J, Parisis C, Rovithis D, Economou D, Savvatis K, Kirlidis T, Tsaknakis T, Skoularigis J, Westermann D, Tschope C, Triposkiadis F. Impact of dopamine infusion on renal function in hospitalized heart failure patients: results of the Dopamine in Acute Decompensated Heart Failure (DAD-HF) Trial. J Card Fail. 2010 Dec;16(12):922-30. PubMed

Gislason GH, Rasmussen JN, Abildstrom SZ, Schramm TK, Hansen ML, Buch P, Sorensen R, Folke F, Gadsboll N, Rasmussen S, Kober L, Madsen M, Torp-Pedersen C. Persistent use of evidence-based pharmacotherapy in heart failure is associated with improved outcomes. Circulation. 2007 Aug 14;116(7):737-44. PubMed

Gislason GH, Rasmussen JN, Abildstrom SZ, Schramm TK, Hansen ML, Fosbol EL, Sorensen R, Folke F, Buch P, Gadsboll N, Rasmussen S, Poulsen HE, Kober L, Madsen M, Torp-Pedersen C. Increased mortality and cardiovascular morbidity associated with use of nonsteroidal anti-inflammatory drugs in chronic heart failure. Arch Intern Med. 2009 Jan 26;169(2):141-9. PubMed

Gissi-HF Investigators, Tavazzi L, Maggioni AP, Marchioli R, Barlera S, Franzosi MG, Latini R, Lucci D, Nicolosi GL, Porcu M, Tognoni G. Effect of n-3 polyunsaturated fatty acids in patients with chronic heart failure (the GISSI-HF trial): a randomised, double-blind, placebo-controlled trial. Lancet. 2008 Oct 4;372(9645):1223-30. PubMed

Gissi-HF Investigators, Tavazzi L, Maggioni AP, Marchioli R, Barlera S, Franzosi MG, Latini R, Lucci D, Nicolosi GL, Porcu M, Tognoni G. Effect of rosuvastatin in patients with chronic heart failure (the GISSI-HF trial): a randomised, double-blind, placebo-controlled trial. Lancet. 2008 Oct 4;372(9645):1231-9. PubMed

Go AS, Lee WY, Yang J, Lo JC, Gurwitz JH. Statin therapy and risks for death and hospitalization in chronic heart failure. JAMA. 2006 Nov 1;296(17):2105-11. PubMed

Goetze JP, Mogelvang R, Maage L, Scharling H, Schnohr P, Sogaard P, Rehfeld JF, Jensen JS. Plasma pro-B-type natriuretic peptide in the general population: screening for left ventricular hypertrophy and systolic dysfunction. Eur Heart J. 2006 Dec;27(24):3004-10. PubMed

Goldstein RE, Boccuzzi SJ, Cruess D, Nattel S. Diltiazem increases late-onset congestive heart failure in postinfarction patients with early reduction in ejection fraction. The Adverse Experience Committee; and the Multicenter Diltiazem Postinfarction Research Group. Circulation. 1991 Jan;83(1):52-60. PubMed

Gorodeski EZ, Chu EC, Reese JR, Shishehbor MH, Hsich E, Starling RC. Prognosis on chronic dobutamine or milrinone infusions for stage D heart failure. Circ Heart Fail. 2009 Jul;2(4):320-4. PubMed

Gottlieb SS, Dickstein K, Fleck E, Kostis J, Levine TB, LeJemtel T, DeKock M. Hemodynamic and neurohormonal effects of the angiotensin II antagonist losartan in patients with congestive heart failure. Circulation. 1993 Oct;88(4 Pt 1):1602-9. PubMed

Grady KL, Meyer PM, Dressler D, Mattea A, Chillcott S, Loo A, White-Williams C, Todd B, Ormaza S, Kaan A, Costanzo MR, Piccione W. Longitudinal change in quality of life and impact on survival after left ventricular assist device implantation. Ann Thorac Surg. 2004 Apr;77(4):1321-7. PubMed

Granger CB, Alexander JH, McMurray JJ, Lopes RD, Hylek EM, Hanna M, Al-Khalidi HR, Ansell J, Atar D, Avezum A, Bahit MC, Diaz R, Easton JD, Ezekowitz JA, Flaker G, Garcia D, Geraldes M, Gersh BJ, Golitsyn S, Goto S, Hermosillo AG, Hohnloser SH, Horowitz J, Mohan P, Jansky P, Lewis BS, Lopez-Sendon JL, Pais P, Parkhomenko A, Verheugt FW, Zhu J, Wallentin L, ARISTOTLE Committees and Investigators. Apixaban versus warfarin in patients with atrial fibrillation. N Engl J Med. 2011 Sep 15;365(11):981-92. PubMed

Granger CB, McMurray JJ, Yusuf S, Held P, Michelson EL, Olofsson B, Ostergren J, Pfeffer MA, Swedberg K. Effects of candesartan in patients with chronic heart failure and reduced left-ventricular systolic function intolerant to angiotensin-converting-enzyme inhibitors: the CHARM-Alternative trial. Lancet. 2003 Sep 6;362(9386):772-6. PubMed

Greenberg B, Czerska B, Delgado RM, Bourge R, Zile MR, Silver M, Klapholz M, Haeusslein E, Mehra MR, Mather P, Abraham WT, Neaton JD, Brown BS, Parker IC, Konstam MA, MOMENTUM Investigators and Coordinators. Effects of continuous aortic flow augm. Circulation. 2008 Sep 16;118(12):1241-9. PubMed

Grosskopf I, Rabinovitz M, Rosenfeld JB. Combination of furosemide and metolazone in the treatment of severe congestive heart failure. Isr J Med Sci. 1986 Nov;22(11):787-90. PubMed

Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr, Clark LT, Hunninghake DB, Pasternak RC, Smith SC Jr, Stone NJ. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines. J Am Coll Cardiol. 2004 Aug 4;44(3):720-32. [45 references] PubMed

Guyatt GH, Akl EA, Crowther M, Gutterman DD, SchuÃ¼nemann HJ, American College of Chest Physicians Antithrombotic Therapy and Prevention of. Executive summary: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians evidence-based clinical practice guideline. Chest. 2012 Feb;141(2 Suppl):7S-47S. PubMed

Guyatt GH, Sullivan MJ, Fallen EL, Tihal H, Rideout E, Halcrow S, Nogradi S, Townsend M, Taylor DW. A controlled trial of digoxin in congestive heart failure. Am J Cardiol. 1988 Feb 1;61(4):371-5. PubMed

Gwadry-Sridhar FH, Arnold JM, Zhang Y, Brown JE, Marchiori G, Guyatt G. Pilot study to determine the impact of a multidisciplinary educational intervention in patients hospitalized with heart failure. Am Heart J. 2005 Nov;150(5):982. PubMed

Hampton JR, van Veldhuisen DJ, Kleber FX, Cowley AJ, Ardia A, Block P, Cortina A, Cserhalmi L, Follath F, Jensen G, Kayanakis J, Lie KI, Mancia G, Skene AM. Randomised study of effect of ibopamine on survival in patients with advanced severe heart failure. Second Prospective Randomised Study of Ibopamine on Mortality and Efficacy (PRIME II) Investigators. Lancet. 1997 Apr 5;349(9057):971-7. PubMed

Hauptman PJ, Havranek EP. Integrating palliative care into heart failure care. Arch Intern Med. 2005 Feb 28;165(4):374-8. [47 references] PubMed

Heerdink ER, Leufkens HG, Herings RM, Ottervanger JP, Stricker BH, Bakker A. NSAIDs associated with increased risk of congestive heart failure in elderly patients taking diuretics. Arch Intern Med. 1998 May 25;158(10):1108-12. PubMed

Hernandez AF, Greiner MA, Fonarow GC, Hammill BG, Heidenreich PA, Yancy CW, Peterson ED, Curtis LH. Relationship between early physician follow-up and 30-day readmission among Medicare beneficiaries hospitalized for heart failure. JAMA. 2010 May 5;303(17):1716-22. PubMed

Hershberger RE, Nauman D, Walker TL, Dutton D, Burgess D. Care processes and clinical outcomes of continuous outpatient support with inotropes (COSI) in patients with refractory endstage heart failure. J Card Fail. 2003 Jun;9(3):180-7. PubMed

Ho JE, Waters DD, Kean A, Wilson DJ, Demicco DA, Breazna A, Wun CC, Deedwania PC, Khush KK, TNT Investigators. Relation of improvement in estimated glomerular filtration rate with atorvastatin to reductions in hospitalizations for heart failure (from the Treating to New Targets [TNT] study). Am J Cardiol. 2012 Jun 15;109(12):1761-6. PubMed

Hohnloser SH, Kuck KH, Dorian P, Roberts RS, Hampton JR, Hatala R, Fain E, Gent M, Connolly SJ, DINAMIT Investigators. Prophylactic use of an implantable cardioverter-defibrillator after acute myocardial infarction. N Engl J Med. 2004 Dec 9;351(24):2481-8. PubMed

Homma S, Thompson JL, Pullicino PM, Levin B, Freudenberger RS, Teerlink JR, Ammon SE, Graham S, Sacco RL, Mann DL, Mohr JP, Massie BM, Labovitz AJ, Anker SD, Lok DJ, Ponikowski P, Estol CJ, Lip GY, Di Tullio MR, Sanford AR, Mejia V, Gabriel AP, del Valle ML, Buchsbaum R, WARCEF Investigators. Warfarin and aspirin in patients with heart failure and sinus rhythm. N Engl J Med. 2012 May 17;366(20):1859-69. PubMed

Horwich TB, MacLellan WR, Fonarow GC. Statin therapy is associated with improved survival in ischemic and non-ischemic heart failure. J Am Coll Cardiol. 2004 Feb 18;43(4):642-8. PubMed

Horwich TB, Patel J, MacLellan WR, Fonarow GC. Cardiac troponin I is associated with impaired hemodynamics, progressive left ventricular dysfunction, and increased mortality rates in advanced heart failure. Circulation. 2003 Aug 19;108(7):833-8. PubMed

Hudson M, Richard H, Pilote L. Differences in outcomes of patients with congestive heart failure prescribed celecoxib, rofecoxib, or non-steroidal anti-inflammatory drugs: population based study. BMJ. 2005 Jun 11;330(7504):1370. PubMed

Hudson MP, O'Connor CM, Gattis WA, Tasissa G, Hasselblad V, Holleman CM, Gaulden LH, Sedor F, Ohman EM. Implications of elevated cardiac troponin T in ambulatory patients with heart failure: a prospective analysis. Am Heart J. 2004 Mar;147(3):546-52. PubMed

Hughes M, Lip GY, Guideline Development Group, National Clinical Guideline for Management of Atrial. Stroke and thromboembolism in atrial fibrillation: a systematic review of stroke risk factors, risk stratification schema and cost effectiveness data. Thromb Haemost. 2008 Feb;99(2):295-304. [53 references] PubMed

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, Stevenson LW, Yancy CW, American College of Cardiology Foundation, American Heart Association. 2009 focused update incorporated into the ACC/AHA 2005 guidelines for the diagnosis and management of heart failure in adults [trunc]. J Am Coll Cardiol. 2009 Apr 14;53(15):e1-e90. [810 references] PubMed

Ilva T, Lassus J, Siirila-Waris K, Melin J, Peuhkurinen K, Pulkki K, Nieminen MS, Mustonen H, Porela P, Harjola VP. Clinical significance of cardiac troponins I and T in acute heart failure. Eur J Heart Fail. 2008 Aug;10(8):772-9. PubMed

Inglis SC, Clark RA, McAlister FA, Ball J, Lewinter C, Cullington D, Stewart S, Cleland JG. Structured telephone support or telemonitoring programmes for patients with chronic heart failure. Cochrane Database Syst Rev. 2010;(8):CD007228. [315 references] PubMed

Januzzi JL Jr, Peacock WF, Maisel AS, Chae CU, Jesse RL, Baggish AL, O'Donoghue M, Sakhuja R, Chen AA, van Kimmenade RR, Lewandrowski KB, Lloyd-Jones DM, Wu AH. Measurement of the interleukin family member ST2 in patients with acute dyspnea: results from the PRIDE (Pro-Brain Natriuretic Peptide Investigation of Dyspnea in the Emergency Department) study. J Am Coll Cardiol. 2007 Aug 14;50(7):607-13. PubMed

Januzzi JL Jr, Rehman SU, Mohammed AA, Bhardwaj A, Barajas L, Barajas J, Kim HN, Baggish AL, Weiner RB, Chen-Tournoux A, Marshall JE, Moore SA, Carlson WD, Lewis GD, Shin J, Sullivan D, Parks K, Wang TJ, Gregory SA, Uthamalingam S, Semigran MJ. Use of amino-terminal pro-B-type natriuretic peptide to guide outpatient therapy of patients with chronic left ventricular systolic dysfunction. J Am Coll Cardiol. 2011 Oct 25;58(18):1881-9. PubMed

Januzzi JL Jr, Sakhuja R, O'donoghue M, Baggish AL, Anwaruddin S, Chae CU, Cameron R, Krauser DG, Tung R, Camargo CA Jr, Lloyd-Jones DM. Utility of amino-terminal pro-brain natriuretic peptide testing for prediction of 1-year mortality in patients with dyspnea treated in the emergency department. Arch Intern Med. 2006 Feb 13;166(3):315-20. PubMed

Jencks SF, Huff ED, Cuerdon T. Change in the quality of care delivered to Medicare beneficiaries, 1998-1999 to 2000-2001. JAMA. 2003 Jan 15;289(3):305-12. PubMed

Jones RH, Velazquez EJ, Michler RE, Sopko G, Oh JK, O'Connor CM, Hill JA, Menicanti L, Sadowski Z, Desvigne-Nickens P, Rouleau JL, Lee KL, STICH Hypothesis 2 Investigators. Coronary bypass surgery with or without surgical ventricular reconstruction. N Engl J Med. 2009 Apr 23;360(17):1705-17. PubMed

Jong P, Yusuf S, Rousseau MF, Ahn SA, Bangdiwala SI. Effect of enalapril on 12-year survival and life expectancy in patients with left ventricular systolic dysfunction: a follow-up study. Lancet. 2003 May 31;361(9372):1843-8. PubMed

Jourdain P, Jondeau G, Funck F, Gueffet P, Le Helloco A, Donal E, Aupetit JF, Aumont MC, Galinier M, Eicher JC, Cohen-Solal A, Juilliere Y. Plasma brain natriuretic peptide-guided therapy to improve outcome in heart failure: the STARS-BNP Multicenter Study. J Am Coll Cardiol. 2007 Apr 24;49(16):1733-9. PubMed

Juurlink DN, Mamdani MM, Lee DS, Kopp A, Austin PC, Laupacis A, Redelmeier DA. Rates of hyperkalemia after publication of the Randomized Aldactone Evaluation Study. N Engl J Med. 2004 Aug 5;351(6):543-51. PubMed

Kaneko Y, Floras JS, Usui K, Plante J, Tkacova R, Kubo T, Ando S, Bradley TD. Cardiovascular effects of continuous positive airway pressure in patients with heart failure and obstructive sleep apnea. N Engl J Med. 2003 Mar 27;348(13):1233-41. PubMed

Kjekshus J, Apetrei E, Barrios V, Bohm M, Cleland JG, Cornel JH, Dunselman P, Fonseca C, Goudev A, Grande P, Gullestad L, Hjalmarson A, Hradec J, Janosi A, Kamensky G, Komajda M, Korewicki J, Kuusi T, Mach F, Mareev V, McMurray JJ, Ranjith N, Schaufelberger M, Vanhaecke J, van Veldhuisen DJ, Waagstein F, Wedel H, Wikstrand J, CORONA Group. Rosuvastatin in older patients with systolic heart failure. N Engl J Med. 2007 Nov 29;357(22):2248-61. PubMed

Kjekshus J, Pedersen TR, Olsson AG, Faergeman O, Pyorala K. The effects of simvastatin on the incidence of heart failure in patients with coronary heart disease. J Card Fail. 1997 Dec;3(4):249-54. PubMed

Kober L, Torp-Pedersen C, McMurray JJ, Gotzsche O, Levy S, Crijns H, Amlie J, Carlsen J, Dronedarone Study Group. Increased mortality after dronedarone therapy for severe heart failure. N Engl J Med. 2008 Jun 19;358(25):2678-87. PubMed

Kociol RD, Horton JR, Fonarow GC, Reyes EM, Shaw LK, O'Connor CM, Felker GM, Hernandez AF. Admission, discharge, or change in

B-type natriuretic peptide and long-term outcomes: data from Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF) linked to Medicare claims. Circ Heart Fail. 2011 Sep;4(5):628-36. PubMed

Koelling TM, Johnson ML, Cody RJ, Aaronson KD. Discharge education improves clinical outcomes in patients with chronic heart failure. Circulation. 2005 Jan 18;111(2):179-85. PubMed

Komajda M, Carson PE, Hetzel S, McKelvie R, McMurray J, Ptaszynska A, Zile MR, Demets D, Massie BM. Factors associated with outcome in heart failure with preserved ejection fraction: findings from the Irbesartan in Heart Failure with Preserved Ejection Fraction Study (I-PRESERVE). Circ Heart Fail. 2011 Jan;4(1):27-35. PubMed

Konstam MA, Neaton JD, Dickstein K, Drexler H, Komajda M, Martinez FA, Riegger GA, Malbecq W, Smith RD, Guptha S, Poole-Wilson PA, HEAAL Investigators. Effects of high-dose versus low-dose losartan on clinical outcomes in patients with heart failure (HEAAL study): a randomised, double-blind trial. Lancet. 2009 Nov 28;374(9704):1840-8. PubMed

Kostis JB, Davis BR, Cutler J, Grimm RH Jr, Berge KG, Cohen JD, Lacy CR, Perry HM Jr, Blaufox MD, Wassertheil-Smoller S, Black HR, Schron E, Berkson DM, Curb JD, Smith WM, McDonald R, Applegate WB. Prevention of heart failure by antihypertensive drug treatment in older persons with isolated systolic hypertension. SHEP Cooperative Research Group. JAMA. 1997 Jul 16;278(3):212-6. PubMed

Krumholz HM, Chen YT, Wang Y, Vaccarino V, Radford MJ, Horwitz RI. Predictors of readmission among elderly survivors of admission with heart failure. Am Heart J. 2000;139(1 I):72-7. PubMed

Krumholz HM, Currie PM, Riegel B, Phillips CO, Peterson ED, Smith R, Yancy CW, Faxon DP, American Heart Association Disease Management Taxonomy Writing Group. A taxonomy for disease management: a scientific statement from the American Heart Association Disease Management Taxonomy Writing Group. Circulation. 2006 Sep 26;114(13):1432-45. [87 references] PubMed

Kwon DH, Halley CM, Carrigan TP, Zysek V, Popovic ZB, Setser R, Schoenhagen P, Starling RC, Flamm SD, Desai MY. Extent of left ventricular scar predicts outcomes in ischemic cardiomyopathy patients with significantly reduced systolic function: a delayed hyperenhancement cardiac magnetic resonance study. JACC Cardiovasc Imaging. 2009 Jan;2(1):34-44. PubMed

Lahpor J, Khaghani A, Hetzer R, Pavie A, Friedrich I, Sander K, Struber M. European results with a continuous-flow ventricular assist device for advanced heart-failure patients. Eur J Cardiothorac Surg. 2010 Feb;37(2):357-61. PubMed

Lainchbury JG, Troughton RW, Strangman KM, Frampton CM, Pilbrow A, Yandle TG, Hamid AK, Nicholls MG, Richards AM. N-terminal pro-B-type natriuretic peptide-guided treatment for chronic heart failure: results from the BATTLESCARRED (NT-proBNP-Assisted Treatment To Lessen Serial Cardiac Readmissions and Death) trial. J Am Coll Cardiol. 2009 Dec 29;55(1):53-60. PubMed

Lappe JM, Muhlestein JB, Lappe DL, Badger RS, Bair TL, Brockman R, French TK, Hofmann LC, Horne BD, Kralick-Goldberg S, Nicponski N, Orton JA, Pearson RR, Renlund DG, Rimmasch H, Roberts C, Anderson JL. Improvements in 1-year cardiovascular clinical outcomes associated with a hospital-based discharge medication program. Ann Intern Med. 2004 Sep 21;141(6):446-53. PubMed

Laramee AS, Levinsky SK, Sargent J, Ross R, Callas P. Case management in a heterogeneous congestive heart failure population: a randomized controlled trial. Arch Intern Med. 2003 Apr 14;163(7):809-17. PubMed

Lee DC, Johnson RA, Bingham JB, Leahy M, Dinsmore RE, Goroll AH, Newell JB, Strauss HW, Haber E. Heart failure in outpatients: a randomized trial of digoxin versus placebo. N Engl J Med. 1982 Mar 25;306(12):699-705. PubMed

Lee DS, Austin PC, Rouleau JL, Liu PP, Naimark D, Tu JV. Predicting mortality among patients hospitalized for heart failure: derivation and validation of a clinical model. JAMA. 2003 Nov 19;290(19):2581-7. PubMed

Lee DS, Stitt A, Austin PC, Stukel TA, Schull MJ, Chong A, Newton GE, Lee JS, Tu JV. Prediction of heart failure mortality in emergent

care: a cohort study. Ann Intern Med. 2012 Jun 5;156(11):767-75, W-261, W-262. PubMed

Leon MB, Smith CR, Mack M, Miller DC, Moses JW, Svensson LG, Tuzcu EM, Webb JG, Fontana GP, Makkar RR, Brown DL, Block PC, Guyton RA, Pichard AD, Bavaria JE, Herrmann HC, Douglas PS, Petersen JL, Akin JJ, Anderson WN, Wang D, Pocock S, PARTNER Trial Investigators. Transcatheter aortic-valve implantation for aortic stenosis in patients who cannot undergo surgery. N Engl J Med. 2010 Oct 21;363(17):1597-607. PubMed

Levy D, Larson MG, Vasan RS, Kannel WB, Ho KK. The progression from hypertension to congestive heart failure. JAMA. 1996 May 22-29;275(20):1557-62. PubMed

Levy WC, Mozaffarian D, Linker DT, Sutradhar SC, Anker SD, Cropp AB, Anand I, Maggioni A, Burton P, Sullivan MD, Pitt B, Poole-Wilson PA, Mann DL, Packer M. The Seattle heart failure model: prediction of survival in heart failure. Circulation. 2006 Mar 21;113(11):1424-33. PubMed

Linde C, Abraham WT, Gold MR, St John Sutton M, Ghio S, Daubert C, REVERSE (REsynchronization reVErses Remodeling in Systolic left vEntricular. Randomized trial of cardiac resynchronization in mildly symptomatic heart failure patients and in asymptomatic patients with left ventricular dysfunction and previous heart failure symptoms. J Am Coll Cardiol. 2008 Dec 2;52(23):1834-43. PubMed

Lipscombe LL, Gomes T, Levesque LE, Hux JE, Juurlink DN, Alter DA. Thiazolidinediones and cardiovascular outcomes in older patients with diabetes. JAMA. 2007 Dec 12;298(22):2634-43. PubMed

Logeart D, Thabut G, Jourdain P, Chavelas C, Beyne P, Beauvais F, Bouvier E, Solal AC. Predischarge B-type natriuretic peptide assay for identifying patients at high risk of re-admission after decompensated heart failure. J Am Coll Cardiol. 2004 Feb 18;43(4):635-41. PubMed

Loh E, Sutton MS, Wun CC, Rouleau JL, Flaker GC, Gottlieb SS, Lamas GA, Moye LA, Goldhaber SZ, Pfeffer MA. Ventricular dysfunction and the risk of stroke after myocardial infarction. N Engl J Med. 1997 Jan 23;336(4):251-7. PubMed

Lok DJ, Van Der Meer P, de la Porte PW, Lipsic E, Van Wijngaarden J, Hillege HL, van Veldhuisen DJ. Prognostic value of galectin-3, a novel marker of fibrosis, in patients with chronic heart failure: data from the DEAL-HF study. Clin Res Cardiol. 2010 May;99(5):323-8. PubMed

Lorenz KA, Lynn J, Dy SM, Shugarman LR, Wilkinson A, Mularski RA, Morton SC, Hughes RG, Hilton LK, Maglione M, Rhodes SL, Rolon C, Sun VC, Shekelle PG. Evidence for improving palliative care at the end of life: a systematic review. Ann Intern Med. 2008 Jan 15;148(2):147-59. [152 references] PubMed

Lubsen J, Just H, Hjalmarsson AC, La Framboise D, Remme WJ, Heinrich-Nols J, Dumont JM, Seed P. Effect of pimobendan on exercise capacity in patients with heart failure: main results from the Pimobendan in Congestive Heart Failure (PICO) trial. Heart. 1996 Sep;76(3):223-31. PubMed

Macchia A, Levantesi G, Franzosi MG, Geraci E, Maggioni AP, Marfisi R, Nicolosi GL, Schweiger C, Tavazzi L, Tognoni G, Valagussa F, Marchioli R, GISSI-Prevenzione Investigators. Left ventricular systolic dysfunction, total mortality, and sudden death in patients with myocardial infarction treated with n-3 polyunsaturated fatty acids. Eur J Heart Fail. 2005 Aug;7(5):904-9. PubMed

Maeda K, Tsutamoto T, Wada A, Mabuchi N, Hayashi M, Tsutsui T, Ohnishi M, Sawaki M, Fujii M, Matsumoto T, Kinoshita M. High levels of plasma brain natriuretic peptide and interleukin-6 after optimized treatment for heart failure are independent risk factors for morbidity and mortality in patients with congestive heart failure. J Am Coll Cardiol. 2000 Nov 1;36(5):1587-93. PubMed

Maggioni AP, Anand I, Gottlieb SO, Latini R, Tognoni G, Cohn JN. Effects of valsartan on morbidity and mortality in patients with heart failure not receiving angiotensin-converting enzyme inhibitors. J Am Coll Cardiol. 2002 Oct 16;40(8):1414-21. PubMed

Maisel A, Hollander JE, Guss D, McCullough P, Nowak R, Green G, Saltzberg M, Ellison SR, Bhalla MA, Bhalla V, Clopton P, Jesse R, Rapid Emergency Department Heart Failure Outpatient Trial investigators. Primary results of the Rapid Emergency Department Heart Failure Outpatient Trial (REDHOT). A multicenter study of B-type natriuretic peptide levels, emergency department decision making, and outcomes in patients presenting with shortness of breath. J Am Coll Cardiol. 2004 Sep 15;44(6):1328-33. PubMed

Maisel AS, Krishnaswamy P, Nowak RM, McCord J, Hollander JE, Duc P, Omland T, Storrow AB, Abraham WT, Wu AH, Clopton P, Steg PG, Westheim A, Knudsen CW, Perez A, Kazanegra R, Herrmann HC, McCullough PA. Rapid measurement of B-type natriuretic peptide in the emergency diagnosis of heart failure. N Engl J Med. 2002 Jul 18;347(3):161-7. PubMed

Maisel AS, Peacock WF, McMullin N, Jessie R, Fonarow GC, Wynne J, Mills RM. Timing of immunoreactive B-type natriuretic peptide levels and treatment delay in acute decompensated heart failure: an ADHERE (Acute Decompensated Heart Failure National Registry) analysis. J Am Coll Cardiol. 2008 Aug 12;52(7):534-40. PubMed

Mansfield DR, Gollogly NC, Kaye DM, Richardson M, Bergin P, Naughton MT. Controlled trial of continuous positive airway pressure in obstructive sleep apnea and heart failure. Am J Respir Crit Care Med. 2004 Feb 1;169(3):361-6. PubMed

Manzano-Fernandez S, Mueller T, Pascual-Figal D, Truong QA, Januzzi JL. Usefulness of soluble concentrations of interleukin family member ST2 as predictor of mortality in patients with acutely decompensated heart failure relative to left ventricular ejection fraction. Am J Cardiol. 2011 Jan 15;107(2):259-67. PubMed

Masoudi FA, Rathore SS, Wang Y, Havranek EP, Curtis JP, Foody JM, Krumholz HM. National patterns of use and effectiveness of angiotensin-converting enzyme inhibitors in older patients with heart failure and left ventricular systolic dysfunction. Circulation. 2004 Aug 10;110(6):724-31. PubMed

Massie BM, Collins JF, Ammon SE, Armstrong PW, Cleland JG, Ezekowitz M, Jafri SM, Krol WF, O'Connor CM, Schulman KA, Teo K, Warren SR, WATCH Trial Investigators. Randomized trial of warfarin, aspirin, and clopidogrel in patients with chronic heart failure: the Warfarin and Antiplatelet Therapy in Chronic Heart Failure (WATCH) trial. Circulation. 2009 Mar 31;119(12):1616-24. PubMed

Mazayev VP, Fomina IG, Kazakov EN, Sulimov VA, Zvereva TV, Lyusov VA, Orlov VA, Olbinskaya LI, Bolshakova TD, Sullivan J, Spormann DO. Valsartan in heart failure patients previously untreated with an ACE inhibitor. Int J Cardiol. 1998 Aug;65(3):239-46. PubMed

McAlister FA, Lawson FM, Teo KK, Armstrong PW. A systematic review of randomized trials of disease management programs in heart failure. Am J Med. 2001 Apr 1;110(5):378-84. PubMed

McAlister FA, Stewart S, Ferrua S, McMurray JJ. Multidisciplinary strategies for the management of heart failure patients at high risk for admission: a systematic review of randomized trials. J Am Coll Cardiol. 2004 Aug 18;44(4):810-9. [46 references] PubMed

McKelvie RS, Yusuf S, Pericak D, Avezum A, Burns RJ, Probstfield J, Tsuyuki RT, White M, Rouleau J, Latini R, Maggioni A, Young J, Pogue J. Comparison of candesartan, enalapril, and their combination in congestive heart failure: randomized evaluation of strategies for left ventricular dysfunction (RESOLVD) pilot study. The RESOLVD Pilot Study Investigators. Circulation. 1999 Sep 7;100(10):1056-64. PubMed

McKelvie RS. Exercise training in patients with heart failure: clinical outcomes, safety, and indications. Heart Fail Rev. 2008 Feb;13(1):3-11. [68 references] PubMed

McMurray JJ, Dunselman P, Wedel H, Cleland JG, Lindberg M, Hjalmarson A, Kjekshus J, Waagstein F, Apetrei E, Barrios V, Bohm M, Kamensky G, Komajda M, Mareev V, Wikstrand J, CORONA Study Group. Coenzyme Q10, rosuvastatin, and clinical outcomes in heart failure: a pre-specified substudy of CORONA (controlled rosuvastatin multinational study in heart failure). J Am Coll Cardiol. 2010 Oct 5;56(15):1196-204. PubMed

Mehra MR, Kobashigawa J, Starling R, Russell S, Uber PA, Parameshwar J, Mohacsi P, Augustine S, Aaronson K, Barr M. Listing criteria

for heart transplantation: International Society for Heart and Lung Transplantation guidelines for the care of cardiac transplant candidates--2006. J Heart Lung Transplant. 2006 Sep;25(9):1024-42. PubMed

Metra M, Eichhorn E, Abraham WT, Linseman J, Bohm M, Corbalan R, DeMets D, De Marco T, Elkayam U, Gerber M, Komajda M, Liu P, Mareev V, Perrone SV, Poole-Wilson P, Roecker E, Stewart J, Swedberg K, Tendera M, Wiens B, Bristow MR, ESSENTIAL Investigators. Effects of low-dose oral enoximone administration on mortality, morbidity, and exercise capacity in patients with advanced heart failure: the randomized, double-blind, placebo-controlled, parallel group ESSENTIAL trials. Eur Heart J. 2009 Dec;30(24):3015-26. PubMed

Metra M, Torp-Pedersen C, Cleland JG, Di Lenarda A, Komajda M, Remme WJ, Dei Cas L, Spark P, Swedberg K, Poole-Wilson PA, COMET investigators. Should beta-blocker therapy be reduced or withdrawn after an episode of decompensated heart failure? Results from COMET. Eur J Heart Fail. 2007 Sep;9(9):901-9. PubMed

Miller LW, Pagani FD, Russell SD, John R, Boyle AJ, Aaronson KD, Conte JV, Naka Y, Mancini D, Delgado RM, MacGillivray TE, Farrar DJ, Frazier OH, HeartMate II Clinical Investigators. Use of a continuous-flow device in patients awaiting heart transplantation. N Engl J Med. 2007 Aug 30;357(9):885-96. PubMed

Moe GW, Howlett J, Januzzi JL, Zowall H, Canadian Multicenter Improved Management of Patients With Congestive Heart. N-terminal pro-B-type natriuretic peptide testing improves the management of patients with suspected acute heart failure: primary results of the Canadian prospective randomized multicenter IMPROVE-CHF study. Circulation. 2007 Jun 19;115(24):3103-10. PubMed

Moss AJ, Hall WJ, Cannom DS, Daubert JP, Higgins SL, Klein H, Levine JH, Saksena S, Waldo AL, Wilber D, Brown MW, Heo M, Multicenter Automatic Defibrillator Implantation Trial Investigators. Improved survival with an implanted defibrillator in patients with coronary disease at high risk for ventricular arrhythmia. N Engl J Med. 1996 Dec 26;335(26):1933-40. PubMed

Moss AJ, Hall WJ, Cannom DS, Klein H, Brown MW, Daubert JP, Estes NA 3rd, Foster E, Greenberg H, Higgins SL, Pfeffer MA, Solomon SD, Wilber D, Zareba W, MADIT-CRT Trial Investigators. Cardiac-resynchronization therapy for the prevention of heart-failure events. N Engl J Med. 2009 Oct 1;361(14):1329-38. PubMed

Moss AJ, Zareba W, Hall WJ, Klein H, Wilber DJ, Cannom DS, Daubert JP, Higgins SL, Brown MW, Andrews ML. Prophylactic implantation of a defibrillator in patients with myocardial infarction and reduced ejection fraction. N Engl J Med. 2002 Mar 21;346(12):877-83. PubMed

Mozaffarian D, Anker SD, Anand I, Linker DT, Sullivan MD, Cleland JG, Carson PE, Maggioni AP, Mann DL, Pitt B, Poole-Wilson PA, Levy WC. Prediction of mode of death in heart failure: the Seattle Heart Failure Model. Circulation. 2007 Jul 24;116(4):392-8. PubMed

Mueller C, Scholer A, Laule-Kilian K, Martina B, Schindler C, Buser P, Pfisterer M, Perruchoud AP. Use of B-type natriuretic peptide in the evaluation and management of acute dyspnea. N Engl J Med. 2004 Feb 12;350(7):647-54. [29 references] PubMed

Nair PK, Kormos RL, Teuteberg JJ, Mathier MA, Bermudez CA, Toyoda Y, Dew MA, Simon MA. Pulsatile left ventricular assist device support as a bridge to decision in patients with end-stage heart failure complicated by pulmonary hypertension. J Heart Lung Transplant. 2010 Feb;29(2):201-8. PubMed

Naylor M, Brooten D, Jones R, Lavizzo-Mourey R, Mezey M, Pauly M. Comprehensive discharge planning for the hospitalized elderly. A randomized clinical trial. Ann Intern Med. 1994 Jun 15;120(12):999-1006. PubMed

Naylor MD, Brooten DA, Campbell RL, Maislin G, McCauley KM, Schwartz JS. Transitional care of older adults hospitalized with heart failure: a randomized, controlled trial. J Am Geriatr Soc. 2004 May;52(5):675-84. PubMed

Neuhold S, Huelsmann M, Strunk G, Stoiser B, Struck J, Morgenthaler NG, Bergmann A, Moertl D, Berger R, Pacher R. Comparison of copeptin, B-type natriuretic peptide, and amino-terminal pro-B-type natriuretic peptide in patients with chronic heart failure: prediction of death

at different stages of the disease. J Am Coll Cardiol. 2008 Jul 22;52(4):266-72. PubMed

Ng LL, Loke IW, Davies JE, Geeranavar S, Khunti K, Stone MA, Chin DT, Squire IB. Community screening for left ventricular systolic dysfunction using plasma and urinary natriuretic peptides. J Am Coll Cardiol. 2005 Apr 5;45(7):1043-50. PubMed

O'Connor CM, Abraham WT, Albert NM, Clare R, Gattis Stough W, Gheorghiade M, Greenberg BH, Yancy CW, Young JB, Fonarow GC. Predictors of mortality after discharge in patients hospitalized with heart failure: an analysis from the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF). Am Heart J. 2008 Oct;156(4):662-73. PubMed

O'Connor CM, Gattis WA, Uretsky BF, Adams KF Jr, McNulty SE, Grossman SH, McKenna WJ, Zannad F, Swedberg K, Gheorghiade M, Califf RM. Continuous intravenous dobutamine is associated with an increased risk of death in patients with advanced heart failure: insights from the Flolan International Randomized Survival Trial (FIRST). Am Heart J. 1999 Jul;138(1 Pt 1):78-86. PubMed

O'Connor CM, Starling RC, Hernandez AF, Armstrong PW, Dickstein K, Hasselblad V, Heizer GM, Komajda M, Massie BM, McMurray JJ, Nieminen MS, Reist CJ, Rouleau JL, Swedberg K, Adams KF Jr, Anker SD, Atar D, Battler A, Botero R, Bohidar NR, Butler J, Clausell N, Corbalan R, Costanzo MR, Dahlstrom U, Deckelbaum LI, Diaz R, Dunlap ME, Ezekowitz JA, Feldman D, Felker GM, Fonarow GC, Gennevois D, Gottlieb SS, Hill JA, Hollander JE, Howlett JG, Hudson MP, Kociol RD, Krum H, Laucevicius A, Levy WC, Mendez GF, Metra M, Mittal S, Oh BH, Pereira NL, Ponikowski P, Tang WH, Tanomsup S, Teerlink JR, Triposkiadis F, Troughton RW, Voors AA, Whellan DJ, Zannad F, Califf RM. Effect of nesiritide in patients with acute decompensated heart failure. N Engl J Med. 2011 Jul 7;365(1):32-43. PubMed

O'Connor CM, Whellan DJ, Lee KL, Keteyian SJ, Cooper LS, Ellis SJ, Leifer ES, Kraus WE, Kitzman DW, Blumenthal JA, Rendall DS, Miller NH, Fleg JL, Schulman KA, McKelvie RS, Zannad F, Pina IL, HF-ACTION Investigators. Efficacy and safety of exercise training in patients with chronic heart failure: HF-ACTION randomized controlled trial. JAMA. 2009 Apr 8;301(14):1439-50. PubMed

Okonko DO, Mandal AK, Missouris CG, Poole-Wilson PA. Disordered iron homeostasis in chronic heart failure: prevalence, predictors, and relation to anemia, exercise capacity, and survival. J Am Coll Cardiol. 2011 Sep 13;58(12):1241-51. PubMed

Oliva F, Latini R, Politi A, Staszewsky L, Maggioni AP, Nicolis E, Mauri F. Intermittent 6-month low-dose dobutamine infusion in severe heart failure: DICE multicenter trial. Am Heart J. 1999 Aug;138(2 Pt 1):247-53. PubMed

Ordovas KG, Higgins CB. Delayed contrast enhancement on MR images of myocardium: past, present, future. Radiology. 2011 Nov;261(2):358-74. PubMed

Packer M, Carver JR, Rodeheffer RJ, Ivanhoe RJ, DiBianco R, Zeldis SM, Hendrix GH, Bommer WJ, Elkayam U, Kukin ML, et al. Effect of oral milrinone on mortality in severe chronic heart failure. The PROMISE Study Research Group. N Engl J Med. 1991 Nov 21;325(21):1468-75. PubMed

Packer M, Gheorghiade M, Young JB, Costantini PJ, Adams KF, Cody RJ, Smith LK, Van Voorhees L, Gourley LA, Jolly MK. Withdrawal of digoxin from patients with chronic heart failure treated with angiotensin-converting-enzyme inhibitors. RADIANCE Study. N Engl J Med. 1993 Jul 1;329(1):1-7. PubMed

Packer M, O'Connor CM, Ghali JK, Pressler ML, Carson PE, Belkin RN, Miller AB, Neuberg GW, Frid D, Wertheimer JH, Cropp AB, DeMets DL. Effect of amlodipine on morbidity and mortality in severe chronic heart failure. Prospective Randomized Amlodipine Survival Evaluation Study Group. N Engl J Med. 1996 Oct 10;335(15):1107-14. PubMed

Pagani FD, Miller LW, Russell SD, Aaronson KD, John R, Boyle AJ, Conte JV, Bogaev RC, MacGillivray TE, Naka Y, Mancini D, Massey HT, Chen L, Klodell CT, Aranda JM, Moazami N, Ewald GA, Farrar DJ, Frazier OH, HeartMate II Investigators. Extended mechanical circulatory support with a continuous-flow rotary left ventricular assist device. J Am Coll Cardiol. 2009 Jul 21;54(4):312-21. PubMed

Pagley PR, Beller GA, Watson DD, Gimple LW, Ragosta M. Improved outcome after coronary bypass surgery in patients with ischemic

cardiomyopathy and residual myocardial viability. Circulation. 1997 Aug 5;96(3):793-800. PubMed

Patel MR, Dehmer GJ, Hirshfeld JW, Smith PK, Spertus JA, American College of Cardiology Foundation Appropriateness Criteria Task Force, Society for Cardiovascular Angiography and Interventions, Society of Thoracic Surgeons, American Association for Thoracic Surgery, American Heart Association, and the American Society of Nuclear Cardiology, Heart Failure Society of America, Society of Cardiovascular Computed Tomography. ACCF/SCAI/STS/AATS/AHA/ASNC 2009 appropriateness criteria for coronary revascularization: a report by the American College of Cardiology Foundation Appropriateness Criteria Task Force, Society for Cardiovascular Angiography and Interventions [trunc]. J Am Coll Cardiol. 2009 Feb 10;53(6):530-53. PubMed

Patel MR, Mahaffey KW, Garg J, Pan G, Singer DE, Hacke W, Breithardt G, Halperin JL, Hankey GJ, Piccini JP, Becker RC, Nessel CC, Paolini JF, Berkowitz SD, Fox KA, Califf RM, the ROCKET AF Investigators. Rivaroxaban versus warfarin in nonvalvular atrial fibrillation. N Engl J Med. 2011 Sep 8;365(10):883-91. PubMed

Peacock WF 4th, De Marco T, Fonarow GC, Diercks D, Wynne J, Apple FS, Wu AH, ADHERE Investigators. Cardiac troponin and outcome in acute heart failure. N Engl J Med. 2008 May 15;358(20):2117-26. PubMed

Peacock WF 4th, Fonarow GC, Emerman CL, Mills RM, Wynne J, ADHERE Scientific Advisory Committee and Investigators, Adhere Study Group. Impact of early initiation of intravenous therapy for acute decompensated heart failure on outcomes in ADHERE. Cardiology. 2007;107(1):44-51. PubMed

Peterson PN, Rumsfeld JS, Liang L, Albert NM, Hernandez AF, Peterson ED, Fonarow GC, Masoudi FA, American Heart Association Get With the Guidelines-Heart Failure Program. A validated risk score for in-hospital mortality in patients with heart failure from the American Heart Association get with the guidelines program. Circ Cardiovasc Qual Outcomes. 2010 Jan;3(1):25-32. PubMed

Pfeffer MA, Braunwald E, Moye LA, Basta L, Brown EJ Jr, Cuddy TE, Davis BR, Geltman EM, Goldman S, Flaker GC, et al. Effect of captopril on mortality and morbidity in patients with left ventricular dysfunction after myocardial infarction. Results of the survival and ventricular enlargement trial. The SAVE Investigators. N Engl J Med. 1992 Sep 3;327(10):669-77. PubMed

Pfeffer MA, McMurray JJ, Velazquez EJ, Rouleau JL, Kober L, Maggioni AP, Solomon SD, Swedberg K, Van de Werf F, White H, Leimberger JD, Henis M, Edwards S, Zelenkofske S, Sellers MA, Califf RM. Valsartan, captopril, or both in myocardial infarction complicated by heart failure, left ventricular dysfunction, or both. N Engl J Med. 2003 Nov 13;349(20):1893-906. PubMed

Pfeffer MA, Swedberg K, Granger CB, Held P, McMurray JJ, Michelson EL, Olofsson B, Ostergren J, Yusuf S, Pocock S. Effects of candesartan on mortality and morbidity in patients with chronic heart failure: the CHARM-Overall programme. Lancet. 2003 Sep 6;362(9386):759-66. PubMed

Pfisterer M, Buser P, Rickli H, Gutmann M, Erne P, Rickenbacher P, Vuillomenet A, Jeker U, Dubach P, Beer H, Yoon SI, Suter T, Osterhues HH, Schieber MM, Hilti P, Schindler R, Brunner-La Rocca HP, TIME-CHF Investigators. BNP-guided vs symptom-guided heart failure therapy: the Trial of Intensified vs Standard Medical Therapy in Elderly Patients With Congestive Heart Failure (TIME-CHF) randomized trial. JAMA. 2009 Jan 28;301(4):383-92. PubMed

Phillips CO, Wright SM, Kern DE, Singa RM, Shepperd S, Rubin HR. Comprehensive discharge planning with postdischarge support for older patients with congestive heart failure: a meta-analysis. JAMA. 2004 Mar 17;291(11):1358-67. PubMed

Piepoli MF, Davos C, Francis DP, Coats AJ, ExTraMATCH Collaborative. Exercise training meta-analysis of trials in patients with chronic heart failure (ExTraMATCH). BMJ. 2004 Jan 24;328(7433):189. PubMed

Pina IL, Apstein CS, Balady GJ, Belardinelli R, Chaitman BR, Duscha BD, Fletcher BJ, Fleg JL, Myers JN, Sullivan MJ, American Heart Association Committee on exercise, rehabilitation, and prevention. Exercise and heart failure: A statement from the American Heart Association Committee on exercise, rehabilitation, and prevention. Circulation. 2003 Mar 4;107(8):1210-25. [174 references] PubMed

Pitt B, Remme W, Zannad F, Neaton J, Martinez F, Roniker B, Bittman R, Hurley S, Kleiman J, Gatlin M. Eplerenone, a selective aldosterone blocker, in patients with left ventricular dysfunction after myocardial infarction. N Engl J Med. 2003 Apr 3;348(14):1309-21. PubMed

Pitt B, Segal R, Martinez FA, Meurers G, Cowley AJ, Thomas I, Deedwania PC, Ney DE, Snavely DB, Chang PI. Randomised trial of losartan versus captopril in patients over 65 with heart failure (Evaluation of Losartan in the Elderly Study, ELITE). Lancet. 1997;349(9054):747-52.

Pitt B, Zannad F, Remme WJ, Cody R, Castaigne A, Perez A, Palensky J, Wittes J. The effect of spironolactone on morbidity and mortality in patients with severe heart failure. Randomized Aldactone Evaluation Study Investigators. New Eng J Med. 1999 Sep 2;341(10):709-17. PubMed

Pocock SJ, Wang D, Pfeffer MA, Yusuf S, McMurray JJ, Swedberg KB, Ostergren J, Michelson EL, Pieper KS, Granger CB. Predictors of mortality and morbidity in patients with chronic heart failure. Eur Heart J. 2006 Jan;27(1):65-75. PubMed

Poole-Wilson PA, Swedberg K, Cleland JG, Di Lenarda A, Hanrath P, Komajda M, Lubsen J, Lutiger B, Metra M, Remme WJ, Torp-Pedersen C, Scherhag A, Skene A. Comparison of carvedilol and metoprolol on clinical outcomes in patients with chronic heart failure in the Carvedilol Or Metoprolol European Trial (COMET): randomised controlled trial. Lancet. 2003 Jul 5;362(9377):7-13. PubMed

Porapakkham P, Porapakkham P, Zimmet H, Billah B, Krum H. B-type natriuretic peptide-guided heart failure therapy: A meta-analysis. Arch Intern Med. 2010 Mar 22;170(6):507-14. PubMed

Preliminary report: effect of encainide and flecainide on mortality in a randomized trial of arrhythmia suppression after myocardial infarction. The Cardiac Arrhythmia Suppression Trial (CAST) Investigators. N Engl J Med. 1989 Aug 10;321(6):406-12. PubMed

Publication Committee for the VMAC Investigators (Vasodilatation in the Management of Acute CHF). Intravenous nesiritide vs nitroglycerin for treatment of decompensated congestive heart failure: a randomized controlled trial. JAMA. 2002 Mar 27;287(12):1531-40. PubMed

Qaseem A, Snow V, Shekelle P, Casey DE Jr, Cross JT Jr, Owens DK, Clinical Efficacy Assessment Subcommittee of the American College of Physicians, Dallas P, Dolan NC, Forciea MA, Halasyamani L, Hopkins RH Jr, Shekelle P. Evidence-based interventions to improve the palliative care of pain, dyspnea, and depression at the end of life: a clinical practice guideline from the American College of Physicians. Ann Intern Med. 2008 Jan 15;148(2):141-6. PubMed

Rehman SU, Mueller T, Januzzi JL Jr. Characteristics of the novel interleukin family biomarker ST2 in patients with acute heart failure. J Am Coll Cardiol. 2008 Oct 28;52(18):1458-65. PubMed

Rich MW, Beckham V, Wittenberg C, Leven CL, Freedland KE, Carney RM. A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure. N Engl J Med. 1995;333(18):1190-5. PubMed

Richards AM, Doughty R, Nicholls MG, MacMahon S, Sharpe N, Murphy J, Espiner EA, Frampton C, Yandle TG, Australia-New Zealand Heart Failure Group. Plasma N-terminal pro-brain natriuretic peptide and adrenomedullin: prognostic utility and prediction of benefit from carvedilol in chronic ischemic left ventricular dysfunction. Australia-New Zealand Heart Failure Group. J Am Coll Cardiol. 2001 Jun 1;37(7):1781-7. PubMed

Rickard J, Bassiouny M, Cronin EM, Martin DO, Varma N, Niebauer MJ, Tchou PJ, Tang WH, Wilkoff BL. Predictors of response to cardiac resynchronization therapy in patients with a non-left bundle branch block morphology. Am J Cardiol. 2011 Dec 1;108(11):1576-80. PubMed

Riegel B, Carlson B, Glaser D, Romero T. Randomized controlled trial of telephone case management in Hispanics of Mexican origin with heart failure. J Card Fail. 2006 Apr;12(3):211-9. PubMed

Riegel B, Carlson B, Kopp Z, LePetri B, Glaser D, Unger A. Effect of a standardized nurse case-management telephone intervention on resource use in patients with chronic heart failure. Arch Intern Med. 2002 Mar 25;162(6):705-12. PubMed

Riegel B, LePetri B. Heart failure disease management models. In: Moser D, Riegel B, editor(s). Improving outcomes in heart failure: an interdisciplinary approach. Gaithersburg (MD): Aspen Publishers; 2001. p. 267-81.

Riegel B, Moser DK, Anker SD, Appel LJ, Dunbar SB, Grady KL, Gurvitz MZ, Havranek EP, Lee CS, Lindenfeld J, Peterson PN, Pressler SJ, Schocken DD, Whellan DJ, American Heart Association Council on Cardiovascular Nursing, American Heart Association Council on Cardiovascular Nursing, American Heart Association Council on Clinical Cardiology, American Heart Association Council on Nutrition, Physical Activity, and, American Heart Association Interdisciplinary Council on Quality of Care and. State of the science: promoting self-care in persons with heart failure: a scientific statement from the American Heart Association. Circulation. 2009 Sep 22;120(12):1141-63. [290 references] PubMed

Riegger GA, Bouzo H, Petr P, Munz J, Spacek R, Pethig H, von Behren V, George M, Arens H. Improvement in exercise tolerance and symptoms of congestive heart failure during treatment with candesartan cilexetil. Symptom, Tolerability, Response to Exercise Trial of Candesartan Cilexetil in Heart Failure (STRETCH) Investigators. Circulation. 1999 Nov 30;100(22):2224-30. PubMed

Risk factors for stroke and efficacy of antithrombotic therapy in atrial fibrillation. Analysis of pooled data from five randomized controlled trials [published erratum appears in Arch Intern Med 1994 Oct 10;154(19):2254]. Arch Intern Med. 1994 Jul 11;154(13):1449-57. PubMed

Rizzello V, Poldermans D, Biagini E, Schinkel AF, Boersma E, Boccanelli A, Marwick T, Roelandt JR, Bax JJ. Prognosis of patients with ischaemic cardiomyopathy after coronary revascularisation: relation to viability and improvement in left ventricular ejection fraction. Heart. 2009 Aug;95(15):1273-7. PubMed

Rogers JG, Butler J, Lansman SL, Gass A, Portner PM, Pasque MK, Pierson RN 3rd, INTrEPID Investigators. Chronic mechanical circulatory support for inotrope-dependent heart failure patients who are not transplant candidates: results of the INTrEPID Trial. J Am Coll Cardiol. 2007 Aug 21;50(8):741-7. PubMed

Rose EA, Gelijns AC, Moskowitz AJ, Heitjan DF, Stevenson LW, Dembitsky W, Long JW, Ascheim DD, Tierney AR, Levitan RG, Watson JT, Meier P, Ronan NS, Shapiro PA, Lazar RM, Miller LW, Gupta L, Frazier OH, Desvigne-Nickens P, et al. Long-term use of a left ventricular assist device for end-stage heart failure. N Engl J Med. 2001 Nov 15;345(20):1435-43. [33 references] PubMed

Rosenberg J, Gustafsson F, Galatius S, Hildebrandt PR. Combination therapy with metolazone and loop diuretics in outpatients with refractory heart failure: an observational study and review of the literature. Cardiovasc Drugs Ther. 2005 Aug;19(4):301-6. PubMed

Sacks FM, Pfeffer MA, Moye LA, Rouleau JL, Rutherford JD, Cole TG, Brown L, Warnica JW, Arnold JM, Wun CC, Davis BR, Braunwald E. The effect of pravastatin on coronary events after myocardial infarction in patients with average cholesterol levels. Cholesterol and Recurrent Events Trial investigators. N Engl J Med. 1996 Oct 3;335(14):1001-9. PubMed

Sato Y, Yamada T, Taniguchi R, Nagai K, Makiyama T, Okada H, Kataoka K, Ito H, Matsumori A, Sasayama S, Takatsu Y. Persistently increased serum concentrations of cardiac troponin t in patients with idiopathic dilated cardiomyopathy are predictive of adverse outcomes. Circulation. 2001 Jan 23;103(3):369-74. PubMed

Schrier RW, Gross P, Gheorghiade M, Berl T, Verbalis JG, Czerwiec FS, Orlandi C, SALT Investigators. Tolvaptan, a selective oral vasopressin V2-receptor antagonist, for hyponatremia. N Engl J Med. 2006 Nov 16;355(20):2099-112. PubMed

Sciarretta S, Palano F, Tocci G, Baldini R, Volpe M. Antihypertensive treatment and development of heart failure in hypertension: a Bayesian network meta-analysis of studies in patients with hypertension and high cardiovascular risk. Arch Intern Med. 2011 Mar 14;171(5):384-94. PubMed

Scirica BM, Morrow DA, Cannon CP, Ray KK, Sabatine MS, Jarolim P, Shui A, McCabe CH, Braunwald E, PROVE IT-TIMI 22

Investigators. Intensive statin therapy and the risk of hospitalization for heart failure after an acute coronary syndrome in the PROVE IT-TIMI 22 study. J Am Coll Cardiol. 2006 Jun 6;47(11):2326-31. PubMed

Senior R, Kaul S, Lahiri A. Myocardial viability on echocardiography predicts long-term survival after revascularization in patients with ischemic congestive heart failure. J Am Coll Cardiol. 1999 Jun;33(7):1848-54. PubMed

Setaro JF, Zaret BL, Schulman DS, Black HR, Soufer R. Usefulness of verapamil for congestive heart failure associated with abnormal left ventricular diastolic filling and normal left ventricular systolic performance. Am J Cardiol. 1990 Oct 15;66(12):981-6. PubMed

Setoguchi S, Nohria A, Rassen JA, Stevenson LW, Schneeweiss S. Maximum potential benefit of implantable defibrillators in preventing sudden death after hospital admission because of heart failure. CMAJ. 2009 Mar 17;180(6):611-6. PubMed

Setsuta K, Seino Y, Takahashi N, Ogawa T, Sasaki K, Harada A, Takano T, Kishida H, Hayakawa H. Clinical significance of elevated levels of cardiac troponin T in patients with chronic heart failure. Am J Cardiol. 1999 Sep 1;84(5):608-11, A9. PubMed

Seyfarth M, Sibbing D, Bauer I, Frohlich G, Bott-Flugel L, Byrne R, Dirschinger J, Kastrati A, Schomig A. A randomized clinical trial to evaluate the safety and efficacy of a percutaneous left ventricular assist device versus intra-aortic balloon pumping for treatment of cardiogenic shock caused by myocardial infarction. J Am Coll Cardiol. 2008 Nov 4;52(19):1584-8. PubMed

Shah RV, Chen-Tournoux AA, Picard MH, van Kimmenade RR, Januzzi JL. Galectin-3, cardiac structure and function, and long-term mortality in patients with acutely decompensated heart failure. Eur J Heart Fail. 2010 Aug;12(8):826-32. PubMed

Sharma D, Buyse M, Pitt B, Rucinska EJ. Meta-analysis of observed mortality data from all-controlled, double-blind, multiple-dose studies of losartan in heart failure. Losartan Heart Failure Mortality Meta-analysis Study Group. Am J Cardiol. 2000 Jan 15;85(2):187-92. PubMed

Sigurd B, Olesen KH, Wennevold A. The supra-additive natriuretic effect addition of bendroflumethiazide and bumetanide in congestive heart failure. Permutation trial tests in patients in long-term treatment with bumetanide. Am Heart J. 1975 Feb;89(2):163-70. PubMed

Slaughter MS, Rogers JG, Milano CA, Russell SD, Conte JV, Feldman D, Sun B, Tatooles AJ, Delgado RM 3rd, Long JW, Wozniak TC, Ghumman W, Farrar DJ, Frazier OH, the HeartMate II Investigators. Advanced Heart Failure Treated with Continuous-Flow Left Ventricular Assist Device. N Engl J Med. 2009 Nov 17;361(23):2241-51. PubMed

Smart N, Marwick TH. Exercise training for patients with heart failure: a systematic review of factors that improve mortality and morbidity. Am J Med. 2004 May 15;116(10):693-706. [108 references] PubMed

Smith CR, Leon MB, Mack MJ, Miller DC, Moses JW, Svensson LG, Tuzcu EM, Webb JG, Fontana GP, Makkar RR, Williams M, Dewey T, Kapadia S, Babaliaros V, Thourani VH, Corso P, Pichard AD, Bavaria JE, Herrmann HC, Akin JJ, Anderson WN, Wang D, Pocock SJ, PARTNER Trial Investigators. Transcatheter versus surgical aortic-valve replacement in high-risk patients. N Engl J Med. 2011 Jun 9;364(23):2187-98. PubMed

Smith SC Jr, Benjamin EJ, Bonow RO, Braun LT, Creager MA, Franklin BA, Gibbons RJ, Grundy SM, Hiratzka LF, Jones DW, Lloyd-Jones DM, Minissian M, Mosca L, Peterson ED, Sacco RL, Spertus J, Stein JH, Taubert KA. AHA/ACCF secondary prevention and risk reduction therapy for patients with coronary and other atherosclerotic vascular disease: 2011 update: a guideline from the American Heart Association and American College of Cardiology Foundation [trunc]. J Am Coll Cardiol. 2011 Nov 29;58(23):2432-46. PubMed

Sochalski J, Jaarsma T, Krumholz HM, Laramee A, McMurray JJ, Naylor MD, Rich MW, Riegel B, Stewart S. What works in chronic care management: the case of heart failure. Health Aff (Millwood). 2009 Jan-Feb;28(1):179-89. PubMed

SOLVD Investigators. Effect of enalapril on survival in patients with reduced left ventricular ejection fractions and congestive heart failure. N Engl J Med. 1991 Aug 1;325(5):293-302. PubMed

Soukoulis V, Dihu JB, Sole M, Anker SD, Cleland J, Fonarow GC, Metra M, Pasini E, Strzelczyk T, Taegtmeyer H, Gheorghiade M. Micronutrient deficiencies an unmet need in heart failure. J Am Coll Cardiol. 2009 Oct 27;54(18):1660-73. [179 references] PubMed

Staessen JA, Wang JG, Thijs L. Cardiovascular prevention and blood pressure reduction: a quantitative overview updated until 1 March 2003. J Hypertens. 2003 Jun;21(6):1055-76. PubMed

Starling RC, Naka Y, Boyle AJ, Gonzalez-Stawinski G, John R, Jorde U, Russell SD, Conte JV, Aaronson KD, McGee EC Jr, Cotts WG, DeNofrio D, Pham DT, Farrar DJ, Pagani FD. Results of th. J Am Coll Cardiol. 2011 May 10;57(19):1890-8. PubMed

Stevenson LW, Miller LW, Desvigne-Nickens P, Ascheim DD, Parides MK, Renlund DG, Oren RM, Krueger SK, Costanzo MR, Wann LS, Levitan RG, Mancini D, REMATCH Investigators. Left ventricular assist device as destination for patients undergoing intravenous inotropic therapy: a subset analysis from REMATCH (Randomized Evaluation of Mechanical Assistance in Treatment of Chronic Heart Failure). Circulation. 2004 Aug 24;110(8):975-81. PubMed

Stevenson LW, Perloff JK. The limited reliability of physical signs for estimating hemodynamics in chronic heart failure. JAMA. 1989 Feb 10;261(6):884-8. PubMed

Stewart S, Marley JE, Horowitz JD. Effects of a multidisciplinary, home-based intervention on unplanned readmissions and survival among patients with chronic congestive heart failure: a randomised controlled study. Lancet. 1999 Sep 25;354(9184):1077-83. PubMed

Stewart S, Pearson S, Horowitz JD. Effects of a home-based intervention among patients with congestive heart failure discharged from acute hospital care. Arch Intern Med. 1998 May 25;158(10):1067-72. PubMed

Strandberg TE, Holme I, Faergeman O, Kastelein JJ, Lindahl C, Larsen ML, Olsson AG, Pedersen TR, Tikkanen MJ, IDEAL Study Group. Comparative effect of atorvastatin (80 mg) versus simvastatin (20 to 40 mg) in preventing hospitalizations for heart failure in patients with previous myocardial infarction. Am J Cardiol. 2009 May 15;103(10):1381-5. PubMed

Syed IS, Glockner JF, Feng D, Araoz PA, Martinez MW, Edwards WD, Gertz MA, Dispenzieri A, Oh JK, Bellavia D, Tajik AJ, Grogan M. Role of cardiac magnetic resonance imaging in the detection of cardiac amyloidosis. JACC Cardiovasc Imaging. 2010 Feb;3(2):155-64. PubMed

Tang AS, Wells GA, Talajic M, Arnold MO, Sheldon R, Connolly S, Hohnloser SH, Nichol G, Birnie DH, Sapp JL, Yee R, Healey JS, Rouleau JL, Resynchronization-Defibrillation for Ambulatory Heart Failure Trial Investigators. Cardiac-resynchronization therapy for mild-to-moderate heart failure. N Engl J Med. 2010 Dec 16;363(25):2385-95. PubMed

Tang WH, Girod JP, Lee MJ, Starling RC, Young JB, Van Lente F, Francis GS. Plasma B-type natriuretic peptide levels in ambulatory patients with established chronic symptomatic systolic heart failure. Circulation. 2003 Dec 16;108(24):2964-6. PubMed

Tang WH, Shrestha K, Shao Z, Borowski AG, Troughton RW, Thomas JD, Klein AL. Usefulness of plasma galectin-3 levels in systolic heart failure to predict renal insufficiency and survival. Am J Cardiol. 2011 Aug 1;108(3):385-90. PubMed

Taub PR, Daniels LB, Maisel AS. Usefulness of B-type natriuretic peptide levels in predicting hemodynamic and clinical decompensation. Heart Fail Clin. 2009 Apr;5(2):169-75. [30 references] PubMed

Taylor AL, Ziesche S, Yancy C, Carson P, D'Agostino R Jr, Ferdinand K, Taylor M, Adams K, Sabolinski M, Worcel M, Cohn JN. Combination of isosorbide dinitrate and hydralazine in blacks with heart failure. N Engl J Med. 2004 Nov 11;351(20):2049-57. PubMed

The effect of diltiazem on mortality and reinfarction after myocardial infarction. The Multicenter Diltiazem Postinfarction Trial Research Group. N Engl J Med. 1988 Aug 18;319(7):385-92. PubMed

Thiele H, Sick P, Boudriot E, Diederich KW, Hambrecht R, Niebauer J, Schuler G. Randomized comparison of intra-aortic balloon support with a percutaneous left ventricular assist device in patients with revascularized acute myocardial infarction complicated by cardiogenic shock. Eur Heart J. 2005 Jul;26(13):1276-83. [28 references] PubMed

Troughton RW, Frampton CM, Yandle TG, Espiner EA, Nicholls MG, Richards AM. Treatment of heart failure guided by plasma aminoterminal brain natriuretic peptide (N-BNP) concentrations. Lancet. 2000 Apr 1;355(9210):1126-30. PubMed

Upadhyay GA, Choudhry NK, Auricchio A, Ruskin J, Singh JP. Cardiac resynchronization in patients with atrial fibrillation: a meta-analysis of prospective cohort studies. J Am Coll Cardiol. 2008 Oct 7;52(15):1239-46. PubMed

Uretsky BF, Young JB, Shahidi FE, Yellen LG, Harrison MC, Jolly MK. Randomized study assessing the effect of digoxin withdrawal in patients with mild to moderate chronic congestive heart failure: results of the PROVED trial. PROVED Investigative Group. J Am Coll Cardiol. 1993 Oct;22(4):955-62. PubMed

VA Coronary Artery Bypass Surgery Cooperative Study Group. Eighteen-year follow-up in the Veterans Affairs Cooperative Study of Coronary Artery Bypass Surgery for stable angina. Circulation. 1992 Jul;86(1):121-30. PubMed

van Kimmenade RR, Pinto YM, Bayes-Genis A, Lainchbury JG, Richards AM, Januzzi JL Jr. Usefulness of intermediate amino-terminal pro-brain natriuretic peptide concentrations for diagnosis and prognosis of acute heart failure. Am J Cardiol. 2006 Aug 1;98(3):386-90. PubMed

VanSuch M, Naessens JM, Stroebel RJ, Huddleston JM, Williams AR. Effect of discharge instructions on readmission of hospitalised patients with heart failure: do all of the Joint Commission on Accreditation of Healthcare Organizations heart failure core measures reflect better care. Qual Saf Health Care. 2006 Dec;15(6):414-7. PubMed

Vantrimpont P, Rouleau JL, Wun CC, Ciampi A, Klein M, Sussex B, Arnold JM, Moye L, Pfeffer M. Additive beneficial effects of beta-blockers to angiotensin-converting enzyme inhibitors in the Survival and Ventricular Enlargement (SAVE) Study. SAVE Investigators. J Am Coll Cardiol. 1997 Feb;29(2):229-36. PubMed

Vasan RS, Benjamin EJ, Larson MG, Leip EP, Wang TJ, Wilson PW, Levy D. Plasma natriuretic peptides for community screening for left ventricular hypertrophy and systolic dysfunction: the Framingham heart study. JAMA. 2002 Sep 11;288(10):1252-9. PubMed

Vatankulu MA, Goktekin O, Kaya MG, Ayhan S, Kucukdurmaz Z, Sutton R, Henein M. Effect of long-term resynchronization therapy on left ventricular remodeling in pacemaker patients upgraded to biventricular devices. Am J Cardiol. 2009 May 1;103(9):1280-4. PubMed

Velazquez EJ, Lee KL, Deja MA, Jain A, Sopko G, Marchenko A, Ali IS, Pohost G, Gradinac S, Abraham WT, Yii M, Prabhakaran D, Szwed H, Ferrazzi P, Petrie MC, O'Connor CM, Panchavinnin P, She L, Bonow RO, Rankin GR, Jones RH, Rouleau JL, STICH Investigators. Coronary-artery bypass surgery in patients with left ventricular dysfunction. N Engl J Med. 2011 Apr 28;364(17):1607-16. PubMed

Velazquez EJ, Pfeffer MA, McMurray JV, Maggioni AP, Rouleau JL, Van de Werf F, Kober L, White HD, Swedberg K, Leimberger JD, Gallo P, Sellers MA, Edwards S, Henis M, Califf RM. VALsartan In Acute myocardial iNfarcTion (VALIANT) trial: baseline characteristics in context. Eur J Heart Fail. 2003 Aug;5(4):537-44. PubMed

Verdecchia P, Sleight P, Mancia G, Fagard R, Trimarco B, Schmieder RE, Kim JH, Jennings G, Jansky P, Chen JH, Liu L, Gao P, Probstfield J, Teo K, Yusuf S, ONTARGET/TRANSCEND Investigators. Effects of telmisartan, ramipril, and their combination on left ventricular hypertrophy in individuals at high vascular risk in the Ongoing Telmisartan Alone and in Combination With Ramipril Global End Point Trial [trunc]. Circulation. 2009 Oct 6;120(14):1380-9. PubMed

Vizzardi E, D'Aloia A, Giubbini R, Bordonali T, Bugatti S, Pezzali N, Romeo A, Dei Cas A, Metra M, Dei Cas L. Effect of spironolactone on left ventricular ejection fraction and volumes in patients with class I or II heart failure. Am J Cardiol. 2010 Nov 1;106(9):1292-6. PubMed

Waldo AL, Camm AJ, deRuyter H, Friedman PL, MacNeil DJ, Pauls JF, Pitt B, Pratt CM, Schwartz PJ, Veltri EP. Effect of d-sotalol on mortality in patients with left ventricular dysfunction after recent and remote myocardial infarction. The SWORD Investigators. Survival With Oral d-Sotalol. Lancet. 1996 Jul 6;348(9019):7-12. PubMed

Wedel H, McMurray JJ, Lindberg M, Wikstrand J, Cleland JG, Cornel JH, Dunselman P, Hjalmarson A, Kjekshus J, Komajda M, Kuusi T, Vanhaecke J, Waagstein F, CORONA Study Group. Predictors of fatal and non-fatal outcomes in the Controlled Rosuvastatin Multinational Trial in Heart Failure (CORONA): incremental value of apolipoprotein A-1, high-sensitivity C-reactive peptide and N-terminal pro B-type natriuretic peptide. Eur J Heart Fail. 2009 Mar;11(3):281-91. PubMed

Wilkoff BL, Cook JR, Epstein AE, Greene HL, Hallstrom AP, Hsia H, Kutalek SP, Sharma A. Dual-chamber pacing or ventricular backup pacing in patients with an implantable defibrillator: the Dual Chamber and VVI Implantable Defibrillator (DAVID) Trial. JAMA. 2002 Dec 25;288(24):3115-23. PubMed

Wilton SB, Leung AA, Ghali WA, Faris P, Exner DV. Outcomes of cardiac resynchronization therapy in patients with versus those without atrial fibrillation: a systematic review and meta-analysis. Heart Rhythm. 2011 Jul;8(7):1088-94. PubMed

Windham BG, Bennett RG, Gottlieb S. Care management interventions for older patients with congestive heart failure. Am J Manag Care. 2003 Jun;9(6):447-59; quiz 460-1. [39 references] PubMed

Xamoterol in severe heart failure. The Xamoterol in Severe Heart Failure Study Group. Lancet. 1990 Jul 7;336(8706):1-6. PubMed

Yusuf S, Pfeffer MA, Swedberg K, Granger CB, Held P, McMurray JJ, Michelson EL, Olofsson B, Ostergren J. Effects of candesartan in patients with chronic heart failure and preserved left-ventricular ejection fraction: the CHARM-Preserved Trial. Lancet. 2003 Sep 6;362(9386):777-81. PubMed

Zairis MN, Tsiaousis GZ, Georgilas AT, Makrygiannis SS, Adamopoulou EN, Handanis SM, Batika PC, Prekates AA, Velissaris D, Kouris NT, Mytas DZ, Babalis DK, Karidis KS, Foussas SG. Multimarker strategy for the prediction of 31 days cardiac death in patients with acutely decompensated chronic heart failure. Int J Cardiol. 2010 Jun 11;141(3):284-90. PubMed

Zannad F, McMurray JJ, Krum H, van Veldhuisen DJ, Swedberg K, Shi H, Vincent J, Pocock SJ, Pitt B, EMPHASIS-HF Study Group. Eplerenone in patients with systolic heart failure and mild symptoms. N Engl J Med. 2011 Jan 6;364(1):11-21. PubMed

Zareba W, Piotrowicz K, McNitt S, Moss AJ, MADIT II Investigators. Implantable cardioverter-defibrillator efficacy in patients with heart failure and left ventricular dysfunction (from the MADIT II population). Am J Cardiol. 2005 Jun 15;95(12):1487-91. PubMed

Type of Evidence Supporting the Recommendations

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

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate and effective diagnosis and management of patients with heart failure (HF)

Potential Harms

- Routine endomyocardial biopsy is not recommended in all cases of heart failure (HF), given limited diagnostic yield and the risk of procedure-related complications.
- Regardless of their mechanism of action (e.g., inhibition of phosphodiesterase, stimulation of adrenergic or dopaminergic receptors, calcium sensitization), chronic oral inotrope treatment increased mortality, mostly related to arrhythmic events. Inotropes should be considered only in such patients with systolic dysfunction who have low cardiac index and evidence of systemic hypoperfusion and/or congestion. To minimize adverse effects, lower doses are preferred. Similarly, the ongoing need for inotropic support and the possibility of discontinuation should be regularly assessed. See Table 26 in the original guideline document for adverse effects of intravenous inotropic agents.
- The principal adverse effects of diuretics include electrolyte and fluid depletion, as well as hypotension and azotemia. Diuretics can cause the depletion of potassium and magnesium, which can predispose patients to serious cardiac arrhythmias. The risk of electrolyte depletion is markedly enhanced when 2 diuretics are used in combination.
- The majority of the adverse reactions of angiotensin-converting enzyme (ACE) inhibitors can be attributed to the 2 principal pharmacological actions of these drugs: those related to angiotensin suppression and those related to kinin potentiation. Other types of adverse effects may also occur (e.g., rash and taste disturbances). Up to 20% of patients will experience an ACE inhibitor–induced cough. With the use of ACE inhibitors, particular care should be given to the patient's volume status, renal function, and concomitant medications. However, most HF patients (85% to 90%) can tolerate these drugs. Clinicians should prescribe an ACE inhibitor with caution if the patient has very low systemic blood pressures (systolic blood pressure <80 mm Hg), markedly increased serum levels of creatinine (>3 mg/dL), bilateral renal artery stenosis, or elevated levels of serum potassium (>5.0 mEq/L).
- Initiation of treatment with a beta blocker may produce 4 types of adverse reactions that require attention and management: fluid retention and worsening HF; fatigue; bradycardia or heart block; and hypotension. The occurrence of fluid retention or worsening HF is not generally a reason for the permanent withdrawal of treatment. Such patients generally respond favorably to intensification of conventional therapy, and once treated, they remain excellent candidates for long-term treatment with a beta blocker. The slowing of heart rate and cardiac conduction produced by beta blockers is generally asymptomatic and thus requires no treatment; however, if the bradycardia is accompanied by dizziness or lightheadedness or if second- or third-degree heart block occurs, clinicians should decrease the dose of the beta blocker. Clinicians may minimize the risk of hypotension by administering the beta blocker and ACE inhibitor at different times during the day. Hypotensive symptoms may also resolve after a decrease in the dose of diuretics in patients who are volume depleted. If hypotension is accompanied by other clinical evidence of hypoperfusion, beta-blocker therapy should be decreased or discontinued pending further patient evaluation. The symptom of fatigue is multifactorial and is perhaps the hardest symptom to address with confidence. Although fatigue may be related to beta blockers, other causes of fatigue should be considered, including sleep apnea, overdiuresis, or depression.
- Adherence to the combination of hydralazine and isosorbide dinitrate has generally been poor because of the large number of tablets required, frequency of administration, and the high incidence of adverse reactions. Frequent adverse effects include headache, dizziness, and gastrointestinal complaints. Nevertheless, the benefit of these drugs can be substantial and warrant a slower titration of the drugs to enhance tolerance of the therapy.
- The principal adverse reactions to digoxin occur primarily when it is administered in large doses, especially in the elderly, but large doses are not necessary for clinical benefits. The major adverse effects 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 digoxin toxicity is commonly associated with serum digoxin levels >2 ng/mL. However, toxicity may also occur with lower digoxin levels, especially if hypokalemia, hypomagnesemia, or hypothyroidism coexists. The concomitant use of clarithromycin, dronedarone, erythromycin, amiodarone, itraconazole, cyclosporine, propafenone, verapamil, or quinidine can increase serum digoxin concentrations and may increase the likelihood of digoxin toxicity. The dose of digoxin should be reduced if treatment with these drugs is initiated. In addition, a low lean body mass and impaired renal function can also elevate serum digoxin levels, which may explain the increased risk of digoxin toxicity in elderly patients.
- Trials of newer oral anticoagulants have compared efficacy and safety with warfarin therapy rather than placebo. Several new oral anticoagulants are now available, including the factor Xa inhibitors apixaban and rivaroxaban and the direct thrombin inhibitor dabigatran. These drugs have few food and drug interactions compared with warfarin and no need for routine coagulation monitoring or dose adjustment. The fixed dosing together with fewer interactions may simplify patient management, particularly with the polypharmacy commonly seen in HF. These drugs have a potential for an improved benefit–risk profile compared with warfarin, which may increase their use in practice, especially in those at increased bleeding risk. However, important adverse effects have been noted with these new anticoagulants, including gastrointestinal distress, which may limit compliance. At present, there is no commercially available agent to reverse the effect of these newer drugs. Trials comparing new anticoagulants with warfarin have enrolled >10,000 patients with HF. As more detailed evaluations of the comparative benefits and risks of these newer agents in patients with HF are still pending, the writing committee considered their use in patients with HF and nonvalvular AF as an alternative to warfarin to be reasonable.
- Because of possible adverse effects and drug interactions of nutritional supplements and their widespread use, clinicians caring for patients

with HF should routinely inquire about their use. Until more data are available, nutritional supplements or hormonal therapies are not recommended for the treatment of HF.
- Because nesiritide has a longer effective half-life than nitroglycerin or nitroprusside, adverse effects such as hypotension may persist longer.

Contraindications

Contraindications

- Patients should not be given an angiotensin-converting enzyme (ACE) inhibitor if they have experienced life-threatening adverse reactions (i.e., angioedema) during previous medication exposure or if they are pregnant or plan to become pregnant.
- Because of reports of development of cardiomyopathy, sibutramine is contraindicated in heart failure.
- Sulfite allergy is a contraindication to dobutamine therapy.
- Treatment with thiazolidinediones (e.g., rosiglitazone) is associated with fluid retention in patients with heart failure and should be avoided in patients with New York Heart Association (NYHA) class II through IV heart failure.
- In patients with previously established structural heart disease, the administration of agents known to have negative inotropic properties such as nondihydropyridine calcium channel blockers and certain antiarrhythmics should be avoided.

Qualifying Statements

Qualifying Statements

- Because the American College of Cardiology Foundation (ACCF)/American Heart Association (AHA) guidelines address patient populations (and clinicians) residing in North America, drugs that are not currently available in North America are discussed in the text without a specific class of recommendation (COR). For studies performed in large numbers of subjects outside North America, each writing committee reviews the potential influence of different practice patterns and patient populations on the treatment effect and relevance to the ACCF/AHA target population to determine whether the findings should inform a specific recommendation.
- The ACCF/AHA practice guidelines are intended to assist clinicians in clinical decision making by describing a range of generally acceptable approaches to the diagnosis, management, and prevention of specific diseases or conditions. The 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 clinician and patient in light of all the circumstances presented by that patient. As a result, situations may arise for which deviations from these guidelines may be appropriate. Clinical decision making should involve consideration of the quality and availability of expertise in the area where care is provided. When these guidelines are used as the basis for regulatory or payer decisions, the goal should be improvement in quality of care. The Task Force recognizes that situations arise in which additional data are needed to inform patient care more effectively; these areas will be identified within each respective guideline when appropriate.
- Prescribed courses of treatment in accordance with these recommendations are effective only if followed. Because lack of patient understanding and adherence may adversely affect outcomes, clinicians should make every effort to engage the patient's active participation in prescribed medical regimens and lifestyles. In addition, patients should be informed of the risks, benefits, and alternatives to a particular treatment and be involved in shared decision making whenever feasible, particularly for COR IIa and IIb, for which the benefit-to-risk ratio may be lower.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Clinical Algorithm

Quick Reference Guides/Physician Guides

Slide Presentation

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)

Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JJ, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WH, Tsai EJ, Wilkoff BL. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2013 Oct 15;62(16):e147-239. [924 references] PubMed

Adaptation

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

Date Released

1995 Nov 1 (revised 2013 Oct 15)

Guideline Developer(s)

American College of Cardiology Foundation - Medical Specialty Society

American Heart Association - Professional Association

Source(s) of Funding

The work of writing committees is supported exclusively by the American College of Cardiology Foundation (ACCF) and American Heart Association (AHA) without commercial support. Writing committee members volunteered their time for this activity.

Guideline Committee

2013 ACCF/AHA Guideline for the Management of Heart Failure Writing Committee

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

Composition of Group That Authored the Guideline

Writing Committee Members: Clyde W. Yancy, MD, MSc, FACC, FAHA (*Chair*); Mariell Jessup, MD, FACC, FAHA (*Vice Chair*); Biykem Bozkurt, MD, PhD, FACC, FAHA; Javed Butler, MBBS, FACC, FAHA; Donald E. Casey, Jr, MD, MPH, MBA, FACP, FAHA; Mark H. Drazner, MD, MSc, FACC, FAHA; Gregg C. Fonarow, MD, FACC, FAHA; Stephen A. Geraci, MD, FACC, FAHA, FCCP; Tamara Horwich, MD, FACC; James L. Januzzi, MD, FACC; Maryl R. Johnson, MD, FACC, FAHA; Edward K. Kasper, MD, FACC, FAHA; Wayne C. Levy, MD, FACC; Frederick A. Masoudi, MD, MSPH, FACC, FAHA; Patrick E. McBride, MD, MPH, FACC; John J. V. McMurray, MD, FACC; Judith E. Mitchell, MD, FACC, FAHA; Pamela N. Peterson, MD, MSPH, FACC, FAHA; Barbara Riegel, DNSc, RN, FAHA; Flora Sam, MD, FACC, FAHA; Lynne W. Stevenson, MD, FACC; W. H. Wilson Tang, MD, FACC; Emily J. Tsai, MD, FACC; Bruce L. Wilkoff, MD, FACC, FHRS

Task Force Members: Jeffrey L. Anderson, MD, FACC, FAHA (*Chair*); Alice K. Jacobs, MD, FACC, FAHA (*Immediate Past Chair*)*; Jonathan L. Halperin, MD, FACC, FAHA (*Chair-Elect*); Nancy M. Albert, PhD, CCNS, CCRN, FAHA; Biykem Bozkurt, MD, PhD, FACC, FAHA; Ralph G. Brindis, MD, MPH, MACC; Mark A. Creager, MD, FACC, FAHA*; Lesley H. Curtis, PhD; David DeMets, PhD; Robert A. Guyton, MD, FACC; Judith S. Hochman, MD, FACC, FAHA; Richard J. Kovacs, MD, FACC, FAHA; Frederick G. Kushner, MD, FACC, FAHA*; E. Magnus Ohman, MD, FACC; Susan J. Pressler, PhD, RN, FAAN, FAHA; Frank W. Sellke, MD, FACC, FAHA; Win-Kuang Shen, MD, FACC, FAHA; William G. Stevenson, MD, FACC, FAHA*; Clyde W. Yancy, MD, MSc, FACC, FAHA*

*Former Task Force member during this writing effort.

Financial Disclosures/Conflicts of Interest

The Task Force makes every effort to avoid actual, potential, or perceived conflicts of interest that may arise as a result of industry relationships or personal interests among the members of the writing committee. All writing committee members and peer reviewers of the guideline are required to disclose all current healthcare-related relationships, including those existing 12 months before initiation of the writing effort. In December 2009, the American College of Cardiology Foundation (ACCF) and American Heart Association (AHA) implemented a new policy for relationship with industry and other entities (RWI) that requires the writing committee chair plus a minimum of 50% of the writing committee to have no *relevant* RWI (Appendix 1 in the original guideline document includes the ACCF/AHA definition of relevance). These statements are reviewed by the Task Force and all members during each conference call and/or meeting of the writing committee and are updated as changes occur. All guideline recommendations require a confidential vote by the writing committee and must be approved by a consensus of the voting members. Members are not permitted to draft or vote on any text or recommendations pertaining to their RWI.

Members who recused themselves from voting are indicated in the list of writing committee members, and specific section recusals are noted in Appendix 1 of the original guideline document. Authors' and peer reviewers' RWI pertinent to this guideline are disclosed in Appendixes 1 and 2 of the original guideline document, respectively. Additionally, to ensure complete transparency, writing committee members' comprehensive disclosure information—including RWI not pertinent to this document—is available as an online supplement. Comprehensive disclosure information for the Task Force is also available online from the American College of Cardiology Web site . The work of writing committees is supported exclusively by the ACCF and AHA without commercial support. Writing committee members volunteered their time for this activity.

Guideline Endorser(s)

American Association of Cardiovascular and Pulmonary Rehabilitation - Medical Specialty Society

American College of Chest Physicians - Medical Specialty Society

Heart Rhythm Society - Professional Association

International Society for Heart and Lung Transplantation - Professional Association

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: 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, Stevenson LW, Yancy CW, American College of Cardiology Foundation, American Heart Association. 2009 focused update incorporated into the ACC/AHA 2005 guidelines for the diagnosis and management of heart failure in adults [trunc]. J Am Coll Cardiol. 2009 Apr 14;53(15):e1-e90.

Guideline Availability

Electronic copies: Available in Portable Document Format (PDF) from the Journal of the American College of Cardiology (ACC) Web site and from the Circulation Web site.

Print copies: Available from the American College of Cardiology, 2400 N Street NW, Washington DC, 20037; (800) 253-4636 (US only).

Availability of Companion Documents

The following are available:

- Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JJV, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WHW, Tsai EJ, Wilkoff BL. 2013 ACCF/AHA guideline for the management of heart failure: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2013;62:1495–539. Electronic copies: Available in Portable Document Format (PDF) from the Journal of the American College of Cardiology (JACC) Web site.
- Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JJV, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WHW, Tsai EJ, Wilkoff BL. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. Online data supplement. J Am Coll Cardiol 2013;62:e147–239. Available in PDF from the JACC Web site.
- Methodology manual and policies from the ACCF/AHA Task Force on Practice Guidelines. 2010 Jun. 88 p. American College of Cardiology Foundation and American Heart Association, Inc. Electronic copies: Available in PDF from the American College of Cardiology (ACC) Web site.

Print copies: Available from the American College of Cardiology, 2400 N Street NW, Washington DC, 20037; (800) 253-4636 (US only).

A clinical toolkit is available from the ACC Web site. In addition, a slide set is available to subscribers from the ACC Web site.

Patient Resources

None available

NGC Status

This summary was completed by ECRI on June 30, 1998. The information was verified by the guideline developer on December 1, 1998. This NGC summary was updated on February 25, 2002. The updated information was verified by the guideline developer as of April 17, 2002. This NGC summary was updated again on September 12, 2005. The updated information was verified by the guideline developer on November 17, 2005. This summary was updated by ECRI Institute on September 5, 2007 following the U.S. Food and Drug Administration advisory on the Thiazolidinedione class of antidiabetic drugs. This summary was updated by ECRI Institute on November 28, 2007 following the U.S. Food and Drug Administration advisory on the Avandia (rosiglitazone maleate) Tablets. This summary was updated by ECRI Institute on March 10, 2008 following the U.S. Food and Drug Administration advisory on Avandia (rosiglitazone maleate). This summary was updated by ECRI Institute on November 8, 2010 following the U.S. Food and Drug Administration advisory on Avandia (rosiglitazone). This NGC summary was updated on November 18, 2010. The updated information was verified by the guideline developer on February 10, 2011. This summary was updated by ECRI Institute on July 22, 2013 following the U.S. Food and Drug administration advisory on Olmesartan Medoxomil. This summary was updated by ECRI Institute on December 6, 2013. The updated information was verified by the guideline developer on January 22, 2014.

Copyright Statement

Disclaimer

NGC Disclaimer