Investigation and management of congestive heart failure

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Congestive heart failure is a common condition that increases in prevalence with increasing age. In 2003, guidance from the National Institute for Health and Clinical Excellence acknowledged that the "rising epidemic of heart failure" is partly the result of people living longer and the more effective treatments for coronary heart disease now available. It also acknowledged, however, that average life expectancy is only about three years after diagnosis, which is much worse than for many other serious illnesses such as cancer of the breast or colon.[1] The condition is associated with poor quality of life, frequent hospital admissions, and poor survival,[2] although this may have changed with the advent of better treatments. Community estimates of prevalence vary from 1.6 to 4.6 cases per 1000 in men aged 45-74 years and from 0.9 to 2.2 cases per 1000 in women. About 1% of men develop heart failure after age 75 and almost 2% after 80 years.[3] This review discusses the immediate management of patients who present with the clinical syndrome of heart failure (usually a combination of dyspnoea, fatigue, exercise intolerance, and fluid retention) and the management of chronic congestive heart failure. It is based on evidence from guidelines, randomised controlled trials, and population cohorts followed for many years. We also emphasise the distinction between heart failure with low ejection fraction and heart failure with preserved ejection fraction because although plenty of evidence exists on how to treat the first entity very little exists on how to treat the second.

What are the clinical features of heart failure?

Heart failure is a clinical syndrome comprising reduced cardiac output, tissue hypoperfusion, and congestion.[4] Table 1 lists the common symptoms and signs of heart failure. In hospital, patients with heart failure typically present with shortness of breath, exercise intolerance, and leg swelling, and they may have most of the signs in table 1. Dyspnoea, fatigue, exercise intolerance, and fluid retention are common, but some of the other features may not be present. In the community, patients often present with less acute symptoms and fewer clinical signs, and the clinical diagnosis of heart failure can be difficult.

Fluid overload

Fluid retention may be present in patients who have dyspnoea, an increase in weight from baseline of more than 2 kg in under three days, raised jugular venous pressure, crepitations on chest auscultation, hepatomegaly, or signs of peripheral oedema.

Exercise tolerance

The degree of exertion needed to elicit symptoms such as breathlessness can be used to grade the severity of symptoms into one of four New York Heart Association functional classes (table 2). Functional class does not define the cause of heart failure or the underlying cardiac abnormality that contributes to the syndrome but the categories are associated with different prognoses. Disease classification may change—for example, during an acute exacerbation a patient may have class IV disease but have class I disease (asymptomatic) after recovery.

Left ventricular ejection fraction

Patients with heart failure may have impaired left ventricular systolic function, which is usually assessed on

SUMMARY POINTS

- Perform echocardiography in patients with certain or probable heart failure to refine the diagnosis and plan treatment
- Measure brain natriuretic peptide (BNP) in patients with an uncertain diagnosis
- A normal BNP result is better than electrocardiography for diagnosing heart failure and rules out heart failure; if raised perform echocardiography
- Echocardiography can determine the underlying structure and function of heart failure
- It is crucial to distinguish heart failure with low ejection fraction from that with preserved ejection fraction because most high quality evidence on treatment is for patients with low ejection fraction
- While waiting for echocardiography (or if not available) give an angiotensin converting enzyme inhibitor and β blocker (where possible) and uptitrate to maximum doses

SOURCES AND SELECTION CRITERIA

As well as using our personal reference collections, we searched the Cochrane database, *Clinical Evidence* and Best Practice (*BMJ* electronic textbook), and the US National Guideline Clearing House up to 18 March 2010. We also reviewed guidelines from the National Institute for Health and Clinical Excellence, Scottish Intercollegiate Guidelines Network, European Society of Cardiology, and the American College of Cardiology Foundation/American Heart Association. We selected systematic reviews and meta-analyses and when not available we used large randomised controlled trials.

Table 1 | Key factors for the diagnosis of heart failure (with or without low ejection fraction)[4]

Diagnostic factor	Comment
Dyspnoea made worse with sometimes minimal exertion	Most common symptom of left sided heart failure; has a sensitivity of 87% (only symptom that has a sensitivity >80%); need to rule out chronic obstructive pulmonary disease and pneumonia, which may coexist
Fatigue	Common because of poor tissue perfusion
Presence of risk factors for cardiovascular disease, including old age, male sex, previous cardiovascular disease, diabetes or dyslipidaemia, hypertension, left ventricular ejection fraction hypertrophy	All are risk factors for cardiovascular disease and congestive heart failure
Previous myocardial infarction	Single best predictor of congestive heart failure; when present the likelihood of congestive heart failure is 21 times greater[5]
Neck vein distension*	Major Framingham† criteria for congestive heart failure*
Third heart sound (S3 gallop)	Major Framingham criteria for congestive heart failure, with a specificity of 99% (almost never seen in other conditions)
Cardiomegaly, dilation, or hypertrophy	Major Framingham criteria for congestive heart failure, with a specificity of 85% (uncommon in other conditions); can be assessed by chest radiography, electrocardiography, or echocardiography
Hepatojugular reflux	Major Framingham criteria for congestive heart failure
Lung crepitations*	Major Framingham criteria for congestive heart failure, with a specificity of 81% (uncommon in other conditions)
Ankle oedema	Minor Framingham criteria for heart failure; congestive heart failure is more likely in men with this and is given more prominence in the Health Technology Assessment[3]
Tachycardia >120 beats/min	A minor Framingham criterion for congestive heart failure
Hepatomegaly*	A minor Framingham criterion for congestive heart failure with a specificity of 97% (uncommon in other conditions)
Night cough	A minor Framingham criterion for congestive heart failure
Pleural effusion (less than one third maximum vital capacity)	A minor Framingham criterion for congestive heart failure
Thyroid enlargement	May point to thyroid disease

*These signs are very specific but do not always occur (low sensitivity), which limits their usefulness.

†The Framingham study is a long term cohort study started in Framingham, Massachusetts, in 1948. Participants were seen every 2 years and checked for cardiovascular disease and risk factors. In 1971 their children were included in the study.[6]

echocardiography by measuring the left ventricular ejection fraction. However, as many as 50% of patients with the syndrome may have preserved left ventricular ejection fraction (usually defined as >50%), and currently little evidence is available to guide management in these patients (box 1). It is important to distinguish between those with a low ejection fraction and those with a preserved ejection fraction because most of the research into treatment has been done on those with low ejection fraction. Many descriptive studies have shown that patients with diagnosed heart failure in the community are undertreated.[8]

How is heart failure diagnosed?

A patient with heart failure may present in several different ways. Table 3 describes the investigations available and assesses their usefulness.

In those who almost certainly have clinical heart failure

Patients who are acutely unwell are usually admitted to hospital urgently. They may have acute pulmonary oedema. A bedside clinical assessment is usually sufficient to make a diagnosis without the need for further investigations. An echocardiogram will help to guide treatment for those with heart failure and low ejection fraction.

In those with probable clinical heart failure

In patients with less acute symptoms who have a constellation of clinical symptoms and signs suggestive of heart failure the clinician might have a high degree of clinical certainty. Early treatment may be initiated and the patient referred for electrocardiography, chest radiography, and echocardiography. Although access to echocardiography may be delayed or restricted in some locations, refer as a priority for echocardiography patients who are at high risk of heart failure (if they have a history of myocardial infarction, basal lung crepitations, or are male and have swollen ankles).

In those in whom the diagnosis is very uncertain

In patients presenting in the community who have coexisting respiratory disease or are elderly, the diagnosis of heart failure is often difficult to make. Such a diagnosis

Table 2 | New York Heart Association classification of congestive heart failure and associated evidence based treatments[7]

Class	Symptoms	Treatment if left ventricular ejection fraction is low	Treatment if left ventricular ejection fraction is preserved
Class I (mild)	No limitation of physical activity; ordinary physical activity does not cause undue fatigue, palpitation, or dyspnoea (shortness of breath)	ACE inhibitor*; consider a β blocker†	
Class II (mild)	Slight limitation of physical activity; comfortable at rest, but ordinary physical activity results in fatigue, palpitation, or dyspnoea	ACE inhibitor; β blocker; candesartan§ (specialist advice needed if adding to an ACE inhibitor)	Candesartan (specialist advice needed)
Class III (moderate)	Marked limitation of physical activity; comfortable at rest, but less than ordinary activity causes fatigue, palpitation, or dyspnoea	ACE inhibitor; β blocker; candesartan (specialist advice needed if adding to an ACE inhibitor); spironolactone‡; digoxin	Candesartan (specialist advice needed)
Class IV (severe)	Cannot carry out any physical activity without discomfort; symptoms of cardiac insufficiency at rest; discomfort increases if any physical activity is undertaken	ACE inhibitor; carvedilol or bisoprolol as β blocker; spironolactone‡; digoxin	Candesartan (specialist advice needed)

*Any angiotensin converting enzyme inhibitor (ACE) inhibitor is recommended but not all have been evaluated in clinical trials.
†Recommended β blockers are carvedilol, bisoprolol, nebivolol, and metoprolol succinate (not available in the UK).
‡Avoid giving an ACE inhibitor, angiotensin receptor blocker, and spironolactone together because of the risk of hypotension and hyperkalaemia.
§Uncertainty exists about angiotensin receptor blockers as a class because irbesartan is not effective whereas candesartan is.

Box 1 | The two types of heart failure

Heart failure with low left ventricular ejection fraction
Left ventricular systolic dysfunction, commonly assessed using the left ventricular ejection fraction, refers to impaired left ventricular pump (contractile) function, usually termed heart failure with low ejection fraction. This is most commonly assessed by echocardiography. It is essential to determine left ventricular systolic function because most of the evidence on the life saving use of angiotensin converting enzyme inhibitor, β blockers, and aldosterone antagonists is based on studies with patients who have heart failure with low ejection fraction. Extensive evidence is available to guide management, including drugs and device based treatments (primary implantable cardiac defibrillators and biventricular pacing) in this group of patients.

Heart failure with preserved left ventricular ejection fraction
Around 50% of patients with heart failure will have preserved left ventricular ejection fraction when assessed using echocardiography. Although many will have left ventricular diastolic dysfunction this is difficult to assess accurately in clinical practice. Such patients have the clinical syndrome of congestive heart failure, with similar symptoms and signs as those who have heart failure with low ejection fraction. Echocardiography is still essential because it will help to define this group of patients, although techniques such as cardiac catheterisation may be needed to assess left ventricular diastolic dysfunction.

Box 2 | Differential diagnosis of clinical heart failure syndrome

Breathlessness
Congestive heart failure
Renal failure
Depression, anxiety, or hyperventilation
Anaemia
Obesity
Chronic obstructive pulmonary disease
Pulmonary embolism
Atrial fibrillation

Oedema
Congestive heart failure
Renal failure
Depression (oedema as a result of inactivity)
Drugs (calcium channel blockers and non-steroidal anti-inflammatory drugs)
Benign ankle oedema
Obesity
Hypoalbuminaemia
Pulmonary embolism
Atrial fibrillation

can be improved by incorporating brain natriuretic peptide in clinical decision making pathways. The 2009 Health Technology Assessment group considers brain natriuretic peptide (measured using brain natriuretic peptide or N-terminal pro-B-type brain natriuretic peptide assays) better than electrocardiography for diagnosing congestive cardiac failure.[3] Low brain natriuretic peptide essentially rules out congestive heart failure as a cause of dyspnoea and guides investigation towards other causes, such as respiratory disease (see box 2 for differential diagnoses). All patients with confirmed congestive heart failure should undergo echocardiography to assess cardiac structure and function. Other tests discussed in table 3 can help establish a functional cause of heart failure or help guide drug treatments.

What treatments may be useful before results of diagnostic tests are available?

We suggest that when there is a strong clinical suspicion of congestive heart failure (with or without suggestive features on chest radiography and electrocardiography) but no access to echocardiography, patients should be given an angiotensin converting enzyme (ACE) inhibitor and a β blocker, titrated up to maximal doses (table 4). This means that patients with heart failure with low ejection fraction will be treated optimally and those with preserved ejection fraction will have their risk of cardiovascular disease lowered by virtue of a lower blood pressure. It is currently unclear if this approach would be beneficial or harmful but we would speculate that at least it would do no harm. For those with heart failure with preserved ejection fraction a change to candesartan could be considered once the diagnosis is confirmed. Although this approach is not ideal and extends beyond the current evidence, it is a pragmatic and reasonable approach to patient care in a resource poor environment because the adverse effects of ACE inhibitors and β blockers are not serious enough to limit their use.

How should a patient with heart failure be treated?[4 10]

Diuretics and assessment of fluid status

Consider treatment with diuretics in patients with heart failure who have dyspnoea or ankle or pulmonary oedema. These drugs should be given before or at the

Table 3 | Investigations for the clinical congestive heart failure syndrome[4]

Test	Information added
Echocardiography	The gold standard test—confirms the diagnosis of heart failure and distinguishes heart failure with low ejection fraction from that with preserved ejection fraction
BNP or NT-pro BNP	When low or normal this test rules out congestive heart failure; both assays are accurate; better than electrocardiography for congestive heart failure[3]
Chest radiography	Will show cardiomegaly and pulmonary venous hypertension; when abnormalities are present very specific; useful for diagnosing respiratory causes of breathlessness
Electrocardiography	If normal this rules out congestive heart failure; useful for other diagnostic purposes such as irregular pulse and cardiac ischaemia; BNP test preferred if available[3]
Spirometry	Can diagnose respiratory causes of dyspnoea; does not rule out congestive heart failure because respiratory conditions can coexist with congestive heart failure
Full blood count	Anaemia may explain congestive heart failure
Thyroid function	Hyperthyroidism or hypothyroidism can be reversible causes of congestive heart failure
Renal function (eg, creatinine)	May explain overload if abnormal and needed for drug dosing
Blood glucose or glycosolated haemoglobin (HbA_{1c}), lipids	Risk factors for cardiovascular disease that may need controlling
Liver function	Can be normal or raised; when raised may influence drug choice
Electrolytes	Of more interest once treatment has started

BNP=brain natriuretic peptide; NT-pro BNP=N-terminal pro-B-type brain natriuretic peptide.

Table 4 | Angiotensin converting enzyme (ACE) inhibitors and β blockers recommended for patients with heart failure and low ejection fraction*

Drug	Starting dose	Target dose	Comments
ACE inhibitors			
Captopril	6.25 mg TDS	50-100 TDS	Cough is a common adverse effect; monitor electrolytes and if creatinine increases >50% consider stopping; potassium can also rise
Cilazapril	0.5 mg OD	2.5 mg daily	As above
Enalapril	2.5 mg BD	10-20 mg daily	As above
Fosinopril	10 mg OD	40 mg OD	As above
Lisinopril[9]	2.5-5 mg	35 mg daily	As above
Perindopril	2 mg once daily	4 mg once daily	As above
Quinapril	2.5-5 mg OD	10-20 mg OD	As above
Ramipril	2.5 OD	5 mg BD or 10 mg OD	As above
β blockers			
Carvedilol†	3.125 mg BD	25-50 mg BD	Monitor all patients taking β blockers for bradycardia, atrial ventricular block, and bronchospasm
Bisoprolol	1.25 mg daily	10 mg daily	As above
Metoprolol succinate	23.75 mg daily	190 mg daily	Not to be used in New York Heart Association class IV disease
Nebivolol	1.25 mg daily	10 mg once daily	

*BD=twice daily; OD=once daily; TDS=three times daily.
†Carvedilol is preferred over metoprolol.[9]

same time as ACE inhibitors, and both should precede the start of β blockers. We have no clear evidence that diuretics have a positive effect on mortality.[1] Diuretics are used on an individual basis to reduce fluid retention. Avoid overtreatment, which can lead to dehydration and renal dysfunction, particularly with loop diuretics.[4] Hypovolaemia can be assessed by measuring supine and standing blood pressures. A postural drop in blood pressure that causes light headedness or unconsciousness indicates hypovolaemia, particularly in elderly patients with heart failure.[1] Bumetanide, furosemide, and torasemide (loop diuretics) act at the loop of Henle, whereas thiazides, metolazone, and potassium sparing agents (such as spironolactone) act in the distal portion of the tubule.[1] The addition of a thiazide diuretic or a potassium sparing diuretic (or both) to loop diuretics can be useful if pulmonary or ankle oedema persists,[4] because the different classes of diuretic are thought to have an additive effect. It is essential to monitor electrolytes in the early phase of diuretic administration. The side effects of diuretics, such as frequent micturition, are unpleasant, especially for elderly patients, and in those with stable symptoms (ideally on maximum doses of ACE inhibitor and β blocker) consider lowering the dose of the loop diuretic, stepping down to a thiazide diuretic, or stopping diuretics completely.

Evidence based drug based treatment in heart failure with low ejection fraction

If the patient has limited fluid retention or is back to their baseline weight an ACE inhibitor can be started at a low dose. It is common practice to start the ACE inhibitor before the β blocker. Several high quality clinical trials have shown that treatment with ACE inhibitors and β blockers at the suggested maximum doses reduces mortality and decreases hospital admissions in people with heart failure. It is important to try to achieve the maximum dose because these benefits have not been confirmed at lower doses.[1 10 11] The dose of ACE inhibitor can be increased every two weeks until the maximum dose is achieved. Consider this approach in all patients except those who have low blood pressure (<100 systolic), are clinically hypotensive, or have terminal comorbidities.[12] Once the maximum dose is achieved add one of the recommended β blockers. If the patient has been assessed for intolerance you can start at a low dose and double it every two weeks.[12] Both drugs can be started even in patients with some degree of dyspnoea, although ideally fluid retention should be minimal by the time the β blocker is started. Tailor treatment to the patient's needs and comorbidities—for example, negotiate with patients about up-titration or considering cardioselective β blockers in those with chronic obstructive pulmonary disease.[13] One study suggested that patients can increase doses at home if they live with an adult who can call for help if any (rare) severe adverse reactions occur.[14] If this is not the case patients could be given the increased dose in the practice surgery and then wait until it is safe to go home. Most patients cope well with increasing doses of β blockers, but up-titration requires a conscious commitment on the part of the clinician to maintain the momentum. For most patients treatment can be managed by primary care clinicians and does not require the input of secondary care clinicians.

Aldosterone antagonists for patients with heart failure with low ejection fraction[15 16]

A systematic review of randomised trials in patients with heart failure with low ejection fraction found that in those categorised as New York Heart Association class III or IV an aldosterone antagonist such as spironolactone may be life saving.[14] Hyperkalaemia is a recognised adverse effect, especially when starting the drug, so patients need to be monitored. Doses of spironolactone higher than 25 mg daily should be used with caution. The combination of spironolactone and an ACE inhibitor can result in worsening renal function or hyperkalaemia (or both), which can occur many months after starting treatment, and may occur at the time of intercurrent illness such as diarrhoea and vomiting. Advise patients to stop the drug themselves if such an illness occurs.

Adding digoxin

If dyspnoea remains a problem despite the treatment recommended above, digoxin may be used even in patients who are in sinus rhythm. A Cochrane systematic review showed that digoxin reduces the combined end point of death and hospital admission in those with both heart failure with low ejection fraction and heart failure with preserved ejection fraction, but most studies have been done on patients who were not taking a β blocker.[17 18]

Drug based treatment for patients with heart failure and preserved ejection fraction[19]

One large randomised controlled trial published in 2003 found that the angiotensin receptor blocker candesartan may reduce readmissions in patients with heart failure and preserved ejection fraction.[20] In this trial about 20% of patients were already taking an ACE inhibitor and about 50% were taking a β blocker. Another randomised

TIPS FOR NON-SPECIALISTS

- If heart failure is suspected but clinical uncertainty remains test for brain natriuretic peptide. A normal test result makes congestive heart failure unlikely. If the result is abnormal consider starting angiotensin converting enzyme inhibitor and β blocker while waiting for echocardiography
- Echocardiography is essential to determine whether the patient has impaired ejection fraction or preserved systolic function (usually assessed by left ventricular ejection fraction). It can also assess valve disease. Treatment for patients with heart failure and low ejection fraction has a clear evidence base, whereas treatment for those with preserved ejection fraction is less clear
- Ask patients to weigh themselves at the same time each day. If their weight goes up more than 2 kg in one to three days ask them to increase their loop diuretic and see their general practitioner. This is the simplest way for doctors and patients to assess fluid retention
- Consider giving all patients an angiotensin converting enzyme inhibitor. Once the maximum dose is achieved add a β blocker and increase to the maximum dose if possible. Try to do this for all patients with heart failure and in particular those with low ejection fraction. This can be done at home as long as another adult is present
- Use spironolactone and digoxin cautiously, perhaps with cardiological advice. It is essential to monitor serum potassium in patients taking spironolactone and other aldosterone antagonists. Extra care should be taken if creatinine is raised because most patients will be elderly and have poor renal function. Patients should be advised to stop the drugs if they become unwell, especially with vomiting and diarrhoea
- Once patients are stable on an angiotensin converting enzyme inhibitor and β blocker consider reducing the dose of their loop diuretic or stepping down to a thiazide and then cutting it out entirely if tolerated
- Patients with heart failure, low ejection fraction, and no complications can often be managed without cardiological advice. However, factors such as underlying cause of congestive heart failure or consideration of device based treatments (implantable cardiac defibrillator or biventricular pacing) may prompt early referral
- Consider referral for patients with heart failure caused by valvular disease, severe heart failure, symptomatic arrhythmia, women who are pregnant or planning a pregnancy, patients with renal failure with a creatinine concentration greater than 200 μmol/l, those with poorly controlled angina, and those not improving with guideline advised treatment

ADDITIONAL EDUCATIONAL RESOURCES

Resources for patients

Patient UK (www.patient.co.uk/health/Heart-Failure.htm)—Good overview pamphlet

British Cardiac Patients Association (www.bcpa.co.uk/)—Useful pamphlet on echocardiography

Resources for healthcare professionals

National Institute for Health and Clinical Excellence. Chronic heart failure. 2003. http://guidance.nice.org.uk/CG5/Guidance/pdf/English

Scottish Intercollegiate Guideline Network. Management of chronic heart failure. 2007. www.sign.ac.uk/pdf/sign95.pdf

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Management of Heart Failure in Adults; with the International Society for Heart and Lung Transplantation. The diagnosis and management of heart failure in adults. a focused update. *J Am Coll Cardiol* 2009;53:1343-82

European Society of Cardiology, Heart Failure Association of the ESC, European Society of Intensive Care. ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2008. *Eur J Heart Failure* 2008;10:933-89

TOPICS AND QUESTIONS FOR FUTURE RESEARCH

- Further research is needed on the treatment of patients with heart failure and preserved ejection fraction, in particular new treatment targets
- Is a high dose of β blocker more effective than a low dose?
- How feasible and effective is treatment guided by brain natriuretic peptide test results for patients with heart failure in primary care?
- How can we improve attempts at maximal dosing of angiotensin converting enzyme inhibitors and β blockers in primary care?
- Does salt and fluid restriction improve survival?
- Does exercise improve survival in heart failure?

trial found that the angiotensin receptor blocker irbesartan made no difference to mortality or readmissions when used in patients with heart failure and preserved ejection fraction.[21] However, because evidence to guide the use of other drugs is limited and treatment is largely empirical, management is probably best guided by advice from secondary care. Heart failure with preserved ejection fraction is commonly associated with hypertension, so effective management of blood pressure is important. Atrial fibrillation can also contribute to the heart failure syndrome in those with a preserved ejection fraction, and effective management of heart rate and anticoagulation is important in patients with atrial fibrillation.[22]

Other drugs

Scottish Intercollegiate Guidelines Network (SIGN) guidelines state that hydralazine and isosorbide dinitrate are options for patients who are intolerant of ACE inhibitors or angiotensin receptor blockers but should not be considered first line except in African-Americans.[23] Statins to lower cholesterol reduced ischaemic heart events in the Heart Protection Study and could be considered for those with suspected ischaemic heart disease.[24] The usefulness of antiplatelet agents for those without evidence of ischaemic heart disease is unclear.[12]

Education and multidisciplinary interventions[25]

Education regarding their condition should be available for all patients with congestive heart failure.[12] Education should cover self management strategies (including recognition of fluid retention with daily weight monitoring and a low salt diet) and use of drugs.[12] In our experience an action plan on what the patients should do in the case of worsening symptoms is useful. Multidisciplinary interventions such as structured nurse telephone contact with and without home visits are recommended by the SIGN group.[23] Randomised trials in which nurses could alter doses of diuretics reported reductions in combined end points of mortality and hospital readmission.[23] SIGN also reported improved adherence to drugs as a result of review by a pharmacist. A randomised trial of education and self management—which comprised clinical review at a hospital based heart failure clinic early after discharge, individual and group education sessions, a personal diary to record drugs and body weight, information booklets, and regular clinical follow-up alternating between the general practitioner and heart failure clinic—reported a reduction in hospital bed days and an improvement in quality of life.[26] However, most assessments of multidisciplinary interventions have been conducted in academic centres and the results may not generalise to smaller centres or community settings.

What non-drug based treatments are recommended?

Several non-drug treatments are available but most are not based on evidence from randomised trials. Approaches include sodium restriction, fluid restriction, daily weighing, avoiding alcohol and tobacco, and losing weight. Systematic reviews of exercise have shown benefits in terms of exercise tolerance and quality of life.[12]

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- Huntington's disease (*BMJ* 2010;340:c3109)
- Management of people with diabetes wanting to fast during Ramadan (*BMJ* 2010;340:c3053)

Discussing end of life care

Heart failure has a poor prognosis but predicting the illness trajectory can be difficult.[6] A paper from 2004 showed that the death rate for those with systolic dysfunction is 11.2% in 12 months and 29.9% in 36 months.[27] Another cohort study from the same year found that β blockers improved prognosis so death rates may improve with increased use of such drugs.[28] It is advisable to discuss end of life wishes, living with uncertainty, and the concerns surrounding possible sudden death with all patients who are diagnosed with heart failure.[6] A qualitative study of 40 patients with heart failure showed that the palliative care values of a "good death" from cancer may not apply to elderly people with heart failure.[29] An author of a book criticising the "over-medication" of fragile elderly people suggests asking patients whether they would like quality or quantity (longer life) of life.[30]

When and to whom to refer?

Patients with heart failure may need referral for cardiological assessment at any stage of assessment and treatment. Use clinical judgment and referral criteria to decide about referral on an individual basis. We recommend a low threshold for referral in view of the malignant nature of the heart failure syndrome. Patients with heart failure associated with clinical signs of valvular disease and those with severe coexisting angina usually require urgent referral early on in the assessment phase. Patients with severe heart failure or those who are not improving despite appropriate evidence based treatment, those with symptomatic arrhythmias, women being treated for heart failure syndrome who are pregnant or planning a pregnancy, patients with renal failure with a creatinine concentration greater than 200 µmol/l, and those with poorly controlled angina should be referred.[1]

Patients with heart failure with low ejection fraction may be candidates for device based treatments, such as a primary implantable cardiac defibrillator or biventricular pacing, once standard medical treatment has been optimised. Local and national guidelines are usually available to guide appropriate selection of patients for such treatments.

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