Heart failure management

Chronic heart failure may be compensated and stable with few signs and baseline symptoms, or decompensated with a recent clinical deterioration and physical evidence of impaired perfusion and oxygenation.

In cases of decompensation, always consider both the original aetiology of the heart failure and potential causes of any deterioration such as:

- Further/worsening ischaemia.
- Myocardial infarction (MI).
- Additional valvular or diastolic dysfunction.
- Infections.
- Arrhythmias - commonly atrial fibrillation (AF).
- Electrolyte imbalance.
- Worsening comorbidities - eg, anaemia, thyroid dysfunction, pulmonary disease, renal dysfunction, diabetes.
- New medications.

Patient education and self-care

Patient and family education and training in self-care are effective at improving adherence, symptom control, functional capacity and well-being. Topics should include:

- Nature and cause of symptoms.
- Available treatments, likely side-effects and responses.
- Recognition and reaction to symptoms - eg, flexible dosing of diuretics which can be titrated to symptoms, with advice as to when to contact the healthcare team.

- Risk factor modification.
- Dietary and exercise advice.
- Psychosocial aspects to the disease.
- Prognosis.

Specialist heart failure nurses

Community-based heart failure nurses provide an important adjunct to self-care, as well as a bridge to secondary care. Referral of those with moderate-to-severe heart failure to such a service improves symptom management, reduces hospital admissions and also assists in the transition to a palliative care approach when appropriate.

Lifestyle modification

Smoking

Encourage the patient who is a smoker to stop smoking; provide support with smoking cessation.

Diet and fluid intake

- Advise patients regarding good nutrition and provide help for obese patients to reduce their weight. Cachectic patients (weight loss over six months ≥6% of previous stable body weight) should be assessed by a dietician.
- Suggest patients should avoid foods with a high salt content and should not add salt to their food. Salt intake should not exceed 2-3 g per day. Consider moderate sodium restriction in severe congestive cardiac failure (CCF); take care that 'low-salt' alternatives are not overused, as they can be very rich in potassium which may be a problem for patients on angiotensin-converting enzyme (ACE) inhibitors or spironolactone.
- Advise patients with severe CCF, particularly in conjunction with hyponatraemia, to restrict their fluid intake sensibly. Take care to avoid excessive dehydration - particularly in elderly patients on high-dose diuretics.

- Patients can contribute to monitoring their fluid retention by regularly weighing themselves. Where there is a sudden, unexpected weight gain of ≥2 kg in three days, advice should be sought. Some patients may benefit from being able to vary their diuretic dose on the basis of regular weights. Self-weighing complements ongoing monitoring of weight in the GP surgery and hospital outpatient and inpatient wards.

Alcohol

Alcohol can act as a negative inotrope and increase blood pressure and the risk of arrhythmias. Restrict alcohol intake with a maximum intake of the recommended safe limits of alcohol. Advise abstention if there is alcohol-induced cardiomyopathy.

Exercise

Encouraging aerobic exercise, preferably as part of a supervised cardiac rehabilitation programme, has proven beneficial effect.[1]

Travel

New York Heart Association (NYHA) class I and II are not restricted in plane travel.[2] Oxygen may be required for class III and is recommended (with in-flight medical assistance) for class IV. High altitudes and travel to very hot and humid areas should be discouraged in symptomatic patients who may not adapt easily.

The Driver and Vehicle Licensing Agency (DVLA) need not be notified for private car use but LGV drivers are disqualified, if symptomatic.[3]

Sex and reproductive health

- There are no specific restrictions for sexual activity, although there is a slight risk of decompensation in those with NYHA class III-IV.
- Advise patients that symptoms such as dyspnoea, palpitations and angina are unlikely to occur related to sex unless similar symptoms are experienced with moderate exercise (eg, climbing two flights of stairs reasonably quickly).

- Sexual problems are common in patients with heart failure related to concurrent cardiovascular disease, side-effects of treatment (eg, beta-blockers) and psychological factors:
    - Sublingual glyceryl trinitrate may be used prophylactically against dyspnoea and chest pain during sex but nitrates must never be combined with phosphodiesterase inhibitors such as sildenafil.
    - Phosphodiesterase inhibitors are not currently recommended for use in those with advanced heart failure.
- Pregnancy risks worsening of heart failure, due to increased blood volume and cardiac output, and many relevant medications are contra-indicated in pregnancy. Potentially fertile women with heart failure should receive prenatal counselling to enable informed reproductive choice.

Mental health and well-being

Depression is very common in heart failure, occurring in at least 1 in 5 patients and at much higher levels in those with advanced disease. Screening and appropriate treatment should be considered in patients with heart failure.[4]

Immunisation

Annual influenza vaccination and single pneumococcal vaccination should be given.

Commonly used drugs[4] [5]

The 2018 National Institute for Health and Care Excellence (NICE) recommendations for treating heart failure state:

- Diuretics should be routinely used for the relief of congestive symptoms and fluid retention in people with heart failure, and titrated (up and down) according to need following the initiation of subsequent heart failure therapies.
- Calcium-channel blockers: **avoid** verapamil, diltiazem and short-acting dihydropyridine agents in people who have heart failure with reduced ejection fraction.

- Make the decision to prescribe **amiodarone** in consultation with a specialist.
- Offer an angiotensin-converting enzyme (ACE) inhibitor and a beta-blocker licensed for heart failure to people who have heart failure with reduced ejection fraction.
- Consider an **angiotensin-II receptor antagonist** licensed for heart failure as an alternative to an ACE inhibitor for people who have heart failure with reduced ejection fraction and intolerable side-effects with ACE inhibitors.
- Do not withhold treatment with a **beta-blocker** solely because of age or the presence of peripheral arterial disease, erectile dysfunction, diabetes, interstitial pulmonary disease or chronic obstructive pulmonary disease. Introduce beta-blockers in a 'start low, go slow' manner. Assess heart rate and clinical status after each titration. Measure blood pressure before and after each dose increment of a beta-blocker.
- Offer a **mineralocorticoid receptor antagonist**, in addition to an ACE inhibitor (or ARB) and beta-blocker, to people who have heart failure with reduced ejection fraction if they continue to have symptoms of heart failure.
- Further specialist treatment options include **ivabradine, sacubitril valsartan, hydralazine in combination with nitrate**, and **digoxin**.
- Anticoagulants for people who have heart failure and atrial fibrillation. In people with heart failure in sinus rhythm, anticoagulation should be considered for those with a history of thromboembolism, left ventricular aneurysm or intracardiac thrombus.
- **Vaccinations**: offer people with heart failure an annual vaccination against influenza. Offer people with heart failure vaccination against pneumococcal disease (only required once).

See also the separate Acute Pulmonary Oedema article.

ACE inhibitors

- **All** patients with an LVEF of 40% or less, regardless of symptom severity, should receive an ACE inhibitor unless contra-indicated or not tolerated.
- This is because ACE inhibitors have been shown to improve ventricular function and patient well-being, to reduce mortality and hospital admissions in many large clinical trials and to be indicated in all stages of left ventricular systolic dysfunction (LVSD).
- Contra-indications include a history of angio-oedema, bilateral renal artery stenosis, hyperkalaemia (>5 mmol/L), severe renal impairment (serum creatinine >220 µmol/L) and severe aortic stenosis.
- Check U&Es and renal function prior to starting treatment and then after 1-2 weeks of treatment or dose adjustment.
- Titrate the dose up after 2-4 weeks, provided there is no worsening of renal function or hyperkalaemia, aiming for the evidence-based target dose or maximum tolerated dose.
- Recheck U&Es at one, three and six months after achieving the maintenance dose, and twice-yearly thereafter.
- If renal function worsens, check and eliminate other nephrotoxic drugs such as non-steroidal anti-inflammatory drugs (NSAIDs). An increase of up to 50% from baseline or to an absolute creatinine concentration of 265 µmol/L is deemed acceptable; however, above this reduce the ACE inhibitor dose. Stop the ACE inhibitor where the creatinine concentration is ≥310 µmol/L.
- Warn the patient regarding initial symptoms of dizziness; where this does not improve with time or causes risk of falling, reduce the dose or stop other hypotensive medications. Switch to an angiotensin-II receptor antagonist if a chronic cough develops.

Diuretics

- Diuretics appear to reduce the risk of death and worsening of chronic heart failure.[6]
- Symptomatic failure usually requires loop diuretics such as furosemide. Diuretics give symptom relief but do not alter prognosis. They should usually be used in combination with an ACE inhibitor.

- Give initial doses intravenously (IV) in cases of severe failure, as their onset of action is faster (5 minutes compared with 1-2 hours po) and oral absorption may be reduced by intestinal mucosal oedema (bumetanide has slightly better bioavailability in the oedematous gut).
- Beware of both overtreatment and undertreatment with diuretics (start with a low dose and increase depending on the response); review clinical condition and electrolytes regularly - watch for hypokalaemia, hypovolaemia leading to circulatory collapse and uraemia, particularly in the older patient. Note that creatinine is not a reliable indicator of overall renal function and that glomerular filtration rate (GFR) may be reduced by up to 75% before it begins to rise, particularly in patients with a low muscle mass.
- Weight monitoring is invaluable in assessing the degree of fluid retention and optimal diuretic strategy. Aim to maintain 'dry weight' with the lowest achievable dose of diuretic.
- Where diuretic response is insufficient:
    - Check compliance and fluid intake.
    - Increase the dose of diuretic.
    - Consider switching from furosemide to bumetanide or torasemide.
    - Add an aldosterone antagonist.
    - Combine a loop diuretic with a thiazide (eg, metolazone).
    - Give the loop diuretic bd or on an empty stomach.
    - Consider short-term use of IV infusion of loop diuretic.
- Excessive diuresis increases the risk of hypotension and renal dysfunction associated with ACE inhibitor therapy. Where ACE inhibitors or aldosterone antagonists are used with a diuretic, potassium replacement is not usually required.

Beta-blockers

- Current guidance suggests that beta-blockers should be used in **all** patients with symptomatic heart failure and an LVEF ≤40%, where tolerated and not contra-indicated. Trial evidence shows beta-blockers increase ejection fraction and exercise tolerance and reduce morbidity, mortality and hospital admissions **additional** to that produced by co-prescription of ACE inhibitors.
- They should be initiated in stabilised patients already on diuretics and ACE inhibitors, regardless of whether or not symptoms persist.[5]
- Evidence for the benefit of beta-blockade in heart failure is limited to bisoprolol, carvedilol, metoprolol and nebivolol. NICE guidance states that if patients were already taking a non-recommended beta-blocker (such as atenolol) they should continue with this.
- A study looking at beta-blocker prescribing in British general practice showed that only about a fifth of patients with heart failure received beta-blockers.[7] A major barrier to this practice is the prior, long-standing contra-indication of beta-blockers in heart failure and concerns about the difficulty of initiating beta-blockers in such patients. They can be safely initiated/titrated in the community in elderly patients and others with relative contra-indications - eg, diabetes, mild hypotension, and fixed airways obstruction.
- Asthma, second- or third-degree heart block, sick sinus syndrome (without pacemaker) and sinus bradycardia (<50 beats per minute (bpm)) remain contra-indications to beta-blocker use.
- Initiate at a low dose, with increases every 2-3 weeks until the target evidence-based dose or maximum tolerated dose is reached.
- Monitor blood pressure and heart rate with each increase in dose. If hypotensive, discontinue other vasodilator drugs (eg, nitrates, calcium-channel blockers) where possible. Where bradycardia (<60 bpm) develops, stop other contributory medications (eg, digoxin, amiodarone).
- Do not abruptly stop beta-blockers, as this risks an MI or arrhythmia.

Angiotensin-II receptor antagonists[8]

- Candesartan and valsartan are now licensed for this indication. They do not cause the chronic cough side-effect associated with ACE inhibitors.

- ARBs are indicated for the treatment of heart failure with reduced ejection fraction only in patients who cannot tolerate an ACE inhibitor because of serious side-effects.
- The combination of ACE inhibitor and ARB should be restricted to patients with symptomatic heart failure with reduced ejection fraction receiving a beta-blocker who are unable to tolerate a mineralocorticoid receptor antagonist (see below). The combination of ACE inhibitor and ARB must be used under strict supervision.
- ARBs must only be used in patients with adequate renal function and a normal serum potassium. Serial monitoring of renal function and U&Es is vital, particularly when used in combination with an ACE inhibitor.

Mineralocorticoid/aldosterone receptor antagonists (MRAs)

- A low-dose aldosterone antagonist should be considered in all patients unless contra-indicated or not tolerated and in the absence of hyperkalaemia and significant renal dysfunction.
- The Eplerenone in Mild Patients Hospitalisation And Survival Study In Heart Failure (EMPHASIS-HF) looked at 2,737 patients with NYHA class II heart failure and an ejection fraction of no more than 35%. They received eplerenone (up to 50 mg daily) or placebo in addition to other recommended therapy. Results showed that as compared with placebo, eplerenone reduced both the risk of death and the risk of hospitalisation among patients with systolic heart failure and mild symptoms.[9] A relative risk reduction of 27% was seen in cardiovascular death or hospitalisation for heart failure (42%). Reductions were also seen in rates of death from any cause (24%), cardiovascular death (24%) or hospitalisation for any reason (23%).
- Hyperkalaemia is a potential risk but has not been seen under trial conditions. It is more common in clinical practice, particularly in elderly patients or those with poor renal function. The combination of an ACE inhibitor and aldosterone antagonist increases the risk of severe hyperkalaemia and careful monitoring is required.
- Measure renal function and U&Es at one week and four weeks after starting/increasing the dose. This should be repeated monthly for the first three months and then at least twice a year on maintenance treatment.

- Where breast tenderness or enlargement occurs, switch from spironolactone to eplerenone.

Ivabradine

Ivabradine is a drug that inhibits the If channel in the sinus node.[10] Its only known pharmacological effect is to slow the heart rate in patients in sinus rhythm. It does not slow the ventricular rate in AF.

- It has been shown to reduce cardiovascular death or hospitalisation for heart failure by 18%.[11]
- It also improved left ventricular function and quality of life.

Sacubitril valsartan[12]

NICE recommends sacubitril valsartan as an option for treating symptomatic chronic heart failure with reduced ejection fraction, only in people with NYHA class II to IV symptoms and with an LVEF of 35% or less and who are already taking a stable dose of ACE inhibitors or angiotensin-II receptor blockers.

Treatment with sacubitril valsartan should be started by a heart failure specialist with access to a multidisciplinary heart failure team. In the PARADIGM-HF trial, sacubitril valsartan was statistically significantly more clinically effective than enalapril at reducing hospitalisations and improving both overall mortality and cardiovascular mortality.

Digoxin

In patients with chronic heart failure, a rhythm-control strategy has not been shown to be superior to a rate-control strategy in reducing morbidity or mortality. Digoxin therefore has a limited role in heart failure management.

However, digoxin may have a useful role in the treatment of patients with heart failure who are in normal sinus rhythm.[13]

SGLT2 inhibitors

Dapagliflozin and empagliflozin are now recommended by NICE for treating symptomatic chronic heart failure, on the advice of a heart failure specialist. Dapagliflozin and empagliflozin can be used in symptomatic chronic heart failure with reduced ejection fraction. Only dapagliflozin is currently recommended with preserved or mildly reduced ejection fraction. They are used in addition to standard treatments, alongside:

- Angiotensin-converting enzyme (ACE) inhibitors or angiotensin-2 receptor blockers (ARBs), with beta-blockers, and, if tolerated, a mineralocorticoid receptor antagonist (MRA): **or**
- Sacubitril valsartan, with beta-blockers, and, if tolerated, an MRA.

The dose for each is 10mg daily.

When used for heart failure, dapagliflozin should not be initiated if the eGFR is less than 15 mL/minute/1.73m^2. Empagliflozin should be avoided if the eGFR is less than 20 mL/minute/1.73m^2

Diabetic patients must be counselled regarding the risk of diabetic ketoacidosis. SGLT2 inhibitors should be used with caution in patients at risk of volume depletion or hypotension.

Editor's note

Dr Krishna Vakharia, 12th December 2023

Empagliflozin for treating chronic heart failure with preserved or mildly reduced ejection fraction [14]

NICE has recommended empagliflozin as an option for treating symptomatic chronic heart failure with preserved or mildly reduced ejection fraction in adults.

Clinical trial evidence shows that empagliflozin plus routine, standard care reduces the combined risk of dying from cardiovascular causes or likelihood of first hospitalisation for heart failure compared with placebo plus standard care.

Opiates or opioids (morphine or diamorphine)

- Opiates such as morphine may be useful in some patients with acute pulmonary oedema, as they reduce anxiety and relieve distress associated with dyspnoea.

- Opiates are also thought to be venodilators, reducing cardiac filling pressures, preload and pulmonary congestion. They may also reduce sympathetic drive.
- However, opiates also induce nausea and depress respiratory drive, potentially increasing the need for invasive ventilation.

Drugs to treat cardiovascular comorbidity

Anticoagulants

Patients with severe heart failure have a greater incidence of strokes and emboli. Oral anticoagulation is recommended in patients with heart failure and permanent, persistent or paroxysmal AF without contra-indication to anticoagulation. It is also recommended for those with intracardiac thrombus or with evidence of systemic embolism.

Statins

In elderly patients with symptomatic chronic heart failure caused by coronary artery disease, secondary prevention with statins may reduce hospitalisations.

Drugs to avoid in heart failure

- Pro-anti-arrhythmics with potentially negative inotropic effects - eg, flecainide.
- Calcium-channel blockers - eg, verapamil, diltiazem (only amlodipine is advisable).
- Tricyclic antidepressants.
- Lithium.
- NSAIDs and cyclo-oxygenase-2 (COX-2) inhibitors.[15]
- Corticosteroids.
- Drugs prolonging QT interval and potentially precipitating ventricular arrhythmias - eg, erythromycin, terfenadine.

Non-drug therapies

- Where heart failure is caused, or exacerbated, by surgically correctable conditions, these should be detected and treated appropriately by:

    - Revascularisation - surgical (coronary artery bypass grafting) or radiological (percutaneous coronary intervention) techniques should be considered in selected heart failure patients with coronary artery disease.
    - Valvular disease - decisions regarding surgery should be individualised. Medical management of heart failure and comorbidities should be optimised prior to surgery. In 2021, NICE withdrew its recommendations on valvular surgery and percutaneous interventions - they were replaced with the NICE guideline on heart valve disease.

- Cardiomyoplasty and partial left ventriculectomy (Batista's operation) are **not** recommended as a treatment of heart failure or alternative to heart transplantation.[16]

- Cardiac resynchronisation therapy (CRT) is of benefit in patients with mild (NYHA class II) symptoms as well as in those who are more severely symptomatic.[17] CRT may be considered where patients are in sinus rhythm, have a low LVEF (≤30%), QRS duration is markedly prolonged and an ECG shows a left bundle branch morphology. This is irrespective of symptom severity.

- About 50% of deaths in patients with heart failure occur suddenly. This is especially true in those with milder symptoms. Most of these are related to ventricular arrhythmias. Prevention of sudden death is therefore an important goal and one for which implantable cardioverter defibrillators (ICDs) may be recommended for both primary and secondary prevention.

- ICDs, CRT with defibrillator or CRT with pacing are recommended as treatment options for people with heart failure who have left ventricular dysfunction with a LVEF of 35% or less.[18]

- The Sudden Cardiac Death in Heart Failure Trial looked at 2,521 patients with non-ischaemic dilated cardiomyopathy or ischaemic heart failure and no prior symptomatic ventricular arrhythmia. They had ejection fraction ≤35% and were in NYHA functional class II or III. These patients were randomised to placebo, amiodarone, or an ICD, in addition to conventional treatment. ICD treatment led to a relative risk reduction (in death) of 23% over a median follow-up of 45.5 months.[19] This benefit was additional to that gained with conventional treatment.
- Heart transplantation may be considered in selected patients when end-stage heart failure is reached without other treatment options. Constraints include lack of donor hearts and problems of rejection/long-term immunosuppression.
- Implantation of a left ventricular assist device may be considered for destination therapy in people ineligible for heart transplantation.[20]
- Percutaneous implantation of pulmonary artery pressure sensors is supported by NICE, provided standard arrangements are in place for clinical governance, consent and audit. Patient selection, monitoring and management should be done by a multidisciplinary team, including healthcare professionals experienced in managing chronic heart failure and interventional specialists experienced in right-heart catheterisation and inserting this device.

Post-discharge management for chronic heart failure

Following discharge from hospital, cardiac failure patients can either be monitored via a clinic-based outpatient service or by a home-based service.[21]

Both models of care principally rely on the appointment of a specialist heart failure nurse to provide healthcare designed to optimise drug therapy, promote self-care (eg, fluid and dietary management), provide a means for early detection of clinical deterioration and apply more appropriate follow-up according to the needs of each patient.

Clinic-based service

- This involves the establishment of a specific heart failure clinic that is usually situated in the hospital outpatient department.
- After hospitalisation, follow-up at a nurse-led heart failure clinic can improve survival and self-care behaviour in patients with heart failure as well as reduce the number of events, re-admissions and days in hospital.

Home-based service

- 'The Heart Manual' is a rehabilitation programme consisting of a self-help manual, supported by a facilitator.[22]
- A home-based programme for low- to moderate-risk patients is not inferior to a traditional centre-based programme.[21] However, the costs of travel are borne by the health service (as opposed to the patient) and individual social characteristics affect willingness to commit to the programme.

Hybrid service

Comprising home plus clinic-based follow-up.

Prognosis

- Prognosis is poor on the whole, with approximately 50% of people with heart failure dying within five years of diagnosis.[23]
- The mortality rate in the UK appears to be improving. A UK study found that the six-month mortality rate for people with heart failure had improved from 26% in 1995 to 14% in 2005.[24]
- The prognosis for people with heart failure and preserved LVEF is a little better than the prognosis for people with heart failure with reduced ejection fraction (HF-REF).
- The risk of sudden death in heart failure has declined with improvements in the treatments and sequential introduction of medications.[25]

Further reading

- Heart Failure Matters; Heart Failure Association of the European Society of Cardiology
- Insertion and use of implantable pulmonary artery pressure monitors in chronic heart failure; NICE Interventional Procedure Guidance, August 2013
- Extracorporeal membrane oxygenation (ECMO) for acute heart failure in adults; NICE Interventional Procedure Guidance, March 2014
- Diagnosing and managing acute heart failure in adults; NICE Clinical Guidelines (Oct 2014 - updated Nov 2021)
- National Heart Failure Audit annual reports; National Institute for Cardiovascular Outcomes Research
- Sacubitril valsartan for treating symptomatic chronic heart failure with reduced ejection fraction; NICE Technology Appraisal Guidance, April 2016
- Heart valve disease presenting in adults: investigation and management; NICE guideline (November 2021)
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