

The patient with AHF may recover extremely well, depending on the aetiology and the underlying pathophysiology. Prolonged treatment on the ward and expert care are required. This is best delivered by a specialist heart failure team that can rapidly initiate medical management and attend to the information needs of the patient and family.

References

- Remme WJ, Swedberg K. Guidelines for the diagnosis and treatment of chronic heart failure. *Eur Heart J* 2001;22:1527–1560.
- Guidelines on the diagnosis and treatment of acute heart failure. Available at <http://www.escardio.org>.
- Effect of prophylactic amiodarone on mortality after acute myocardial infarction and in congestive heart failure: meta-analysis of individual data from 6500 patients in randomised trials. Amiodarone Trials Meta-Analysis Investigators. *Lancet* 1997;350:1417–1424.
- McCullough PA, Philbin EF, Spertus JA *et al*. Confirmation of a heart failure epidemic: findings from the Resource Utilization Among Congestive Heart Failure (REACH) study. *J Am Coll Cardiol* 2002;39:60–69.
- Cleland JG, Swedberg K, Follath F *et al*. The EuroHeart Failure survey programme—a survey on the quality of care among patients with heart failure in Europe. Part 1: Patient characteristics and diagnosis. *Eur Heart J* 2003;24:442–463.
- Fox KF, Cowie MR, Wood DA *et al*. Coronary artery disease as the cause of incident heart failure in the population. *Eur Heart J* 2001;22:228–236.
- Al-Khadra AS, Salem DN, Rand WM *et al*. Warfarin anticoagulation and survival: a cohort analysis from the studies of left ventricular dysfunction. *J Am Coll Cardiol* 1998;31:749–753.
- Berry C, Murdoch DR, McMurray JJ. Economics of chronic heart failure. *Eur J Heart Fail* 2001;3:283–291.
- The treatment of heart failure. Task Force of the Working Group on Heart Failure of the European Society of Cardiology. *Eur Heart J* 1997;18:736–753.
- Adams KF, Jr., Zannad F. Clinical definition and epidemiology of advanced heart failure. *Am Heart J* 1998;135:S204–S215.
- O'Connell JB. The economic burden of heart failure. *Clin Cardiol* 2000;23:III6–III10.
- Stevenson R, Ranjadayalan K, Wilkinson P *et al*. Short and long term prognosis of acute myocardial infarction since introduction of thrombolysis. *Br Med J* 1993;307:349–353.
- Roguin A, Behar D, Ben Ami H *et al*. Long-term prognosis of acute pulmonary oedema—an ominous outcome. *Eur J Heart Fail* 2000;2:137–144.
- Krumholz MH P, EM, Tu N *et al*. The treatment target in acute decompensated heart failure. *Rev Cardiovasc Med* 2001;2(Suppl. 2):S7–S12.
- Krumholz HM, Chen J, Murillo JE *et al*. Admission to hospitals with on-site cardiac catheterization facilities: impact on long-term costs and outcomes. *Circulation* 1998;98:2010–2016.
- Cowie MR, Mosterd A, Wood DA *et al*. The epidemiology of heart failure. *Eur Heart J* 1997;18:208–225.
- McAlister FA, Lawson FM, Teo KK *et al*. A systematic review of randomized trials of disease management programs in heart failure. *Am J Med* 2001;110:378–384.
- Krumholz HM, Vaccarino V, Ellerbeck EF *et al*. Determinants of appropriate use of angiotensin-converting enzyme inhibitors after acute myocardial infarction in persons > or = 65 years of age. *Am J Cardiol* 1997;79:581–586.
- Rich MW, Beckham V, Wittenberg C *et al*. A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure. *N Engl J Med* 1995;333:1190–1195.
- Nohria A TS, Fang JC, Lewis EF *et al*. Clinical assessment identifies hemodynamic profiles that predict outcomes in patients admitted with heart failure. *J Am Coll Cardiol* 2003;41:1797–1804.
- Grady KL, Dracub K, Kennedy G, Moser DK, Piano M, Svensson LW. AHA Scientific Statement: Team management of patients with heart failure: a statement of health care professional from the cardiovascular nursing council of the American Heart Association. *Circulation* 2000;1002:2443–2456.
- Nohria A, Lewis E, Stevenson LW. Medical management of advanced heart failure. *JAMA* 2002;287:628–640.
- Killip T, 3rd, Kimball JT. Treatment of myocardial infarction in a coronary care unit. A two year experience with 250 patients. *Am J Cardiol* 1967;20:457–464.
- Forrester JS, Diamond GA, Swan HJ. Correlative classification of clinical and hemodynamic function after acute myocardial infarction. *Am J Cardiol* 1977;39:137–145.
- Arnold JM, Braunwald E, Sandor T *et al*. Inotropic stimulation of reperfused myocardium with dopamine: effects on infarct size and myocardial function. *J Am Coll Cardiol* 1985;6:1026–1034.
- Bolli R. Basic and clinical aspects of myocardial stunning. *Prog Cardiovasc Dis* 1998;40:477–516.
- Wijns W, Vatner SF, Camici PG. Hibernating myocardium. *N Engl J Med* 1998;339:173–181.
- Marban E. Myocardial stunning and hibernation. The physiology behind the colloquialisms. *Circulation* 1991;83:681–688.
- Bertrand ME, Simoons ML, Fox KA *et al*. Management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. *Eur Heart J* 2002;23:1809–1840.
- Van de Werf F, Ardissino D, Betriu A *et al*. Management of acute myocardial infarction in patients presenting with ST-segment elevation. The Task Force on the Management of Acute Myocardial Infarction of the European Society of Cardiology. *Eur Heart J* 2003;24:28–66.
- Fuster V, Ryden LE, Asinger RW *et al*. ACC/AHA/ESC guidelines for the management of patients with atrial fibrillation. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines and Policy Conferences (Committee to develop guidelines for the management of patients with atrial fibrillation) developed in collaboration with the North American Society of Pacing and Electrophysiology. *Eur Heart J* 2001;22:1852–1923.
- Maisel AS, Krishnaswamy P, Nowak RM *et al*. Rapid measurement of B-type natriuretic peptide in the emergency diagnosis of heart failure. *N Engl J Med* 2002;347:161–167.
- Dao Q, Krishnaswamy P, Kazanegra R *et al*. Utility of B-type natriuretic peptide in the diagnosis of congestive heart failure in an urgent-care setting. *J Am Coll Cardiol* 2001;37:379–385.
- Cowie MR, Jourdain P, Maisel A *et al*. Clinical applications of B-type natriuretic peptide (BNP) testing. *Eur Heart J* 2003;24:1710–1718.
- Capomolla S, Pozzoli M, Opasich C *et al*. Dobutamine and nitroprusside infusion in patients with severe congestive heart failure: hemodynamic improvement by discordant effects on mitral regurgitation, left atrial function, and ventricular function. *Am Heart J* 1997;134:1089–1098.
- Tousignant CP, Walsh F, Mazer CD. The use of transesophageal echocardiography for preload assessment in critically ill patients. *Anesth Analg* 2000;90:351–355.
- Nagueh SF, Kopelen HA, Zoghbi WA. Feasibility and accuracy of Doppler echocardiographic estimation of pulmonary artery occlusive pressure in the intensive care unit. *Am J Cardiol* 1995;75:1256–1262.
- Nishimura RA, Tajik AJ. Determination of left-sided pressure gradients by utilizing Doppler aortic and mitral regurgitant signals: validation by simultaneous dual catheter and Doppler studies. *J Am Coll Cardiol* 1988;11:317–321.
- Braunwald E, Antman EM, Beasley JW *et al*. ACC/AHA 2002 guideline update for the management of patients with unstable angina and non-ST-segment elevation myocardial infarction—summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on the Management of Patients With Unstable Angina). *J Am Coll Cardiol* 2002;40:1366–1374.
- Colucci WS, Elkayam U, Horton DP *et al*. Intravenous nesiritide, a natriuretic peptide, in the treatment of decompensated congestive heart failure. Nesiritide Study Group. *New Engl J Med* 2000;343:246–253.
- Torre-Amione G, Young JB, Durand J *et al*. Hemodynamic effects of tezosentan, an intravenous dual endothelin receptor antagonist, in patients with class III to IV congestive heart failure. *Circulation* 2001;103:973–980.

42. Follath F, Cleland JG, Just H *et al.* Efficacy and safety of intravenous levosimendan compared with dobutamine in severe low-output heart failure (the LIDO study): a randomised double-blind trial. *Lancet* 2002;**360**:196–202.
43. Steimle AE, Stevenson LW, Chelimsky-Fallick C *et al.* Sustained hemodynamic efficacy of therapy tailored to reduce filling pressures in survivors with advanced heart failure. *Circulation* 1997;**96**:1165–1172.
44. Gottlieb SS, Brater DC, Thomas I *et al.* BG9719 (CVT-124), an A1 adenosine receptor antagonist, protects against the decline in renal function observed with diuretic therapy. *Circulation* 2002;**105**:1348–1353.
45. Shah MR, Stinnett SS, McNulty SE *et al.* Hemodynamics as surrogate end points for survival in advanced heart failure: an analysis from FIRST. *Am Heart J* 2001;**141**:908–914.
46. Boyd O, Grounds RM, Bennett ED. A randomized clinical trial of the effect of deliberate perioperative increase of oxygen delivery on mortality in high-risk surgical patients. *JAMA* 1993;**270**:2699–2707.
47. Sandham JD, Hull RD, Brant RF *et al.* A randomized, controlled trial of the use of pulmonary-artery catheters in high-risk surgical patients. *N Engl J Med* 2003;**348**:5–14.
48. Rhodes A, Cusack RJ, Newman PJ *et al.* A randomised, controlled trial of the pulmonary artery catheter in critically ill patients. *Intens Care Med* 2002;**28**:256–264.
49. Mueller HS, Chatterjee K, Davis KB *et al.* ACC expert consensus document. Present use of bedside right heart catheterization in patients with cardiac disease. *J Am Coll Cardiol* 1998;**32**:840–864.
50. van den Berghe G, Wouters P, Weekers F *et al.* Intensive insulin therapy in the critically ill patients. *N Engl J Med* 2001;**345**:1359–1367.
51. Rawles JM, Kenmore AC. Controlled trial of oxygen in uncomplicated myocardial infarction. *Br Med J* 1976;**1**:1121–1123.
52. Packer PM. Proposal for a new clinical end point to evaluate the efficacy of drugs and devices in the treatment of chronic heart failure. *J Card Fail* 2001;**7**:176–182.
53. Udelson JE, Smith WB, Hendrix GH *et al.* Acute hemodynamic effects of conivaptan, a dual V(1A) and V(2) vasopressin receptor antagonist, in patients with advanced heart failure. *Circulation* 2001;**104**:2417–2423.
54. Cuffe MS, Califf RM, Adams KF Jr., *et al.* Short-term intravenous milrinone for acute exacerbation of chronic heart failure: a randomized controlled trial. *JAMA* 2002;**287**:1541–1547.
55. Silver MA, Horton DP, Ghali JK *et al.* Effect of nesiritide versus dobutamine on short-term outcomes in the treatment of patients with acutely decompensated heart failure. *J Am Coll Cardiol* 2002;**39**:798–803.
56. Fonarow GC, Stevenson LW, Walden JA *et al.* Impact of a comprehensive heart failure management program on hospital readmission and functional status of patients with advanced heart failure. *J Am Coll Cardiol* 1997;**30**:725–732.
57. Marik PE. Pulmonary artery catheterization and esophageal doppler monitoring in the ICU. *Chest* 1999;**116**:1085–1091.
58. Jardin F, Valtier B, Beauchet A *et al.* Invasive monitoring combined with two-dimensional echocardiographic study in septic shock. *Intens Care Med* 1994;**20**:550–554.
59. Gore JM, Goldberg RJ, Spodick DH *et al.* A community-wide assessment of the use of pulmonary artery catheters in patients with acute myocardial infarction. *Chest* 1987;**92**:721–727.
60. Zion MM, Balkin J, Rosenmann D *et al.* Use of pulmonary artery catheters in patients with acute myocardial infarction. Analysis of experience in 5,841 patients in the SPRINT Registry. SPRINT Study Group. *Chest* 1990;**98**:1331–1335.
61. Connors AF Jr., Speroff T, Dawson NV *et al.* The effectiveness of right heart catheterization in the initial care of critically ill patients. SUPPORT Investigators. *JAMA* 1996;**276**:889–897.
62. Ivanov R, Allen J, Calvin JE. The incidence of major morbidity in critically ill patients managed with pulmonary artery catheters: a meta-analysis. *Crit Care Med* 2000;**28**:615–619.
63. Wilson J, Woods I, Fawcett J *et al.* Reducing the risk of major elective surgery: randomised controlled trial of preoperative optimisation of oxygen delivery. *Br Med J* 1999;**318**:1099–1103.
64. Rasanen J, Heikkila J, Downs J *et al.* Continuous positive airway pressure by face mask in acute cardiogenic pulmonary edema. *Am J Cardiol* 1985;**55**:296–300.
65. Bersten AD, Holt AW, Vedig AE *et al.* Treatment of severe cardiogenic pulmonary edema with continuous positive airway pressure delivered by face mask. *N Engl J Med* 1991;**325**:1825–1830.
66. Lin M, Yang YF, Chiang HT *et al.* Reappraisal of continuous positive airway pressure therapy in acute cardiogenic pulmonary edema. Short-term results and long-term follow-up. *Chest* 1995;**107**:1379–1386.
67. Takeda S, Nejima J, Takano T *et al.* Effect of nasal continuous positive airway pressure on pulmonary edema complicating acute myocardial infarction. *Jpn Circ J* 1998;**62**:553–558.
68. Kelly CA, Newby DE, McDonagh TA *et al.* Randomised controlled trial of continuous positive airway pressure and standard oxygen therapy in acute pulmonary oedema; effects on plasma brain natriuretic peptide concentrations. *Eur Heart J* 2002;**23**:1379–1386.
69. Pang D, Keenan SP, Cook DJ *et al.* The effect of positive pressure airway support on mortality and the need for intubation in cardiogenic pulmonary edema: a systematic review. *Chest* 1998;**114**:1185–1192.
70. Masip J, Betbese AJ, Paez J *et al.* Non-invasive pressure support ventilation versus conventional oxygen therapy in acute cardiogenic pulmonary oedema: a randomised trial. *Lancet* 2000;**356**:2126–2132.
71. Sharon A, Shpirer I, Kaluski E *et al.* High-dose intravenous isosorbide-dinitrate is safer and better than Bi-PAP ventilation combined with conventional treatment for severe pulmonary edema. *J Am Coll Cardiol* 2000;**36**:832–837.
72. Mehta S, Jay GD, Woolard RH *et al.* Randomized, prospective trial of bilevel versus continuous positive airway pressure in acute pulmonary edema. *Crit Care Med* 1997;**25**:620–628.
73. Lee G, DeMaria AN, Amsterdam EA *et al.* Comparative effects of morphine, meperidine and pentazocine on cardiocirculatory dynamics in patients with acute myocardial infarction. *Am J Med* 1976;**60**:949–955.
74. Samama MM, Cohen AT, Darmon JY *et al.* A comparison of enoxaparin with placebo for the prevention of venous thromboembolism in acutely ill medical patients. Prophylaxis in Medical Patients with Enoxaparin Study Group. *N Engl J Med* 1999;**341**:793–800.
75. Cotter G, Metzko E, Kaluski E *et al.* Randomised trial of high-dose isosorbide dinitrate plus low-dose furosemide versus high-dose furosemide plus low-dose isosorbide dinitrate in severe pulmonary oedema. *Lancet* 1998;**351**:389–393.
76. Cohn JN, Franciosa JA. Vasodilator therapy of cardiac failure (second of two parts). *N Engl J Med* 1977;**297**:254–258.
77. Jain P, Massie BM, Gattis WA *et al.* Current medical treatment for the exacerbation of chronic heart failure resulting in hospitalization. *Am Heart J* 2003;**145**:S3–S17.
78. Reves JG, Erdmann W, Mardis M *et al.* Evidence for existence of intramyocardial steal. *Adv Exp Med Biol* 1977;**94**:755–760.
79. Colucci WS. Nesiritide for the treatment of decompensated heart failure. *J Cardiac Fail* 2001;**7**:92–100.
80. Swedberg K, Held P, Kjekshus J *et al.* Effects of early administration of enalapril on mortality in patients with acute myocardial infarction. Results of the Cooperative New Scandinavian Enalapril Survival Study II (CONSENSUS II). *N Engl J Med* 1992;**327**:678–684.
81. Ambrosioni E, Borghi C, Magnani B. The effect of the angiotensin-converting-enzyme inhibitor zofenopril on mortality and morbidity after anterior myocardial infarction. The Survival of Myocardial Infarction Long-Term Evaluation (SMILE) Study Investigators. *N Engl J Med* 1995;**332**:80–85.
82. Latini R, Tognoni G, Maggioni AP *et al.* Clinical effects of early angiotensin-converting enzyme inhibitor treatment for acute myocardial infarction are similar in the presence and absence of aspirin: systematic overview of individual data from 96,712 randomized patients. Angiotensin-converting Enzyme Inhibitor Myocardial Infarction Collaborative Group. *J Am Coll Cardiol* 2000;**35**:1801–1807.
83. Follath F. Do diuretics differ in terms of clinical outcome in congestive heart failure? *Euro Heart J* 1998;**19**(Suppl. P):P5–P8.
84. Brater DC. Diuretic therapy. *N Engl J Med* 1998;**339**:387–395.
85. Wilson JR, Reichek N, Dunkman WB *et al.* Effect of diuresis on the performance of the failing left ventricle in man. *Am J Med* 1981;**70**:234–239.

86. Johnson W, Omland T, Hall C *et al.* Neurohormonal activation rapidly decreases after intravenous therapy with diuretics and vasodilators for class IV heart failure. *J Am Coll Cardiol* 2002;**39**:1623–1629.
87. Brater DC. Resistance to loop diuretics. Why it happens and what to do about it. *Drugs* 1985;**30**:427–443.
88. Cotter G, Metzko E, Kaluski E *et al.* Randomised trial of high-dose isosorbide dinitrate plus low-dose furosemide versus high-dose furosemide plus low-dose isosorbide dinitrate in severe pulmonary oedema [see comments]. *Lancet* 1998;**351**:389–393.
89. Gardtman M, Waagstein L, Karlsson T *et al.* Has an intensified treatment in the ambulance of patients with acute severe left heart failure improved the outcome? *Eur J Emerg Med* 2000;**7**:15–24.
90. Sacchetti A, Ramoska E, Moakes ME *et al.* Effect of ED management on ICU use in acute pulmonary edema. *Am J Emerg Med* 1999;**17**:571–574.
91. Kramer WG, Smith WB, Ferguson J *et al.* Pharmacodynamics of torsemide administered as an intravenous injection and as a continuous infusion to patients with congestive heart failure. *J Clin Pharmacol* 1996;**36**:265–270.
92. Lahav M, Regev A, Ra'anani P *et al.* Intermittent administration of furosemide vs continuous infusion preceded by a loading dose for congestive heart failure. *Chest* 1992;**102**:725–731.
93. Pivac N, Rumboldt Z, Sardelic S *et al.* Diuretic effects of furosemide infusion versus bolus injection in congestive heart failure. *Int J Clin Pharmacol Res* 1998;**18**:121–128.
94. van Meyel JJ, Smits P, Dormans T *et al.* Continuous infusion of furosemide in the treatment of patients with congestive heart failure and diuretic resistance. *J Intern Med* 1994;**235**:329–334.
95. Channer KS, McLean KA, Lawson-Matthew P *et al.* Combination diuretic treatment in severe heart failure: a randomised controlled trial. *Br Heart J* 1994;**71**:146–150.
96. Dormans TP, Gerlag PG, Russel FG *et al.* Combination diuretic therapy in severe congestive heart failure. *Drugs* 1998;**55**:165–172.
97. Ellison DH. Diuretic therapy and resistance in congestive heart failure. *Cardiology* 2001;**96**:132–143.
98. Kiyingi A, Field MJ, Pawsey CC *et al.* Metolazone in treatment of severe refractory congestive cardiac failure. *Lancet* 1990;**335**:29–31.
99. van Vliet AA, Donker AJ, Nauta JJ *et al.* Spironolactone in congestive heart failure refractory to high-dose loop diuretic and low-dose angiotensin-converting enzyme inhibitor. *Am J Cardiol* 1993;**71**:21A–28A.
100. Cotter G, Weissgarten J, Metzko E *et al.* Increased toxicity of high-dose furosemide versus low-dose dopamine in the treatment of refractory congestive heart failure. *Clin Pharmacol Ther* 1997;**62**:187–193.
101. Kramer BK, Schweda F, Riegger GA. Diuretic treatment and diuretic resistance in heart failure. *Am J Med* 1999;**106**:90–96.
102. Neuberg GW, Miller AB, O'Connor CM *et al.* Diuretic resistance predicts mortality in patients with advanced heart failure. *Am Heart J* 2002;**144**:31–38.
103. Wakelkamp M, Alvan G, Gabrielsson J *et al.* Pharmacodynamic modeling of furosemide tolerance after multiple intravenous administration. *Clin Pharmacol Ther* 1996;**60**:75–88.
104. Dormans TP, van Meyel JJ, Gerlag PG *et al.* Diuretic efficacy of high dose furosemide in severe heart failure: bolus injection versus continuous infusion. *J Am Coll Cardiol* 1996;**28**:376–382.
105. Maxwell AP, Ong HY, Nicholls DP. Influence of progressive renal dysfunction in chronic heart failure. *Eur J Heart Fail* 2002;**4**:125–130.
106. Marik PE, Kussman BD, Lipman J *et al.* Acetazolamide in the treatment of metabolic alkalosis in critically ill patients. *Heart Lung* 1991;**20**:455–459.
107. Sharpe N. Beta-blockers in heart failure. Future directions. *Eur Heart J* 1996;**17**(Suppl. B):39–42.
108. Furberg CD. Overview of completed sudden death trials: US experience. *Cardiology* 1987;**74**(Suppl. 2):24–31.
109. Yusuf S, Peto R, Lewis J *et al.* Beta blockade during and after myocardial infarction: an overview of the randomized trials. *Prog Cardiovasc Dis* 1985;**27**:335–371.
110. Herlitz J, Waagstein F, Lindqvist J *et al.* Effect of metoprolol on the prognosis for patients with suspected acute myocardial infarction and indirect signs of congestive heart failure (a subgroup analysis of the Goteborg Metoprolol Trial). *Am J Cardiol* 1997;**80**:40J–44J.
111. Herlitz J, Elmfeldt D, Hjalmarson A *et al.* Effect of metoprolol on indirect signs of the size and severity of acute myocardial infarction. *Am J Cardiol* 1983;**51**:1282–1288.
112. Witchitz S, Cohen-Solal A, Dartois N *et al.* Treatment of heart failure with celiprolol, a cardioselective beta blocker with beta-2 agonist vasodilatory properties. The CELICARD Group. *Am J Cardiol* 2000;**85**:1467–1471.
113. Held PH, Corbeij HM, Dunselman P *et al.* Hemodynamic effects of metoprolol in acute myocardial infarction. A randomized, placebo-controlled multicenter study. *Am J Cardiol* 1985;**56**:47G–54G.
114. Katz AM. Potential deleterious effects of inotropic agents in the therapy of chronic heart failure. *Circulation* 1986;**73**:III184–III190.
115. Packer M. The development of positive inotropic agents for chronic heart failure: how have we gone astray? *J Am Coll Cardiol* 1993;**22**:119A–126A.
116. O'Connor CM, Gattis WA, Uretsky BF *et al.* 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;**138**:78–86.
117. Thackray S, Easthaugh J, Freemantle N *et al.* The effectiveness and relative effectiveness of intravenous inotropic drugs acting through the adrenergic pathway in patients with heart failure—a meta-regression analysis. 2002;**4**:515–529.
118. Goldberg LI, McDonald RH, Jr., Zimmerman AM. Sodium diuresis produced by dopamine in patients with congestive heart failure. *N Engl J Med* 1963;**269**:1060–1064.
119. Colucci WS, Wright RF, Braunwald E. New positive inotropic agents in the treatment of congestive heart failure. Mechanisms of action and recent clinical developments. 1. *N Engl J Med* 1986;**314**:290–299.
120. Maskin CS, Ocken S, Chadwick B *et al.* Comparative systemic and renal effects of dopamine and angiotensin-converting enzyme inhibition with enalapril in patients with heart failure. *Circulation* 1985;**72**:846–852.
121. Metra M, Missale C, Spano PF *et al.* Dopaminergic drugs in congestive heart failure: hemodynamic and neuroendocrine responses to ibopamine, dopamine, and dihydroergotoxine. *J Cardiovasc Pharmacol* 1995;**25**:732–740.
122. Leier CV, Binkley PF. Parenteral inotropic support for advanced congestive heart failure. *Prog Cardiovasc Dis* 1998;**41**:207–224.
123. Fowler MB, Laser JA, Hopkins GL *et al.* Assessment of the beta-adrenergic receptor pathway in the intact failing human heart: progressive receptor down-regulation and subsensitivity to agonist response. *Circulation* 1986;**74**:1290–1302.
124. Feldman MD, Copelas L, Gwathmey JK *et al.* Deficient production of cyclic AMP: pharmacologic evidence of an important cause of contractile dysfunction in patients with end-stage heart failure. *Circulation* 1987;**75**:331–339.
125. Colucci WS, Dennis AR, Leatherman GF *et al.* Intracoronary infusion of dobutamine to patients with and without severe congestive heart failure. Dose-response relationships, correlation with circulating catecholamines, and effect of phosphodiesterase inhibition. *J Clin Invest* 1988;**81**:1103–1110.
126. Colucci WS, Wright RF, Jaski BE *et al.* Milrinone and dobutamine in severe heart failure: differing hemodynamic effects and individual patient responsiveness. *Circulation* 1986;**73**:III175–III183.
127. Galley HF. Renal-dose dopamine: will the message now get through? *Lancet* 2000;**356**:2112–2113.
128. Lowes BD, Tsvetkova T, Eichhorn EJ *et al.* Milrinone versus dobutamine in heart failure subjects treated chronically with carvedilol. *Int J Cardiol* 2001;**81**:141–149.
129. Metra M, Nodari S, D'Aloia A *et al.* Beta-blocker therapy influences the hemodynamic response to inotropic agents in patients with heart failure: a randomized comparison of dobutamine and enoximone before and after chronic treatment with metoprolol or carvedilol. *J Am Coll Cardiol* 2002;**40**:1248–1258.
130. Gilbert EM, Hershberger RE, Wiechmann RJ *et al.* Pharmacologic and hemodynamic effects of combined beta-agonist stimulation and phosphodiesterase inhibition in the failing human heart. *Chest* 1995;**108**:1524–1532.
131. Levine TB, Levine AB, Elliott WG *et al.* Dobutamine as bridge to angiotensin-converting enzyme inhibitor-nitrate therapy in end-stage heart failure. *Clin Cardiol* 2001;**24**:231–236.

132. Caldicott LD, Hawley K, Heppell R *et al*. Intravenous enoximone or dobutamine for severe heart failure after acute myocardial infarction: a randomized double-blind trial. *Eur Heart J* 1993;14:696–700.
133. Burger AJ, Horton DP, LeJemtel T *et al*. Effect of nesiritide (B-type natriuretic peptide) and dobutamine on ventricular arrhythmias in the treatment of patients with acutely decompensated congestive heart failure: the PRECEDENT study. *Am Heart J* 2002;144:1102–1108.
134. Schulz R, Rose J, Martin C *et al*. Development of short-term myocardial hibernation. Its limitation by the severity of ischemia and inotropic stimulation. *Circulation* 1993;88:684–695.
135. Colucci WS, Wright RF, Braunwald E. New positive inotropic agents in the treatment of congestive heart failure. Mechanisms of action and recent clinical developments. 2. *N Engl J Med* 1986;314:349–358.
136. Bohm M, Deutsch HJ, Hartmann D *et al*. Improvement of postreceptor events by metoprolol treatment in patients with chronic heart failure. *J Am Coll Cardiol* 1997;30:992–996.
137. Loh E, Elkayam U, Cody R *et al*. A randomized multicenter study comparing the efficacy and safety of intravenous milrinone and intravenous nitroglycerin in patients with advanced heart failure. *J Card Fail* 2001;7:114–121.
138. Kivikko M, Lehtonen L, Colucci WS. Sustained hemodynamic effects of intravenous levosimendan. *Circulation* 2003;107:81–86.
139. Innes CA, Wagstaff AJ. Levosimendan: A review of its use in the management of acute decompensated heart failure. *Drugs* 2003;63:2651–2671.
140. Nieminen MS, Lilleberg J, Leikola-Pelho T *et al*. Dose related responses of a new calcium-sensitizer, simendan, in man. *Eur Heart J* 1992;13:P1440.
141. Nieminen MS, Akkila J, Hasenfuss G *et al*. Hemodynamic and neurohumoral effects of continuous infusion of levosimendan in patients with congestive heart failure. *J Am Coll Cardiol* 2000;36:1903–1912.
142. Slawsky MT, Colucci WS, Gottlieb SS *et al*. Acute hemodynamic and clinical effects of levosimendan in patients with severe heart failure. Study Investigators. *Circulation* 2000;102:2222–2227.
143. Cleland JG, McGowan J. Levosimendan: a new era for inodilator therapy for heart failure? *Curr Opin Cardiol* 2002;17:257–265.
144. Bohm M, Beuckelmann D, Brown L *et al*. Reduction of beta-adrenoceptor density and evaluation of positive inotropic responses in isolated, diseased human myocardium. *Eur Heart J* 1988;9:844–852.
145. Bohm M, La Rosee K, Schmidt U *et al*. Force-frequency relationship and inotropic stimulation in the nonfailing and failing human myocardium: implications for the medical treatment of heart failure. *Clin Invest* 1992;70:421–425.
146. The effect of digoxin on mortality and morbidity in patients with heart failure. The Digitalis Investigation Group. *New Engl J Med* 1997;336:525–533.
147. Hood WB Jr, Dans AL, Guyatt GH *et al*. Digitalis for treatment of congestive heart failure in patients in sinus rhythm. The Cochrane Database of Systematic Reviews 2004 Issue 4.
148. Ratshin RA, Rackley CE, Russell RO, Jr. Hemodynamic evaluation of left ventricular function in shock complicating myocardial infarction. *Circulation* 1972;45:127–139.
149. Lee DC, Johnson RA, Bingham JB *et al*. Heart failure in outpatients: a randomized trial of digoxin versus placebo. *N Engl J Med* 1982;306:699–705.
150. Rahimtoola SH, Sinno MZ, Chuquimia R *et al*. Effects of ouabain on impaired left ventricular function in acute myocardial infarction. *N Engl J Med* 1972;287:527–531.
151. Spargias KS, Hall AS, Ball SG. Safety concerns about digoxin after acute myocardial infarction. *Lancet* 1999;354:391–392.
152. Varonkov Y, Shell WE, Smirnov V *et al*. Augmentation of serum CPK activity by digitalis in patients with acute myocardial infarction. *Circulation* 1977;55:719–727.
153. McClement BM AA. Value of signal-averaged electrocardiography, radionuclide ventriculopathy, Holter monitoring and clinical variables for prediction of arrhythmic events in survivors of acute myocardial infarction in the thrombolytic era. *J Am Coll Cardiol* 1993;21:1419–1427.
154. Khand AU, Rankin AC, Kaye GC *et al*. Systematic review of the management of atrial fibrillation in patients with heart failure. *Eur Heart J* 2000;21:614–632.
155. Wong SC, Sanborn T, Sleeper LA *et al*. Angiographic findings and clinical correlates in patients with cardiogenic shock complicating acute myocardial infarction: a report from the SHOCK Trial Registry. Should we emergently revascularize Occluded Coronaries for cardiogenic shock? *J Am Coll Cardiol* 2000;36:1077–1083.
156. Malmberg K, Norhammar A, Wedel H *et al*. Glycometabolic state at admission: important risk marker of mortality in conventionally treated patients with diabetes mellitus and acute myocardial infarction: long-term results from the Diabetes and Insulin-Glucose Infusion in Acute Myocardial Infarction (DIGAMI) study. *Circulation* 1999;99:2626–2632.
157. Hochman JS, Buller CE, Sleeper LA *et al*. Cardiogenic shock complicating acute myocardial infarction—etiologies, management and outcome: a report from the SHOCK Trial Registry. Should we emergently revascularize occluded Coronaries for cardiogenic shock? *J Am Coll Cardiol* 2000;36:1063–1070.
158. Menon V, Slater JN, White HD *et al*. Acute myocardial infarction complicated by systemic hypoperfusion without hypotension: report of the SHOCK trial registry. *Am J Med* 2000;108:374–380.
159. Sexton DJ, Spelman D. Current best practices and guidelines. Assessment and management of complications in infective endocarditis. *Cardiol Clin* 2003;21:273–282.
160. Olaison L, Pettersson G. Current best practices and guidelines. Indications for surgical intervention in infective endocarditis. *Cardiol Clin* 2003;21:235–251.
161. Houpikian P, Raoult D. Diagnostic methods. Current best practices and guidelines for identification of difficult-to-culture pathogens in infective endocarditis. *Cardiol Clin* 2003;21:207–217.
162. Towns ML, Reller LB. Diagnostic methods. Current best practices and guidelines for isolation of bacteria and fungi in infective endocarditis. *Cardiol Clin* 2003;21:197–205.
163. Conti CR. Endocarditis prophylaxis yes: endocarditis prophylaxis no. *Clin Cardiol* 2003;26:255–256.
164. Lengyel M, Fuster V, Keltai M *et al*. Guidelines for management of left-sided prosthetic valve thrombosis: a role for thrombolytic therapy. Consensus Conference on Prosthetic Valve Thrombosis. *J Am Coll Cardiol* 1997;30:1521–1526.
165. Bonow RO, Carabello B, de Leon AC *et al*. ACC/AHA Guidelines for the Management of Patients With Valvular Heart Disease. Executive Summary. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Patients with Valvular Heart Disease). *J Heart Valve Dis* 1998;7:672–707.
166. Alpert JS. The thrombosed prosthetic valve: current recommendations based on evidence from the literature. *J Am Coll Cardiol* 2003;41:659–660.
167. Ozkan M, Kaymaz C, Kirma C *et al*. Intravenous thrombolytic treatment of mechanical prosthetic valve thrombosis: a study using serial transesophageal echocardiography. *J Am Coll Cardiol* 2000;35:1881–1889.
168. Hering D, Piper C, Horstkotte D. Management of prosthetic valve thrombosis. *Eur Heart J Suppl* 2001;3(suppl. Q):Q22–Q26.
169. Roudaut R, Lafitte S, Roudaut MF *et al*. Fibrinolysis of mechanical prosthetic valve thrombosis: a single-center study of 127 cases. *J Am Coll Cardiol* 2003;41:653–658.
170. Erbel R, Alfonso F, Boileau C *et al*. Diagnosis and management of aortic dissection. *Eur Heart J* 2001;22:1642–1681.
171. Angeja BG, Grossman W. Evaluation and management of diastolic heart failure. *Circulation* 2003;107:659–663.
172. Burkhoff D, Maurer MS, Packer M. Heart failure with a normal ejection fraction: is it really a disorder of diastolic function? *Circulation* 2003;107:656–658.
173. Dalrymple-Hay MJ, Monro JL, Livesey SA *et al*. Postinfarction ventricular septal rupture: the Wessex experience. *Semin Thorac Cardiovasc Surg* 1998;10:111–116.
174. Crenshaw BS, Granger CB, Birnbaum Y *et al*. Risk factors, angiographic patterns, and outcomes in patients with ventricular septal defect complicating acute myocardial infarction. GUSTO-I (Global Utilization of Streptokinase and TPA for Occluded Coronary Arteries) Trial Investigators. *Circulation* 2000;101:27–32.
175. Boersma E, Poldermans D, Bax JJ *et al*. Predictors of cardiac events after major vascular surgery: Role of clinical characteristics, dobutamine echocardiography, and beta-blocker therapy. *JAMA* 2001;285:1865–1873.

176. Anand IS, Chugh SS. Mechanisms and management of renal dysfunction in heart failure. *Curr Opin Cardiol* 1997;12:251–258.
177. Weinfeld MS, Chertow GM, Stevenson LW. Aggravated renal dysfunction during intensive therapy for advanced chronic heart failure. *Am Heart J* 1999;138:285–290.
178. Hillege HL, Girbes AR, de Kam PJ *et al*. Renal function, neurohormonal activation, and survival in patients with chronic heart failure. *Circulation* 2000;102:203–210.
179. Leier CV, Dei Cas L, Metra M. Clinical relevance and management of the major electrolyte abnormalities in congestive heart failure: hyponatremia, hypokalemia, and hypomagnesemia. *Am Heart J* 1994;128:564–574.
180. Agostoni PG, Marenzi GC, Sganzerla P *et al*. Lung-heart interaction as a substrate for the improvement in exercise capacity after body fluid volume depletion in moderate congestive heart failure. *Am J Cardiol* 1995;76:793–798.
181. Sharma A, Hermann DD, Mehta RL. Clinical benefit and approach of ultrafiltration in acute heart failure. *Cardiology* 2001;96:144–154.
182. Tepel M, van der Giet M, Schwarzfeld C *et al*. Prevention of radiographic-contrast-agent-induced reductions in renal function by acetylcysteine. *N Engl J Med* 2000;343:180–184.
183. Briguori C, Manganello F, Scarpato P *et al*. Acetylcysteine and contrast agent-associated nephrotoxicity. *J Am Coll Cardiol* 2002;40:298–303.
184. Chu VL, Cheng JW. Fenoldopam in the prevention of contrast media-induced acute renal failure. *Ann Pharmacother* 2001;35:1278–1282.
185. Marenzi G, Marana I, Lauri G *et al*. The prevention of radiocontrast-agent-induced nephropathy by hemofiltration. *N Engl J Med* 2003;349:1333–1340.
186. Kindman LA, Vagelos RH, Willson K *et al*. Abnormalities of pulmonary function in patients with congestive heart failure, and reversal with ipratropium bromide. *Am J Cardiol* 1994;73:258–262.
187. Kitchen JB, 3rd, Kastor JA. Pacing in acute myocardial infarction—indications, methods, hazards, and results. *Cardiovasc Clin* 1975;7:219–243.
188. Priori SG, Aliot E, Blomstrom-Lundqvist C *et al*. Task Force on Sudden Cardiac Death, European Society of Cardiology. *Europace* 2002;4:3–18.
189. Monsieurs KG, Handley AJ, Bossaert LL. European Resuscitation Council Guidelines 2000 for Automated External Defibrillation. A statement from the Basic Life Support and Automated External Defibrillation Working Group(1) and approved by the Executive Committee of the European Resuscitation Council. *Resuscitation* 2001;48:207–209.
190. Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Part 3: adult basic life support. The American Heart Association in collaboration with the International Liaison Committee on Resuscitation. *Circulation* 2000;102:122–159.
191. Mathew J, Hunsberger S, Fleg J *et al*. Incidence, predictive factors, and prognostic significance of supraventricular tachyarrhythmias in congestive heart failure. *Chest* 2000;118:914–922.
192. Effect of metoprolol CR/XL in chronic heart failure: Metoprolol CR/XL Randomised Intervention Trial in Congestive Heart Failure (MERIT-HF). *Lancet* 1999;353:2001–2007.
193. Pedersen OD, Bagger H, Keller N *et al*. Efficacy of dofetilide in the treatment of atrial fibrillation-flutter in patients with reduced left ventricular function: a Danish investigations of arrhythmia and mortality on dofetilide (diamond) substudy. *Circulation* 2001;104:292–296.
194. Blomstrom-Lundqvist C, Scheinman MM, Aliot EM *et al*. ACC/AHA/ESC guidelines for the management of patients with supraventricular arrhythmias—executive summary. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients with Supraventricular Arrhythmias) developed in collaboration with NASPE-Heart Rhythm Society. *J Am Coll Cardiol* 2003;42:1493–1531.
195. Hebbar AK, Hueston WJ. Management of common arrhythmias: Part I. Supraventricular arrhythmias. *Am Fam Physician* 2002;65:2479–2486.
196. The pre-hospital management of acute heart attacks. Recommendations of a Task Force of the The European Society of Cardiology and The European Resuscitation Council. *Eur Heart J* 1998;19:1140–1164.
197. Ellison KE, Stevenson WG, Sweeney MO *et al*. Catheter ablation for hemodynamically unstable monomorphic ventricular tachycardia. *J Cardiovasc Electrophysiol* 2000;11:41–44.
198. Pohjola-Sintonen S, Muller JE, Stone PH *et al*. Ventricular septal and free wall rupture complicating acute myocardial infarction: experience in the Multicenter Investigation of Limitation of Infarct Size. *Am Heart J* 1989;117:809–818.
199. London RE LS. The electrocardiographic signs of acute hemopericardium. *Circulation* 1962;25:780–786.
200. Lopez-Sendon J, Gonzalez A, Lopez de Sa E *et al*. Diagnosis of subacute ventricular wall rupture after acute myocardial infarction: sensitivity and specificity of clinical, hemodynamic and echocardiographic criteria. *J Am Coll Cardiol* 1992;19:1145–1153.
201. Zamorano J, Moreno R, Almeria C *et al*. Left ventricular free wall rupture during dobutamine stress echocardiography. *Rev Esp Cardiol* 2002;55:312–314.
202. Deja MA, Szostek J, Widenka K *et al*. Post infarction ventricular septal defect—can we do better? *Eur J Cardiothorac Surg* 2000;18:194–201.
203. Ryan TJ, Antman EM, Brooks NH *et al*. 1999 update: ACC/AHA Guidelines for the Management of Patients with Acute Myocardial Infarction: Executive Summary and Recommendations: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Acute Myocardial Infarction). *Circulation* 1999;100:1016–1030.
204. Haley JH, Sinak LJ, Tajik AJ *et al*. Dynamic left ventricular outflow tract obstruction in acute coronary syndromes: an important cause of new systolic murmur and cardiogenic shock. *Mayo Clin Proc* 1999;74:901–906.
205. Thompson CR, Buller CE, Sleeper LA *et al*. Cardiogenic shock due to acute severe mitral regurgitation complicating acute myocardial infarction: a report from the SHOCK Trial Registry. Should we use emergently revascularize Occluded Coronaries in cardiogenic shock? *J Am Coll Cardiol* 2000;36:1104–1109.
206. Tavakoli R, Weber A, Brunner-La Rocca H *et al*. Results of surgery for irreversible moderate to severe mitral valve regurgitation secondary to myocardial infarction. *Eur J Cardiothorac Surg* 2002;21:818–824.
207. Waksman R, Weiss AT, Gotsman MS *et al*. Intra-aortic balloon counterpulsation improves survival in cardiogenic shock complicating acute myocardial infarction. *Eur Heart J* 1993;14:71–74.
208. Stevenson LW, Kormos RL. Mechanical Cardiac Support 2000: Current applications and future trial design. *J Thorac Cardiovasc Surg* 2001;121:418–424.
209. Goldstein DJ, Oz MC, Rose EA. Implantable left ventricular assist devices. *N Engl J Med* 1998;339:1522–1533.
210. Delgado DH, Rao V, Ross HJ *et al*. Mechanical circulatory assistance: state of art. *Circulation* 2002;106:2046–2050.
211. Bartlett RH, Roloff DW, Custer JR *et al*. Extracorporeal life support: the University of Michigan experience. *JAMA* 2000;283:904–908.
212. Rose EA, Gelijns AC, Moskowitz AJ *et al*. Long-term mechanical left ventricular assistance for end-stage heart failure. *N Engl J Med* 2001;345:1435–1443.