Guidelines for the prevention, detection and management of people with chronic heart failure in Australia 2006

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ABSTRACT

- Chronic heart failure (CHF) is found in 1.5%–2.0% of Australians. Considered rare in people aged less than 45 years, its prevalence increases to over 10% in people aged ⩾ 65 years.
- CHF is one of the most common reasons for hospital admission and general practitioner consultation in the elderly (⩾ 70 years).
- Common causes of CHF are ischaemic heart disease (present in > 50% of new cases), hypertension (about two-thirds of cases) and idiopathic dilated cardiomyopathy (around 5%–10% of cases).
- Diagnosis is based on clinical features, chest x-ray and objective measurement of ventricular function (eg, echocardiography). Plasma levels of B-type natriuretic peptide (BNP) may have a role in diagnosis, primarily as a test for exclusion. Diagnosis may be strengthened by a beneficial clinical response to treatment(s) directed towards amelioration of symptoms.
- Management involves prevention, early detection, amelioration of disease progression, relief of symptoms, minimisation of exacerbations, and prolongation of survival.

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Australian data on the epidemiology and public health significance of chronic heart failure (CHF) are limited. Current estimates rely largely on information from large-scale population cohort studies in the United States and Europe.[1] While CHF is found in 1.5%–2.0% of Australians, the overall pattern of CHF shows that its incidence and prevalence rise markedly with age.[2,3] The point prevalence of CHF has been about 1% in people aged 50–59 years, 10% in people aged ⩾ 65 years, and over 50% in people aged ⩾ 85 years.[1,4]

Based on these international estimates and Australian data, about 300 000 Australians are believed to have CHF at any one time, and at least 10% of Australians aged over 65 years develop CHF.[5] In addition, extrapolation of more extensive Australian data suggests that, in the year 2000, there were more than 20 000 incident hospital admissions for CHF, particularly in the elderly (⩾ 70 years), and that it was associated with a total of 100 000 hospitalisations and contributed to 1.4 million days of hospital stay.[5,6] From a primary care perspective, CHF engenders a complexity of issues relating to its detection and optimal management, and is one of the most common reasons for elderly patients to consult a general practitioner. A survey of 341 Australian GPs estimated that, for every 100 patients aged over 60 years seen in general practice, 11 had known CHF and two would be newly diagnosed as having CHF based on clinical features and known aetiological factors.[7]

Overall, chronic cardiovascular disease accounts for more than $5 billion per year in health care costs in Australia,[8] and, although there are no precise data, CHF is estimated to contribute to more than $1 billion of these costs.[6] The major driver of CHF-related health care costs is hospitalisation (about two-thirds of total expenditure), the major preventable cost component being recurrent hospital stays. The cost burden of CHF in Australia is also expected to increase markedly because of:

- the ageing of the Australian population;
- the projected increase in the number of older people with common precursors of CHF (eg, coronary heart disease and hypertension);
- an increasing prevalence of obesity and metabolic syndromes;
- improved survival rates for people with CHF;
- a continued decline in case-fatality rates associated with acute coronary syndromes; and
- improved diagnosis of CHF because of increased use of sensitive (eg, echocardiography) and point-of-care (eg, B-type natriuretic peptide [BNP]) tests.

Treatment of CHF, with a variety of complementary approaches, has proven extremely effective, reducing morbidity and the cost burden while prolonging survival.

Causes and diagnosis of CHF

Common causes of CHF are ischaemic heart disease (present in > 50% of new cases), hypertension (about two-thirds of cases) and idiopathic dilated cardiomyopathy (around 5%–10% of cases). Systolic (impaired contractile function) and diastolic (impaired relaxation) heart failure often coexist; the distinction between them is relevant to the therapeutic approach. Diagnosis is based on well known clinical features and appropriate investigations, not only to confirm or exclude the diagnosis of CHF, but also to establish underlying causes for which particular treatment is necessary (see Box 1 for a diagnostic algorithm for CHF). In this position statement, CHF is defined as:

> A complex clinical syndrome with typical symptoms (eg, dyspnoea, fatigue) that can occur at rest or on effort that is characterised by objective evidence of an underlying structural abnormality OR cardiac dysfunction that impairs the ability of the ventricle to fill with or eject blood (particularly during exercise). A diagnosis of CHF may be further strengthened by a beneficial clinical response to treatment(s) directed towards amelioration of symptoms associated with this condition.

Recommendations relating to the diagnosis of CHF are shown in Box 2. The grades of recommendation for this position statement are listed below.[12]

A: Rich body of high-quality randomised controlled trial (RCT) data.

B: Limited body of RCT data or high-quality non-RCT data.

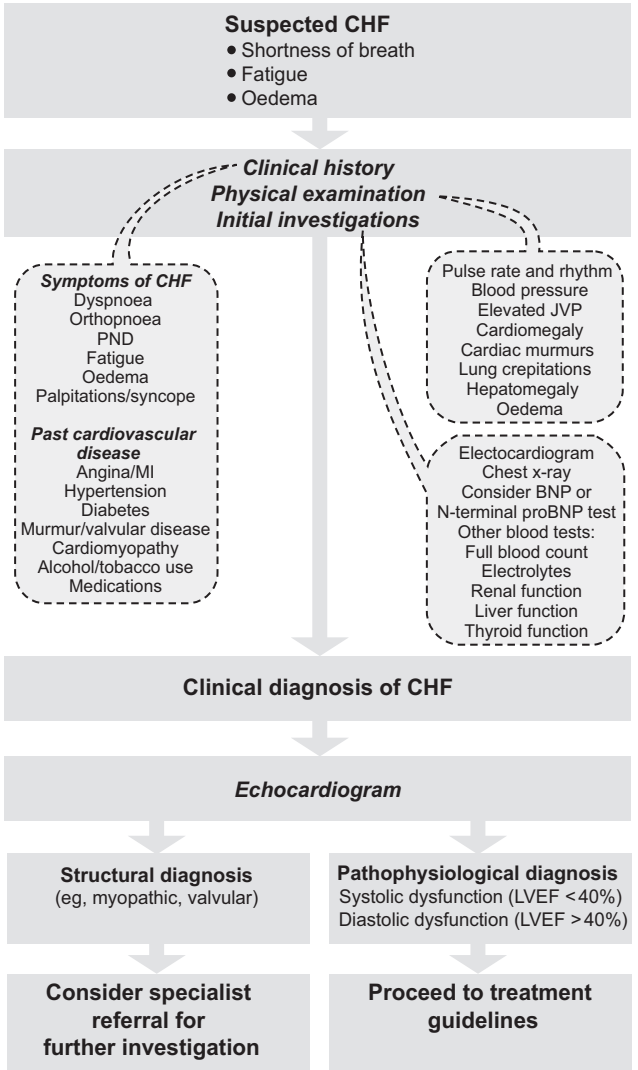
C: Limited evidence.

D: No evidence available — panel consensus judgement.

Supporting people with CHF

There are a range of effective strategies available to support people with CHF to improve and prolong their lives and achieve a good

1 Diagnostic algorithm for chronic heart failure (CHF)



PND = paroxysmal nocturnal dyspnoea. MI = myocardial infarction. JVP = jugular venous pressure. BNP = B-type natriuretic peptide. LVEF = left-ventricular ejection fraction. ◆

2 Recommendations for diagnostic investigation of chronic heart failure (CHF)

Recommendation	Grade of recommendation[12]
All patients with suspected CHF should have echocardiography to improve diagnostic accuracy and determine the mechanism of heart failure.	D
Coronary angiography should be considered in patients with a history of exertional angina or suspected ischaemic left-ventricular dysfunction.	D
Plasma BNP measurement may be helpful in patients presenting with recent onset dyspnoea; it has been shown to improve diagnostic accuracy with a high negative-predictive value.[9]	B
Haemodynamic measurements may be particularly helpful in patients with refractory CHF, recurrent diastolic CHF (HFPSF), or in whom the diagnosis of CHF is in doubt.[10]	D
Endomyocardial biopsy may be indicated in cardiomyopathy with recent onset of symptoms, where coronary heart disease has been excluded by angiography, or where an inflammatory or infiltrative process is suspected.[11]	D
Nuclear cardiology, stress echocardiography and positron emission tomography can be used to assess reversibility of ischaemia and viability of myocardium in patients with CHF who have myocardial dysfunction and coronary heart disease. Protocols have been developed using magnetic resonance imaging to assess ischaemia and myocardial viability, and to diagnose infiltrative disorders. However, magnetic resonance imaging is not widely available.	D
Thyroid function tests should be considered, especially in older patients without pre-existing coronary heart disease who develop atrial fibrillation or in whom no other cause of CHF is evident.	D

BNP = B-type natriuretic peptide. HFPSF = heart failure with preserved systolic function. ◆

end of life. These strategies include non-pharmacological management, pharmacotherapy, supportive devices, surgical procedures, post-discharge CHF management programs, and palliative care. Effective management of CHF requires a combination of these strategies and the full cooperation of patients and their families and care-givers whenever possible.

Non-pharmacological and pharmacological management

Routine instigation of non-pharmacological measures represents a central component of CHF management. This includes considering diet, exercise, and alcohol and fluid intake, as well as managing relevant comorbid conditions. These recommendations are summarised in Box 3.

Box 4 summarises pharmacological approaches to preventing and treating asymptomatic left-ventricular dysfunction. These include appropriate use of angiotensin-converting enzyme inhibitors (ACEIs) and β-blockers, as well as general management of patients with risk factors for ischaemic events.

Box 5 summarises recommendations for treatment of symptomatic chronic heart failure, divided into first-line agents (those that improve survival or alleviate symptoms), second-line agents, and others for patients who may have a specific need for such therapies.

Drugs to avoid or use with caution in CHF

- Antiarrhythmic agents (apart from β-blockers and amiodarone) should be avoided because of their proarrhythmic potential, negative inotropic effects, and associated increased mortality.
- Calcium antagonists that are direct negative inotropic agents, such as verapamil and diltiazem, are contraindicated in patients with systolic CHF. Dihydropyridine calcium antagonists such as amlodipine and felodipine do not improve survival in patients with systolic CHF, but can be used to treat comorbidities such as angina or hypertension in such patients.[33,34,48]
- Tricyclic antidepressants and type-I antiarrhythmic agents should be avoided because of their proarrhythmic potential.
- Non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided, as they can inhibit the effects of diuretics and ACEIs, and

3 Recommendations for non-pharmacological management of chronic heart failure (CHF)

Recommendation	Grade of recommendation[12]
Regular physical activity is recommended.[13] All patients should be referred to a specially designed physical activity program if available.[14-16]	B
Patient support by a doctor and a dedicated multidisciplinary team involving a comprehensive predischarge review and follow-up through a home visit or specialist CHF clinic is recommended to prevent clinical deterioration.[17,18]	A
Patients frequently have coexisting sleep apnoea; if suspected, patients should be referred to a sleep clinician as they may benefit from nasal continuous positive airway pressure.[19]	D
Patients who have an acute exacerbation, or are clinically unstable, should have a period of bed rest until their condition improves.[20]	D
Dietary sodium should be limited to below 2 g daily.[18]	C
Fluid intake should generally be limited to 1.5 L a day with mild to moderate symptoms and 1 L a day in severe cases, especially if there is coexistent hyponatraemia.[21]	C
Alcohol intake should generally be nil, but should not exceed 10–20 g a day (1–2 standard drinks).[21]	D
Smoking should be strongly discouraged.	D
Patients should be advised to weigh themselves daily and to consult their doctor if their weight increases by more than 2 kg in a 2-day period, or if they experience dyspnoea, oedema or abdominal bloating.	D
Patients should be vaccinated against influenza and pneumococcal disease.	B
High altitude destinations should be avoided. Travel to very humid or hot climates should be undertaken with caution and fluid status should be carefully monitored.	C
Sildenafil and other phosphodiesterase 5 inhibitors are generally safe in patients with heart failure. However, these medications are contraindicated in patients receiving nitrate therapy, or those who have hypotension, arrhythmias or angina pectoris.[22]	C
Obese patients should be advised to lose weight.	D
A diet with reduced saturated fat intake and a high fibre intake is encouraged.	D
No more than two cups of caffeinated beverages per day is recommended.	D
Pregnancy should be avoided.	D

4 Recommendations for preventing chronic heart failure (CHF) and treating asymptomatic left-ventricular (LV) dysfunction

Recommendation	Grade of recommendation[12]
All patients with asymptomatic systolic LV dysfunction should be treated with an ACEI indefinitely, unless intolerant.[23,24]	A
Antihypertensive therapy should be used to prevent subsequent CHF in patients with elevated blood pressure levels.[25-30]	A
Preventive treatment with an ACEI may be considered in individuals at high risk of ventricular dysfunction.[31]	B
β-Blocker therapy should be commenced early after a myocardial infarction, whether or not the patient has systolic ventricular dysfunction.[25,26]	B
Statin therapy should be used as part of a risk factor management strategy to prevent ischaemic events and subsequent CHF in patients who fulfil criteria for commencement of lipid-lowering therapy.[32]	B

ACEI = angiotensin-converting enzyme inhibitor. ◆

can worsen both cardiac and renal function.[49] Cyclooxygenase (COX)-2 inhibitors appear to have similar adverse effects on salt and water retention as do standard NSAIDs.[50]

- Corticosteroids also have adverse effects on salt and water retention and should be avoided, if possible.
- Thiazolidinediones, metformin and tumour necrosis factor antagonists should be used with caution in patients with CHF.

Outpatient treatment of advanced systolic heart failure

- Positive inotropic agents can improve cardiac performance during short-term and long-term therapy. β-Adrenergic agonists (eg, dobutamine) and phosphodiesterase inhibitors (eg, milrinone) enhance cardiac contractility by increasing myocardial levels of cyclic adenosine monophosphate.[51] However, despite favourable short-term haemodynamic and clinical effects, long-term oral therapy with positive inotropic agents has not been shown to reliably improve symptoms or clinical status, and has been associated with a significant increase in mortality.[52-54] For similar reasons, long-term intermittent infusions of positive inotropic drugs are not recommended.
- Levosimendan is a calcium-sensitising inotrope and vasodilator which may lead to improvements in outcomes compared with dobutamine and does not antagonise the effects of β-blockers.[55] Further studies are ongoing to establish the place of this agent in the management of advanced systolic CHF.

Devices

Current recommendations for biventricular pacing and implantable cardioverter defibrillator (ICD) treatment of symptomatic CHF

5 Recommendations for pharmacological treatment of symptomatic chronic heart failure (CHF)

Recommendation	Grade of recommendation[12]
First-line agents	
ACEIs, unless not tolerated or contraindicated, are recommended for all patients with systolic heart failure (LVEF < 40%), whether symptoms are mild, moderate or severe.[35,36]	A
Every effort should be made to increase doses of ACEIs to those shown to be of benefit in major trials.[37,38] If this is not possible, a lower dose of ACEI is preferable to none at all.	B
Diuretics should be used, if necessary, to achieve euvolaemia in fluid-overloaded patients. In patients with systolic left-ventricular dysfunction, diuretics should never be used as monotherapy but should always be combined with an ACEI to maintain euvolaemia.	D
β-Blockers are recommended, unless not tolerated or contraindicated, for all patients with systolic CHF who remain mildly to moderately symptomatic despite appropriate doses of ACEIs.[33,39-41]	A
β-Blockers are also indicated for patients with symptoms of advanced CHF.[41]	B
Aldosterone receptor blockade with spironolactone is recommended for patients who remain severely symptomatic, despite appropriate doses of ACEIs and diuretics.[42] Eplerenone is recommended in the early post-myocardial infarction period for patients with LV systolic dysfunction and symptoms of CHF.	B
Angiotensin II receptor antagonists may be used as an alternative for patients who do not tolerate ACEIs because of kinin-mediated adverse effects (eg, cough).[43] They should also be considered for reducing morbidity and mortality in patients with systolic CHF who remain symptomatic despite receiving ACEIs.[44]	A
Second-line agents	
Digoxin may be considered for symptom relief and to reduce hospitalisation in patients with advanced CHF.[45] It remains valuable therapy in CHF patients with atrial fibrillation.	B
Hydralazine–isosorbide dinitrate should be reserved for patients who are truly intolerant of ACEIs and angiotensin receptor antagonists, or for whom these agents are contraindicated and no other therapeutic option exists.[46]	B
Other agents	
Amlodipine and felodipine can be used to treat comorbidities, such as hypertension of coronary heart disease, in patients with systolic CHF. They have been shown to neither increase nor decrease mortality (personal communication, Milton Packer, Head, Department of Clinical Sciences, University of Texas, Southwestern Medical Centre, Dallas, Tex, USA).[34,47]	B

ACEI = angiotensin-converting enzyme inhibitor. LVEF = left-ventricular ejection fraction. ◆

are summarised in Box 6. This is a rapidly developing and somewhat contentious area of heart failure management. Many patients who meet criteria for biventricular pacing will meet criteria for ICD, in which case they should receive devices that combine these therapies.

Surgery

Left-ventricular aneurysmectomy may benefit patients with CHF in whom a large aneurysm can be excised, particularly if the remaining myocardium is functionally normal and there is minimal residual coronary artery disease.[58]

Left-ventricular free wall excision (frequently with concomitant mitral valve repair or replacement) aims to restore a normal myocardial mass-to-volume ratio in patients with severe left-ventricular dilatation. However, this procedure has not yet been subjected to clinical trials to define its place (if any) in managing CHF.[59] Non-stimulated synthetic wrapping of the heart, which passively restricts left-ventricular dilatation, has been evaluated, with promising initial results.[60]

Left-ventricular assist devices (LVADs) are most often used as a temporary bridge to cardiac transplantation or for recovery of the heart after cardiac surgery.[61] While they have occasionally been used as a long-term alternative to cardiac transplantation, no device has received regulatory approval for this indication. Their prohibitive cost and large size, the fact that only part of the device is implantable, and the risk of complications (especially infection and thromboembolism) limit the widespread use of currently available LVADs in patients with end-stage CHF.[62] Surgical management of mitral regurgitation can produce significant improvement in both symptoms and left-ventricular function.[63]

Cardiac transplantation is an accepted therapy for certain patients with refractory CHF who meet eligibility criteria.[64] The 5-year survival rate is 65%–75%, but a shortage of donors means it is available to very few patients.

Coronary revascularisation for coronary heart disease in patients with CHF

- Patients with coronary heart disease (CHD) who present with CHF (CHD–CHF) should be considered for coronary revascularisation after optimal pharmacological therapy has been started. Those with angina pectoris, a surrogate marker of viable ischaemic myocardium, are the more favourable candidates for coronary artery bypass graft surgery.[65] However, patients with diabetes and CHD–CHF, who may not manifest angina as a symptom, warrant a more objective assessment of their myocardial status before excluding revascularisation as a therapeutic option.
- For objective investigation of myocardial ischaemia and viability, dipyridamole and exercise thallium tests have been supplemented by positron emission tomography scanning and, more recently, cardiac magnetic resonance imaging. Individually, or in combination, these investigations can provide an objective assess-

6 Recommendations for device-based treatment of symptomatic chronic heart failure (CHF)

Recommendation	Grade of recommendation[12]
Biventricular pacing (cardiac resynchronisation therapy), with or without implantable cardioverter defibrillator, should be considered in patients with CHF who fulfil each of the following criteria:[56] • NYHA symptoms class III–IV on treatment • Dilated heart failure with LVEF ⩽ 35% • QRS duration ⩾ 120 ms • Sinus rhythm	A
Implantable cardioverter defibrillator implantation should be considered in patients with CHF who fulfil any of the following criteria:[57] • Survived cardiac arrest resulting from ventricular fibrillation or ventricular tachycardia not due to a transient or reversible cause • Spontaneous sustained ventricular tachycardia in association with structural coronary heart disease • LVEF ⩽ 30% measured at least 1 month after acute myocardial infarction or 3 months after coronary artery revascularisation surgery • Symptomatic CHF (NYHA functional class II–III) and LVEF ⩽ 35%	A

NYHA = New York Heart Association. LVEF = left-ventricular ejection fraction. ◆

ment of the potential benefit of coronary revascularisation in most patients with CHD–CHF.[66] However, there are no randomised controlled studies assessing the role of coronary revascularisation in treating heart failure symptoms.

- Adjunctive surgical procedures, including mitral valvuloplasty, surgical ventricular restoration (Dor procedure) and septal anterior ventricular exclusion (SAVE) procedures, may be performed in patients with CHD–CHF in combination with surgical revascularisation or, on occasion, as isolated procedures.

Acute exacerbations of CHF

The treatment of acute decompensated heart failure in those with underlying CHF is complex and involves appropriate use of oxygen and pharmacological therapies including diuretics and nitrates, as well as non-invasive mechanical therapies, such as continuous positive airway pressure via mask (CPAP), or bilevel non-invasive positive-pressure ventilation (BiPAP). Patients with decompensation refractory to these therapies may require inotropic support, assisted ventilation, intra-aortic balloon counterpulsation and, in extreme cases, ventricular assist devices.

Heart failure with preserved systolic function

The existence of heart failure with preserved systolic function (HFPSF) is universally accepted, although its precise definition, and hence, epidemiology, is subject to much debate. HFPSF is associated with an increased number of cardiovascular events and reduced survival, although less so than is systolic CHF.[67] Recommendations for treatment are based on expert opinion only, as no randomised controlled trial has yet shown morbidity or mortality benefits in patients with HFPSF.[68] Treatment comprises aggressive risk factor modification, including blood pressure reduction, strict glycaemic control and therapy directed against left-ventricular hypertrophy.[69]

Treatment of associated disorders

CHF is often accompanied by important comorbid conditions that require specific intervention. These include concomitant ischaemic heart disease, valvular disease, arrhythmia, arthritis, gout, renal dysfunction, anaemia, diabetes, and sleep apnoea (Box 7).

Postdischarge CHF management programs

Much of the burden of CHF is attributable to the large number of frail elderly patients in whom extensive comorbidity, poor coping skills, polypharmacy, and subsequent recurrent unplanned hospitalisations are common.[76] To optimise the often complex management of such patients, a range of specialist management programs have been developed. The most successful of these programs have incorporated the following features:

- targeting of high-risk (eg, frail elderly) individuals after acute hospitalisation;
- multidisciplinary approach;
- individualised care;
- patient education and counselling (often involving the family or carer);
- promotion of self-care behaviours;
- intensive follow-up to detect and address clinical problems proactively;
- strategies to apply evidence-based pharmacological treatment and to improve adherence;
- application of non-pharmacological strategies where appropriate (eg, fluid and electrolyte management, and exercise programs); and
- patient-initiated access to appropriate advice and support.[76]

Meta-analyses of randomised trials (including those undertaken in Australia) have shown that predominantly nurse-led, multidisciplinary programs of care, delivered either in the home or through specialist CHF clinics, significantly reduce the risk of rehospitalisation, improve quality of life, reduce health care costs and prolong survival.[77-81] Compared with treatment with ACEIs (numbers needed to treat [NNTs] to reduce mortality and CHF admissions being 19 and 16, respectively),[82] these programs of care compare very favourably; the equivalent NNTs being 17 to reduce mortality and 10 to reduce admissions.[78]

Based on a favourable economic analysis of a United Kingdom-wide CHF service[83] and the tangible benefits derived from the systematic management of CHF in New South Wales,[84] CHF management programs are now proliferating widely throughout Australia.

Palliative support

Quality of life for patients with severe CHF refractory to optimal pharmacological and non-pharmacological strategies can be poor, and comparable to that of patients with terminal malignancies.[85-87]

7 Treatment of associated disorders

Disorder	Main management considerations
Cardiac arrhythmia	
Atrial	• Long-term anticoagulation therapy (ie, warfarin) in patients with chronic atrial fibrillation[70]
	• Control ventricular response
	• Amiodarone, sotalol in patients at high risk of arrhythmia for prophylaxis against atrial tachyarrhythmia
Ventricular	• Implantable cardioverter defibrillator for symptomatic ventricular fibrillation/tachycardia and low ejection fraction[56]
	• Amiodarone provides no survival benefit[71]
	• Class I agents (eg, flecainide, disopyramide, quinidine, procainamide) are contraindicated
Valvular heart disease	• Consider surgical correction in appropriate patients
Coronary heart disease	• β-Blockers, nitrates, dihydropyridine calcium channel blockers
	• Perhexiline in patients with refractory angina
	• Avoid non-dihydropyridine calcium channel blockers
Arthritis	• Avoid cyclooxygenase-2 inhibitors and non-steroidal anti-inflammatory drugs[49]
	• Avoid high-dose aspirin
Chronic renal failure	• Angiotensin-converting enzyme inhibitors/angiotensin-receptor blockers are of benefit despite risk of further renal function worsening[72]
	• Caution with spironolactone because of risk of hyperkalaemia
	• Correct anaemia (eg, with erythropoietin)
Anaemia	• Exclude other causes
	• Consider erythropoietin[73]
Malignancy	• Caution with anthracyclines
Diabetes	• Caution with metformin, thiazolidinediones
	• β-Blockers are effective and should not be avoided[74]
Thromboembolism	• Role of warfarin remains uncertain in sinus rhythm[75]
Gout	• Avoid non-steroidal anti-inflammatory drugs, cyclooxygenase-2 inhibitors, steroids if possible
	• Colchicine is the preferred acute treatment option
	• Allopurinol if attacks are recurrent ◆

Survival rates are as poor as for patients with the most common form of cancer, with a case-fatality rate of 75% over 5 years overall in those hospitalised with CHF.[88]

Palliative care should be considered for patients with the strong possibility of death within 12 months and who have advanced symptoms (ie, New York Heart Association Class IV) and poor quality of life, resistant to optimal pharmacological and non-pharmacological therapies.[89-91] Strong markers of impending mortality include:

- advanced age;
- recurrent hospitalisation for decompensated heart failure and/or a related diagnosis;
- New York Heart Association Class IV symptoms;
- poor renal function;
- cardiac cachexia;
- low serum sodium concentration; and
- refractory hypotension necessitating withdrawal of medical therapy.

Ideally, the decision to alter the focus of management from one of clinical improvement to palliation should be taken in consultation with the patient's GP, a cardiologist or specialist physician, and a palliative care specialist, having carefully considered all available treatment options.

Summary

There is now substantial evidence that improved detection and appropriate management of patients with CHF improve their quality of life and prolong survival. Therapeutic strategies include appropriate diagnostic testing in patients suspected of having CHF, and applying evidence-based pharmacological and non-pharmacological approaches that encompass drug therapy, devices, surgery, and targeted management and palliative care programs where appropriate.

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