CLINICAL PRACTICE GUIDELINES

Management of chronic heart failure

Quick reference guide and summary of recommendations

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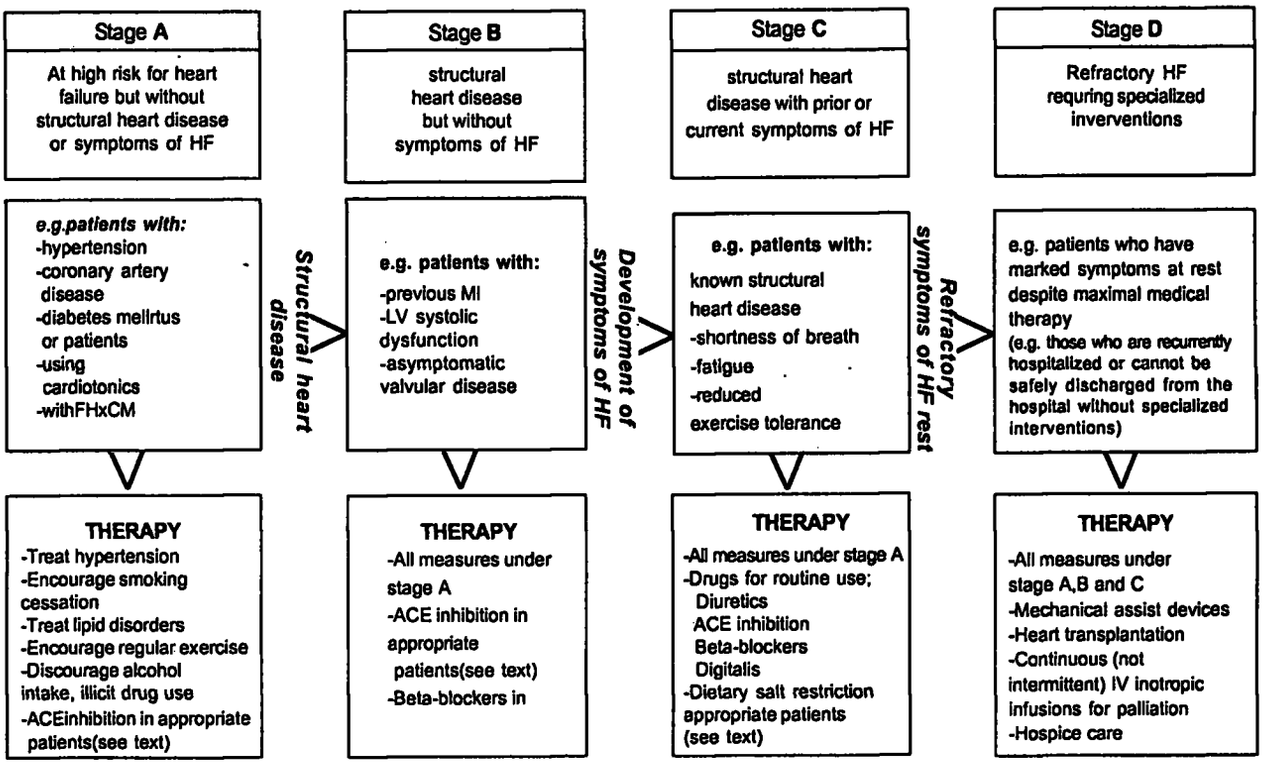
Aims of treatment

- Prevention
  - Prevention and/or controlling of diseases leading to cardiac dysfunction and heart failure
  - Prevention of progression to heart failure once cardiac dysfunction is established
- Reduce Morbidity Maintenance or improvement in quality of life
- Reduce Mortality Increased duration of life

Management outline

- Establish that the patient has heart failure
- Ascertain presenting features: pulmonary oedema, exertional breathlessness, fatigue, peripheral oedema
- Assess severity of symptoms
- Determine aetiology of heart failure
- Identify precipitating and exacerbating factors
- Identify concomitant diseases relevant to heart failure and its management
- Estimate prognosis
- Anticipate complications
- Counsel patient and relatives
- Choose appropriate management
- Monitor progress and manage accordingly

Different Stages of Heart Failure and Therapies Appropriate for Each Stage



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Diuretics

- Diuretics should be prescribed to all patients who have evidence of, and to most patients with a prior history of, fluid retention
- Diuretics produce symptomatic benefits more rapidly than any other drug for HF
- Diuretics are the only drugs used for the treatment of HF that can adequately control the fluid retention of HF
- Diuretics should not be used alone in the treatment of HF
- Appropriate and optimal use of diuretics is the cornerstone of any successful approach to the treatment of HF and is a key element in the success of other drugs used for the treatment of HF.

ACE Inhibitors

- Should be used for all grades of symptomatic HF
- Should also be given in asymptomatic left ventricular systolic dysfunction (LVSD)

Beta-blockers

- For patients with a recent myocardial infarction(MI) regardless of ejection fraction
- Patients with a reduced ejection fraction, whether or not they have experienced a MI
- All stable patients with symptomatic left ventricular dysfunction (LVD)
- Patients should have no or minimal fluid retention and should not have required treatment recently with an intravenous positive inotropic agent

Cardiac glycosides

- In atrial fibrillation (AF) with any degree of symptomatic HF, whether or not LVD is the cause, in order to slow the ventricular rate thereby improving left ventricular function and symptoms
- In AF, a combination of digoxin and beta blockade appears superior to either agent alone
- In sinus rhythm, digoxin is recommended to improve the clinical status of patients with persisting HF symptoms due to LVSD despite ACEI and diuretic treatment

Spiranolactone

- The addition of low doses of spironolactone should be considered in patients with recent or recurrent symptoms of at rest despite the use of digoxin, diuretics, an ACEI and (usually) a beta- blocker
- The role of spironolactone has not been defined in mild to moderate HF and the use of this drug cannot be recommended at present

Angiotensin II receptor antagonists (ARBs)

- Could be considered in patients who do not tolerate ACEI for symptomatic treatment

Positive Inotropic Agents

- Commonly used to limit episodes of severe HF or as a bridge to heart transplantation in end-stage HF. However, treatment-related complications may occur and their effect on prognosis is not well recognised
- Repeated or prolonged treatment with oral inotropic agents increases mortality
- Currently insufficient data are available to recommend dopaminergic agents for HF treatment

Drugs commonly used for treatment of chronic heart failure

Drug	Initial Dose	Maximum Dose
Loop diuretics		
Bumetanide	0.5 to 1.0mg once or twice daily	Titrate to achieve dry weight (up to 10mg daily)
Frusemide	20 to 40mg once or twice daily	Titrate to achieve dry weight (up to 400mg daily)
Torsemide	10 to 20mg once or twice daily	Titrate to achieve dry weight (up to 200mg daily)
ACE Inhibitors		
Captopril	6.25mg 3 times daily	50mg 3 times daily
Enalapril	2.5mg twice daily	10mg to 20mg twice daily
Fosinopril	5mg to 10mg once daily	40mg twice daily
Lisinopril	2.5mg to 5.0mg once daily	20mg to 40mg once daily
Quinapril	10mg twice daily	40mg twice daily
Ramipril	1.25mg to 2.5mg once daily	10mg once daily
Angiotensin 11 Receptor blockers [Antagonists] (ARBs)		
Losartan	12.5mg twice daily	50mg twice daily
Valsartan	40mg twice daily	16mg twice daily
Candersartan	4mg twice daily	16mg daily
Beta-receptor blockers		
Bisoprolol	1.25mg once daily	10mg once daily
Carvedilol	3.125mg twice daily	25mg twice daily:50mg twice daily for patients more than 85kg
Metoprolol tartrate	6.25mg twice daily	75mg twice daily
Digitalis glycosides		
Digoxin	0.125 to 0.25mg once daily	0.125 to 0.25mg once daily
Aldosterone antagonists		
Spironolactone	25mg once daily	50mg once daily

ACE indicate angiotensin converting enzyme.

** Thiazide diuretics are not listed in this table but may be appropriate for patients with mild heart failure or associated hypertension or as a second diurectic in patients refractory to loop diuretics alone.*

Treatment options (general advice and measures, exercise and exercise training, pharmacological therapy, devices and surgery)

Non-pharmacological management

- General advice and measures
- Exercise and exercise training

Pharmacological therapy

- Angiotensin-converting enzyme (ACE) inhibitors
- Diuretics
- Beta-adrenoceptor antagonists
- Aldosterone receptor antagonists
- Angiotensin receptor antagonists
- Cardiac glycosides
- Vasodilator agents (nitrates/hydralazine)
- Positive inotropic agents
- Anticoagulation
- Antiarrhythmic agents
- Oxygen

Devices and surgery

- Revascularization (catheter interventions and surgery), other forms of surgery
- Pacemakers
- Implantable cardioverter defibrillators (ICD)
- Heart transplantation, ventricular assist devices, artificial heart, ultrafiltration, haemodialysis

Most frequent causes of worsening heart failure

Non-cardiac

- Non-compliance to the prescribed regimen (salt, liquid, medication)
- Recently co-prescribed drugs (antiarrhythmics other than amiodarone, beta-blockers, non-steroidal anti-inflammatory drugs, verapamil, diltiazem)
- Alcohol abuse
- Renal dysfunction (excessive use of diuretics)
- Infection
- Pulmonary embolism
- Thyroid dysfunction (e.g.amiodarone)
- Anaemia (hidden bleeding)

Cardiac

- Atrial fibrillation
- Other supraventricular or ventricular arrhythmias
- Bradycardia
- Appearance or worsening of mitral or tricuspid regurgitation
- Myocardial ischaemia (frequently symptomless), including myocardial infarction
- Excessive preload reduction (diuretics+ACE inhibitors)

Summary of recommendations

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

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

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

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

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

Level A if the data are derived from multiple randomized clinical trials, **Level B** when data are derived from a single randomized trial or nonrandomized studies, and **Level C** when the consensus opinion of experts is the primary source of recommendation

Recommendations for the evaluation of patients with HF class I

1. Thorough history and physical examination to identify cardiac and noncardiac disorders that might lead to the development of HF or accelerate the progression of HF. (*Level of Evidence: C*)
2. Initial and ongoing assessment of a patient's ability to perform routine and desired activities of daily living. (*Level of Evidence: C*)
3. Initial and ongoing assessment of volume status. (*Level of Evidence: C*)
4. Initial measurement of complete blood count, urinalysis, serum electrolytes (including calcium and magnesium), blood urea nitrogen, serum creatinine, blood glucose, liver function tests, and thyroid-stimulating hormone. (*Level of Evidence: C*)
5. Serial monitoring of serum electrolytes and renal function. (*Level of Evidence: C*)
6. Initial 12-lead electrocardiogram and chest radiograph. (*Level of Evidence: C*)
7. Initial 2-dimensional echocardiography with Doppler or radionuclide ventriculography to assess left ventricular systolic function. (*Level of Evidence: C*)
8. Cardiac catheterization with coronary arteriography in patients with angina who are candidates for revascularization. (*Level of Evidence: B*)

Class IIa

1. Cardiac catheterization with coronary arteriography in patients with chest pain who have not had evaluation of their coronary anatomy and who have no contraindications to coronary revascularization. (*Level of Evidence: C*)
2. Cardiac catheterization with coronary arteriography in patients with known or suspected coronary artery disease but without angina who are candidates for revascularization. (*Level of Evidence: C*)
3. Non-invasive imaging to detect ischemia and viability in patients with known coronary artery disease and no angina who are being considered for revascularization. (*Level of Evidence: C*)
4. Maximal exercise testing with measurement of respiratory gas exchange and/or blood oxygen saturation to help determine whether HF is the cause of exercise limitation when the contribution of HF is uncertain. (*Level of Evidence: C*)
5. Maximal exercise testing with measurement of respiratory gas exchange to identify high-risk patients who are candidates for cardiac transplantation or other advanced treatments. (*Level of Evidenee: B*)
6. Echocardiography in asymptomatic first-degree relatives of patients with idiopathic dilated cardiomyopathy. (*Level of Evidence: C*)

7. Repeat measurement of ejection fraction in patients who have had a change in clinical status or who have experienced or recovered from a clinical event or received treatment that might have had a significant effect on cardiac function. (*Level of Evidence: C*)
8. Screening for hemochromatosis. (*Level of Evidence: C*)
9. Measurement of serum antinuclear antibody, rheumatoid factor, urinary vanillylmandelic acid, and metanephrines in selected patients. (*Level of Evidence: C*)

Class IIb

1. Noninvasive imaging to define the likelihood of coronary artery disease in patients with left ventricular dysfunction. (*Level of Evidence: C*)
2. Maximal exercise testing with measurement of respiratory gas exchange to facilitate prescription of an appropriate exercise program. (*Level of Evidence: C*)
3. Endomyocardial biopsy in patients in whom an inflammatory or infiltrative disorder of the heart is suspected. (*Level of Evidence: C*)
4. Assessment of HIV status. (*Level of Evidence: C*)

Class III

1. Endomyocardial biopsy in the routine evaluation of patients with HF. (*Level of Evidence: C*)
2. Routine Holter monitoring or signal-averaged electrocardiography. (*Level of Evidence: C*)
3. Repeat coronary arteriography or non-invasive testing for ischemia in patients for whom coronary artery disease has previously been excluded as the cause of left ventricular dysfunction. (*Level of Evidence: C*)
4. Routine measurement of circulating levels of norepinephrine or endothelin. (*Level of Evidence: C*)

Recommendations for patients at high risk of developing HF (Stage A)

Class I

1. Control of systolic and diastlic hypertension in accordance with recommended guidelines. (*Level of Evidence: A*)
2. Treatment of lipid disorders, in accordance with recommended guidelines. (*Level of Evidence: B*)
3. Avoidance of patient behaviors that may increase the risk of HF (e.g., smoking, alcohol consumption, and illicit drug use). (*Level of Evidence: C*)
4. ACE inhibition in patients with a history of atherosclerotic vascular disease, diabetes mellftus, or hypertension and associated cardiovascular risk factors. (*Level of Evidence: B*)
5. Control of ventricular rate in patients with supraventricular tachyarrhythmias. (*Level of Evidence: B*)
6. Treatment of thyroid disorders. (*Level of Evidence: C*)
7. Periodic evaluation for signs and symptoms of HF. (*Level of Evidence: C*)

Class IIa

Noninvasive evaluation of left ventricular function in patients with a strong family history of cardiomyopathy or in those receiving cardiotoxic interventions. (*Level of Evidence: C*)

Class III

1. Exercise to prevent the development of HF. (*Level of Evidence: C*)
2. Reduction of dietary salt beyond that which is prudent for healthy individuals in patients without hypertension or fluid retention. (*Level of Evidence: C*)
3. Routine testing to detect left ventricular dysfunction in patients without signs or symptoms of HF or evidence of structural heart disease. (*Level of Evidence: C*)
4. Routine use of nutritional supplements to prevent the development of structural heart disease. (*Level of Evidence: C*).

Recommendations for patients with asymptomatic left ventricular systolic dysfunction (Stage B)

Class I

1. ACE inhibition in patients with a recent or remote history of myocardial infarction regardless of ejection fraction. (*Level of Evidence: A*)
2. ACE inhibition in patients with a reduced ejection fraction, whether or not they have experienced a myocardial infarction. (*Level of Evidence: B*)
3. Beta-blockade in patients with a recent myocardial infarction regarfftess of ejection fraction. (*Level of Evidence: A*)
4. Beta-blockade in patients with a reduced ejection fraction, whether or not they have experienced a myocardial infarction. (*Level of Evidence: B*)
5. Valve replacement or repair for patients with hemodynamically significant valvular stenosis or regurgitation. (*Level of Evidence: B*)
6. Regular evaluation for signs and symptoms of HF. (*Level of Evidence: C*)
7. Measures listed as Class I recommendations for patients in Stage A.
   (*Levels of Evidence: A, B, and C as appropriate*).

Long-term treatment with systemic vasodilators in patients with severe aortic regurgitation. (*Level of Evidence: B*)

Class IIb

1. Treatment with digoxin in patients with left ventricular dysfunction who are in sinus rhythm. (*Level of Evidence: C*)
2. Reduction of dietary salt beyond that which is prudent for healthy individuals in patients without hypertension or fluid retention. (*Level of Evidence:* C)
3. Exercise to prevent the development of HF. (*Level of Evidence: C*)
4. Routine use of nutritional supplements to treat structural heart disease or prevent the development of symptoms of HF. (*Level of Evidence: C*)

Recommendations for treatment of symptomatic left ventricular systolic dysfunction (Stage C)

Class I

1. Diuretics in patients who have evidence of fluid retention. (*Level of Evidence: A*)
2. ACE inhibition in all patients, unless contraindicated. (see text). (*Level of Evidence: A*)
3. Beta-adrenergic blockade in all stable patients, unless contraindicated (see text). Patients should have no or minimal evidence of fluid retention and should not have required treatment recently with an intravenous positive inotropic agent. (*Level of Evidence: A*)
4. Digitalis for the treatment of symptoms of HF, unless contraindicated (see text). (*Level of Evidence: A*)
5. Withdrawal of drugs known to adversely affect the clinical status of patients (e.g., nonsteroidal anti-inflammatory drugs, most antiarrhythmic drugs, and most calcium channel blocking drugs; see text). (*Level of Evidence: B*)
6. Measures listed as Class I recommendations for patients in stages A and B. (*Levels of Evidence: A, B, and C as appropriate*).

Class IIa

1. Spironolactone in patients with recent or current Class IV symptoms, preserved renal function and a normal potassium concentration. (*Level of Evidence: B*)

2. Exercise training as an adjunctive approach to improve clinical status in ambulatory patients. (*Level of Evidence: A*)
3. Angiotensin receptor blockade in patients who are being treated with digitalis, diuretics, and a beta-blocker and who cannot be given an ACE inhibitor because of cough or angioedema. (*Level of Evidence: A*)
4. A combination of hydralazine and a nitrate in patients who are being treated with digitalis, diuretics, and a beta-blocker and who cannot be given an ACE inhibitor because of hypotension or renal insufficiency. (*Level of Evidence: B*)

Class IIb

1. Addition of an angiotensin receptor blocker to an ACE inhibitor. (*Level of Evidence: B*)
2. Addition of a nitrate (alone or in combination with hydralazine) to an ACE inhibitor in patients who are also being given digitalis, diuretics, and beta-biocker. (*Level of Evidence: B*)

Class III

1. Long-term intermittent use of an infusion of a positive inotropic drug. (*Level of Evidence: C*)
2. Use of an angiotensin receptor blocker instead of an ACE inhibitor in patients with HF who have not been given or who can tolerate an ACE inhibitor. (*Level of Evidence: B*)
3. Use of an angiotensin receptor blocker before a beta-blocker in patients with HF who are taking an ACE inhibitor. (*Level of Evidence: A*)
4. Use of a calcium channel blocking drug as a treatment for HF. (*Level of Evidence: B*)
5. Routine use of nutritional supplements (coenzyme Q10, carnitine, taurine, and antioxidants) or hormonal therapies (growth hormone or thyroid hormone) for the treatment of HF. (*Level of Evidence: C*)

Recommendations for patients with refractory end-stage HF (Stage D)

Class I

1. Meticulous identification and control of fluid retention. (*Level of Evidence: B*)
2. Referral for cardiac transplantation in eligible patients. (*Level of Evidence: B*)
3. Referral to an HF program with expertise in the management of refractory HF. (*Level of Evidence: A*)
4. Measures listed as class I recommendations for patients in Stages A, B, and C. (*Levels of Evidence: A, B, and C as appropriate*).

Class IIb

1. Pulmonary artery catheter placement to guide therapy in patients with persistently severe symptoms. (*Level of Evidence: C*)
2. Mitral valve repair or replacement for severe secondary mitral regurgitation. (*Level of Evidence: C*)
3. Continuous intravenous infusion of a positive inotropic agent for palliation of symptoms. (*Level of Evidence: C*)

Class III

1. Partial left ventriculectomy. (*Level of Evidence: C*)
2. Routine intermittent infusions of positive inotropic agents. (*Level of Evidence: B*)

Recommendations for management of concomitant diseases in patients with HF

Class I

1. Control of systolic and diastotic hypertension in patients with HF in accordance with recommended guidelines. (*Level of Evidence: A*)
2. Nitrates and beta-blockers (in conjunction with diuretics) for the treatment of angina in patients with HF. (*Level of Evidence: B*)

3. Coronary revascularization in patients who have both HF and angina. (*Level of Evidence: A*)
4. Anticoagulants in patients with HF who have paroxysmal or chronic atrial fibrillation or a previous thromboembolic event. (*Level of Evidence: A*)
5. Control of the ventricular response in patients with HF and atrial fibrillation with a beta-blocker (or amiodarone, if the beta-blocker is contraindicated or not tolerated). (*Level of Evidence: A*)
6. Beta-adrenergic blockade (unless contraindicated) in patients with HF to reduce the risk of sudden death. Patients should have no or minimal fluid retention and should not have recently required treatment with an intravenous positive inotropic agent. (*Level of Evidence: A*)
7. Implantable cardioverter-defibrillator (alone or in combination with amiodarone) in patients with HF who have a history of sudden death, ventricular fibrillation, or hemodynamicaliy destabilizing ventricular tachycardia. (*Level of Evidence: A*)

Class IIa

1. Antiplatelet agents for prevention of myocardial infarction and death in patients with HF who have underlying coronary artery disease. (*Level of Evidence: B*)
2. Digitalis to control the ventricular response in patients with HF and atrial fibrillation.(*Level of Evidence: A*)

Class IIb

1. Coronary revascularization in patients who have HF and coronary artery disease but no angina. (*Level of Evidence: B*)
2. Restoration of sinus rhythm by electrical cardioversion in patients with HF and atrial fibrillation. (*Level of Evidence: C*)
3. Amiodarone to prevent sudden death in patients with HF and asymptomatic ventricular arrhythmias. (*Level of Evidence: B*)
4. Anticoagulation in patients with HF who do not have atrial fibrillation or a previous thromboembolic event. (*Level of Evidence: B or C*)

Class III

1. Routine use of an implantable cardioverter-defibrillator in patients with HF. (*Level of Evidence: C*)
2. Class I or III antiarrhythmic drugs (except amiodarone) in patients with HF for the prevention or treatment of asymptomatic ventricular arrhythmias. (*Level of Evidence: A*)
3. Ambulatory electrocardiograph* monitoring for the detection of asymptomatic ventricular arrhythmias. (*Level of Evidence: A*)

Recommendations for management of HF and preserved systolic function

Class I

1. Control of systolic and diastolic hypertension, in accordance with published guidelines. (*Level of Evidence: A*)
2. Control of ventricular rate in patients with atrial fibrillation. (*Level of Evidence: C*)
3. Diuretics to control pulmonary congestion and peripheral edema. (*Level of Evidence: C*)

Class IIa

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

Class IIb

1. Restoration of sinus rhythm in patients with atrial fibrillation. (Level of Evidence:)
2. Use of beta-adrenergic blocking agents, ACE inhibitors, angiotensin receptor blockers, or calcium antagonists in patients with controlled hypertension to minimize symptoms of HF. (*Level of Evidence: C*)
3. Digitalis to minimize symptoms of HF. (*Level of Evidence: C*)