The diagnosis and management of chronic heart failure in the older patient

Neil D. Gillespie

Senior Lecturer in Medicine (Ageing & Health), University of Dundee, Ninewells Hospital & Medical School, Dundee DD1 9SY, United Kingdom

Chronic heart failure is a common problem in old age. Dyspnoea and fatigue are the most common symptoms and should alert the clinician to the likely diagnosis. When there is a clinical suspicion of heart failure, further assessment is required to confirm the aetiology. In older patients, heart failure with normal systolic function is frequently encountered. However, patients with left ventricular systolic dysfunction usually have a poorer prognosis, and most treatments have been evaluated in these patients. Useful investigations include the 12-lead electrocardiogram, chest radiology and echocardiography. A blood test for B-type natriuretic peptide is being increasingly used as a ‘rule out’ test for heart failure. There are several treatment options. Initially, patients should be treated with a diuretic and ACE inhibitor, provided there are no contraindications. β-Blocker therapy is also first-line therapy once a patients’ haemodynamic status has been stabilized. Additional treatments include spironolactone, angiotensin antagonists and digoxin. Patient factors and tolerability may limit the number of treatment options. Treatment regimes are most effective when delivered using a multidisciplinary approach.

Keywords: heart failure; diagnosis; treatment.

Introduction

Heart failure is predominantly a disease of old age, often varying in severity and presentation. In recent years, there have been considerable advances in the understanding of both the pathophysiology and approaches to treatment for patients with heart failure [1]. In younger patients, heart failure is often a consequence of myocardial infarction with resultant left ventricular remodelling and dilatation, while in older patients, the etiology is more likely to be influenced by a number of additional factors including hypertension, valvular heart disease and atrial fibrillation. Other heart failure aetiologies include the cardiomyopathies and reno-vascular disease, and additional non-cardiac disease such as anaemia can result in a symptomatic deterioration [2].
There has been increased attention on the diagnosis and management of patients with heart failure for many reasons, but an increase in the incidence and prevalence, due mainly to improved detection and diagnosis, means that the diagnosis and management remains a priority in all health-care settings. Severe heart failure with pulmonary oedema requires hospitalization, but effective early management can prevent the need for hospitalization, and as such is an area which is being increasingly developed [3].

Much of the literature concentrates on patients with left ventricular systolic dysfunction as a cause for their heart failure. These patients have a poor prognosis, and pharmacological therapy has been shown to improve morbidity and mortality. Estimates of the prevalence of heart failure with abnormal systolic function vary but may be as high as 10% in older patients [4]. However, many older patients have symptoms and signs of heart failure without systolic dysfunction [5]. This can lead to confusion regarding the precise diagnosis in individual patients given the number of contributing symptoms and signs. Precise definitions of left ventricular diastolic dysfunction are limited by technical considerations, but estimates of the prevalence in older patients suggest it could be as high as 30%. However, patients with normal systolic function heart failure have a better prognosis than those patients with systolic dysfunction [6]. As patients with abnormal systolic function have a poorer outlook, most effort has been directed at improving prognosis for these patients. However, heart failure with normal systolic function is not benign and has mortality in the region of 40% at 5 years.

Many definitions of heart failure have existed in the past but a consensus on a more precise definition has only been achieved in recent years. The European Society of Cardiology (ESC) definition [7] adds some clarity and includes reference to both symptoms and signs of heart disease together with consideration of structural heart disease while recognizing the importance of a response to treatment (Fig. 1). This simplifies the approach to assessment, diagnosis and treatment and can be used with other indices and guidelines such as the New York Heart Association (NYHA) classification and the AHA/ACC guidelines [8].

**Initial assessment**

The presentation of heart failure in older patients may be insidious or sudden with the onset of severe shortness of breath usually attributable to pulmonary oedema. However, patients may complain only of fatigue or lack of energy. When present, the classical symptoms of dyspnoea and orthopnoea make the diagnosis fairly easy to confirm [9]. Other symptoms may be present including peripheral oedema, but may have
The diagnosis and management of chronic heart failure in the older patient

many other causes. This may prove a problem in the primary-care setting where access to investigations may be limited. Additional issues include variation and fluctuation in the severity of symptoms. Exertional dyspnoea in older patients may also be as a result of physical deconditioning, and evaluation of those patients who are significantly overweight can be difficult. Often patients will have had a previous history of cardiac disease or hypertension, but this is not always the case. Table 1 lists some of the more common causes of heart failure in the older patient.

Clinical examination of patients can provide further useful information. Patients may have evidence of atrial fibrillation, a displaced apex

Table 1 Common causes of heart failure in older patients

<table>
<thead>
<tr>
<th>Myocardial infarction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary artery disease</td>
</tr>
<tr>
<td>Cardiac valvular disease</td>
</tr>
<tr>
<td>Left ventricular hypertrophy</td>
</tr>
<tr>
<td>Renovascular disease</td>
</tr>
<tr>
<td>Atrial fibrillation with rapid ventricular response</td>
</tr>
<tr>
<td>Anaemia</td>
</tr>
<tr>
<td>Thyrotoxicosis</td>
</tr>
</tbody>
</table>
beat or a cardiac murmur [10]. Signs such as an elevated JVP may confirm fluid overload, but may not always be indicative of cardiac disease and can be present in thromboembolic disease or renal failure. Given the large number of possible explanations for clinical signs, it can therefore be difficult to make a diagnosis of heart failure based on clinical signs alone [11]. Table 2 lists some of the important differential diagnoses to consider. A number of clinical studies have shown that in as many as half the cases of heart failure evaluated by general practitioners, the diagnosis was incorrect when compared with more objective evidence of disease [12]. This is important as the majority of patients with heart failure live independently in the community and only present to the larger hospital setting when symptoms become severe.

Given the difficulty of accurately diagnosing older patients with suspected heart failure, efforts have been made in recent years to improve access to investigations, but careful selection of patients is important to make the best use of available resources [13].

The NYHA classification is a useful way of categorizing the severity of heart failure in individual patients and this categorization also has prognostic utility.

### Investigations

The electrocardiogram (ECG) is a useful preliminary investigation in the assessment of the patient with suspected heart failure. If the ECG is entirely normal, it is unlikely that a patient has heart failure [14]. Abnormalities suggestive of heart failure include evidence of previous infarction, left ventricular hypertrophy, atrial fibrillation and left bundle branch block. A normal ECG should therefore make the clinician suspect some other cause for the presenting symptoms. If, however, the ECG is abnormal, a further objective assessment of the patient is required. In most cases, this would involve an echocardiogram. Echocardiography is the ideal investigation as information can be obtained

<table>
<thead>
<tr>
<th>Differential diagnoses of heart failure in older patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic obstructive pulmonary disease</td>
</tr>
<tr>
<td>Hypothyroidism</td>
</tr>
<tr>
<td>Depression</td>
</tr>
<tr>
<td>Anaemia</td>
</tr>
<tr>
<td>Diabetes</td>
</tr>
<tr>
<td>Chronic venous insufficiency</td>
</tr>
<tr>
<td>Liver disease</td>
</tr>
<tr>
<td>Renal disease</td>
</tr>
<tr>
<td>Pulmonary thromboembolic disease</td>
</tr>
</tbody>
</table>
about cardiac valves as well as ventricular function. This is important as information can be gathered regarding structural heart disease which can be used to categorize the severity of heart failure as suggested by recent ACC/AHA [15] guidelines. Additionally, obstructive valvular disease can be detected and other factors influencing the left ventricular preload. Older patients are more likely to have structural heart disease and this has implications for the choice of treatment for patients with aortic stenosis [16].

Where echocardiography is not readily available, additional information may be obtained from either plain chest radiology [17] or a blood sample for B-type natriuretic peptide (BNP) [18]. A chest X-ray may provide information about the presence or absence of cardiomegaly together with information regarding pulmonary congestion, such as the presence of fluid in the horizontal fissure or upper lobe pulmonary diversion. However, it may provide other clues to a cause of breathlessness such as the presence of chronic obstructive pulmonary disease or consolidation. However, a normal chest X-ray provides little additional information and cannot be used to exclude heart failure. Furthermore, a good quality chest radiograph can prove difficult to obtain in the older patient, particularly when there are chest wall abnormalities. Its optimum use is usually in patients with acute dyspnoea.

BNP levels may provide guidance, where available, as to how necessary further investigation may be in an individual patient. BNP is a cardiac neuropeptide and its plasma levels correlate well with the presence of cardiac dysfunction [19]. Plasma levels of BNP are elevated in patients with left ventricular systolic dysfunction and the level corresponds well with left ventricular function. Its levels are also elevated in other conditions, including renal impairment and cor pulmonale. As a result, it is most useful in excluding a diagnosis of heart failure. In addition, BNP has prognostic use [20]. However, this test is not yet routinely available in many health-care settings. A normal BNP level is good at ruling out heart failure. If a patient has a normal 12-lead ECG and a normal CXR but an elevated BNP, then further assessment by echocardiography would be advisable. The next few years should see a more widespread use of this test in routine clinical practice. Access to investigations depends on many factors. Hospitalized patients usually have fairly good access to echocardiography but community-based elderly patients, particularly those with mobility problems, may have more limited access to investigations. This has implications for diagnosis as these patients often have additional co-morbidities and pathologies, which can contribute to diagnostic uncertainty.

Individual patients may have had varying levels of assessment, but by combining the information available in individual patients, it may be possible to reach a diagnosis on the basis of some or all of these
mentioned investigations. While determining the extent of structural heart disease, it is important to remember that heart failure results not only because of structural heart disease but also because of maladaptations of the neuroendocrine system with resultant fluid overload. Where there is mild or little detectable structural heart disease, it may be possible to pharmacologically control the renin angiotensin system with greater ease than if there is severe structural heart disease, although this is not always the case.

Where an objective assessment of left ventricular function by echocardiography is required, this can usually be done qualitatively [21]. Measurement of ejection fraction may not always be necessary and M-mode measurements can be misleading if there is asymmetry of the left ventricle [22]. Where a detailed quantitative measurement of left ventricular function is required, this may be obtained by radionuclide ventriculography or cardiac catheterization for appropriate patients, such as those undergoing additional treatments such as coronary by-pass surgery. Attempts continue to be made to improve the access to echocardiography for those patients with suspected heart failure [23]. The introduction of more portable echocardiography may make this more achievable in practice [24].

While all the above mentioned investigations may be appropriate to an extent in the assessment of the older patient with heart failure, not every patient will require all of these investigations before treatment is commenced. Additional simple blood tests such as a FBC and serum electrolytes should be performed regularly in the older patient with a confirmed diagnosis of heart failure. Table 3 summarizes the initial investigations for an older patient with chronic heart failure.

**Treatment**

Once a patient with a suspected diagnosis of heart failure has had an objective assessment of their symptoms, it is important to tailor treatment accordingly, whilst minimizing risks of polypharmacy and drug interactions [25]. Ideally, older patients with heart failure benefit from a multidisciplinary assessment, and evidence suggests that this type of

<table>
<thead>
<tr>
<th>Table 3 Investigations for an older patient with suspected heart failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBC and serum biochemistry</td>
</tr>
<tr>
<td>12-lead electrocardiogram</td>
</tr>
<tr>
<td>Chest radiology</td>
</tr>
<tr>
<td>B-type natriuretic peptide</td>
</tr>
<tr>
<td>Echocardiography</td>
</tr>
</tbody>
</table>

British Medical Bulletin 2005;75 and 76
assessments result in improved overall management with reduced hospitalizations for episodes of decompensation [26]. Other approaches, including the deployment of heart failure nurses, appear to be effective at optimizing the delivery and coordination of care for all patients with heart failure [27].

Symptoms caused by fluid retention should be treated with diuretic therapy with titration aided by weight monitoring. Additional treatments for heart failure include treatment with an ACE inhibitor titrated carefully with particular attention paid to dosage and tolerability (Table 4), β-blockade, spironolactone or digoxin (Table 5). β-Blockers offer substantial benefits and should be used in patients who are stable, even without overt symptoms. The role of angiotensin antagonists is being increasingly recognized especially in patients in whom ACE inhibition is contraindicated. Each of these pharmacological options will now be discussed.

Diuretic therapy for heart failure [28] in many ways was pivotal until the role of the angiotensin–renin system was fully understood and modified pharmacologically. Reduction in left ventricular preload with loop diuretic therapy results in improved cardiac output as a result of improving stroke volume by compensating for failing left ventricular performance. The main therapeutic considerations are titrating the dose of diuretic and paying close attention to weight, postural blood pressure and electrolyte values. In older patients with disturbed fluid balance homeostasis, this can be problematic as often intravascular volume is low. Additional problems with incontinence of urine precipitated by diuretic usage exacerbate the situation for the patient. However, blockade of the angiotensin–renin system with other treatments may reduce

| Table 4 Regularly used ACE inhibitors in the management of patients with heart failure |
|---------------------------------|---------------------------------|
| Captopril | 6.25–12.5 mg initially, up to 25 mg three times daily |
| Enalapril | 2.5 mg initially, up to 20 mg in divided doses |
| Lisinopril | 2.5 mg initially, usually up to 20–40 mg daily |
| Fosinopril | 10 mg initially, up to 40 mg daily |
| Perindopril | 2 mg initially, 4 mg maintenance dosage |
| Quinapril | 2.5 mg initially, usually up to 40 mg |
| Ramipril | 1.5 mg initially, up to 10 mg daily |

| Table 5 Main treatment options for patients with heart failure |
|---------------------------------|---------------------------------|
| Diuretic therapy |
| Angiotensin-converting enzyme inhibitor |
| β-Blocker therapy |
| Spironolactone |
| Angiotensin antagonist |
| Digoxin |
the need for large doses of diuretic with all the resultant problems. Loop diuretics should be used at the lowest dose possible once excess fluid has been removed.

When patients are on long-term diuretic therapy, the dose should be kept to a minimum where possible and intravenous diuretics should be reserved for cases of severe fluid overload and pulmonary oedema. In the acute situation [29], alternatives to intravenous diuretics are increasingly used, including intravenous nitrates. For those patients with chronic resistant oedema, in the absence of other causes such as hypoalbuminaemia or renal disease, short-term use of more potent diuretics such as metolazone can be effective. Whatever the choice of diuretic, it is important that the dose is adjusted in keeping with the clinical condition of the patient, and advice from a heart failure nurse or clinical pharmacist may be helpful in this regard.

The evidence base for treating heart failure due to left ventricular systolic dysfunction with an ACE inhibitor is good [30]. Patients derive improvements in morbidity and mortality when patients with left ventricular systolic dysfunction are treated with an ACE inhibitor at the optimal dosage. The landmark clinical trials had differing entry criteria, but the consistent observation was that patients treated on an optimum dose of an ACE inhibitor derive benefit from treatment, as long as there were no major contraindications to therapy. The benefit of therapy appeared to be clear irrespective of the ACE inhibitor. Concerns about first dose postural hypotension seem to be less than originally thought, as the starting dosage regimes have been better evaluated.

The role of β-blockers in the management of heart failure had been uncertain for many years with only small studies suggesting benefit. The lack of adequately powered clinical trials until the mid 1990s meant that many issues remained unresolved. The major concerns related to the negatively inotropic effects of β-blockers in patients with heart failure. However, at least 4 major clinical trials have confirmed the role of β-blocker therapy in patients with heart failure, with complex modes of action possibly related to individual β-blockers. The studies confirmed about a one-third reduction in mortality for patients with heart failure [31–34].

The benefits in chronic heart failure are derived when patients are stable, although there is some evidence that β-blockers are effective in patients with even advanced NYHA class IV heart failure [35].

Benefits have been observed with metoprolol, carvedilol and bisoprolol in patients already established on treatment with diuretic and an ACE inhibitor. It is likely that modes of action may be different for each β-blocker as they have quite distinct pharmacological properties. For example, carvedilol is a non-selective β-blocker with alpha-adrenergic blocking activities, while metoprolol has relatively selective beta-1 blocking activities.
Some doubt remains as to the most effective β-blocker for use in heart failure. In the BEST study, little benefit from treatment with bucindolol was obtained [36]. In the COMET study, short-acting metoprolol appeared to be less effective than carvedilol in the treatment of chronic heart failure [37]. In the recently published SENIORS study, nebivolol had limited impact on all cause mortality and only a modest effect on hospital admissions [38]. The implications of this study are not fully clear, but the inclusion of patients with ejection fractions greater than 35% may be important in explaining the trial results.

Additional blockade of the renin–angiotensin system may be possible with angiotensin antagonists, but there is some suggestion that patients on all 3 treatments, i.e. ACE inhibitor, β-blocker and angiotensin antagonist may fare less well. Inevitably, problems with polypharmacy are an issue in older patients and are compounded with deteriorating renal function and impaired cardiovascular homeostatic feedback mechanisms. The therapy should be tailored to individual patients and strict fluid balance should be adhered to.

Where there is a recognized contraindication to ACE inhibition, the angiotensin antagonist candesartan has been shown to be well tolerated and reduces cardiovascular mortality and morbidity in patients with symptomatic chronic heart failure and intolerance to ACE inhibition. In the CHARM-Alternative trial [39], there was a significant reduction in hospital admission and cardiovascular death for those patients treated with candesartan. Other studies of angiotensin antagonists in patients with heart failure have had variable results. The Val-HeFT study for patients with NYHA class II–IV heart failure and an ejection fraction of less than 40% revealed a 13% reduction for a combined morbidity–mortality end point [40]. As many older patients have normal systolic function heart failure, the result of the ‘preserved’ arm of the CHARM study is of interest [41]. For those patients class II–IV with an ejection fraction of greater than 40% and NYHA heart failure, addition of candesartan to current treatments reduced hospital admission but had no impact on mortality. In the CHARM-Added evaluation, candesartan had additional benefit to patients already receiving an ACE inhibitor, and patients derived significant reduction in other cardiovascular end points [42].

The RALES study suggests that low dose spironolactone (up to 25 mg daily) may be beneficial in severe heart failure, with improvements in morbidity and mortality observed when used as an adjunct to standard therapy [43]. Older patients who receive spironolactone should have their renal function closely monitored and serum potassium levels should be monitored regularly.

Digoxin has been used in heart failure for many years and has a number of actions including that of a positive inotrope and an ability to block conduction through the atrioventricular node. Its role is mainly in...
controlling fast ventricular rates for patients with atrial fibrillation. It is best avoided in patients with atrial fibrillation who have no evidence of heart failure. Older patients with atrial fibrillation and heart failure are more prone to decompensation, as a loss of atrial systole, which occurs in atrial fibrillation has a greater haemodynamic significance. Such a decompensation may occur as a result of an intercurrent chest infection. The risks of digoxin toxicity become more marked in older patients who have hypokalemia.

Digoxin toxicity is an important clinical issue and is regularly encountered particularly when patients are on several medications where there remains a risk of adverse drug–drug interactions. The role of digoxin in heart failure in patients with sinus rhythm became a bit clearer as a result of a large multi-centre trial [44]. Patients treated with digoxin for heart failure did not derive any overall mortality benefit from treatment, but did have reduced hospitalizations. Additionally, older patients are more likely to have impaired renal function and as such be prone to digoxin toxicity. As a result, it is sensible to monitor the dose of digoxin, carefully utilizing as low a dose as possible, with monitoring digoxin levels in the plasma as an important consideration.

Anticoagulation should be considered in all patients who have heart failure and atrial fibrillation. Careful consideration is required before treatment commences when patients are frail and have associated cognitive impairment.

**Delivery of care**

The mode of delivery of treatment for patients with heart failure is an important issue. There is now good evidence to show that effective delivery of heart failure services can improve the management of patients with heart failure [45]. The multidisciplinary team has an important role to play especially with tailoring and monitoring treatment. The clinical pharmacist and heart failure nurse, where available, have important roles in the management of the older patient with heart failure. Coordination of care in this manner can reduce the need for hospitalization for heart failure and can result in improvement in quality of life for patients. Additional strategies which appear to be effective include the utilization of nurse practitioners who may follow up patients in their own home, following an episode of decompensated heart failure [46]. Specific areas where improved coordination of treatment may be important include the titration of β-blocker dose, adjusting diuretic dosage and evaluating and preventing adverse drug reactions. The nature of the multidisciplinary care may vary depending on the health-care setting and the available resources.
The majority of older patients with heart failure in the United Kingdom, however, are managed by their general practitioners [47]. The key issues in the management of patients with mild heart failure include symptom control and optimizing treatment regimes so that patients derive prognostic benefit from therapy by halting the progression of the disease, where necessary. However, there still remain some problems in providing patients in primary care with good access to investigative facilities such as electrocardiography and echocardiography. This may be a particular problem for more frail elderly patients who may have problems with mobility. However, as many as a third of these patients will not have heart failure, so effective assessment is important for the best utilization of scarce resources. Issues which are important include availability of echocardiography and access to specialist services.

However, the availability of guidelines may help general practitioners to be more aware of the key issues in the management of the patient with chronic heart failure.

Where heart failure is managed by the hospital specialist, the approach may be different depending on whether the patient is managed by a cardiologist, a general internal physician or a geriatrician. The minority of patients will be managed by cardiologists with the majority of patients reviewed by general physicians and geriatricians [48]. Evidence suggests that if older patients gain access to echocardiography, they are more likely to receive appropriate treatment of their heart failure.

While cardiologists are more likely to treat patients with therapy of proven benefit, the situation may be gradually improving amongst non-cardiologists and general practitioners. The introduction of clinical guidelines from SIGN [49] and NICE [50] have improved the frameworks for treating patients with heart failure, and the emergence of clinical governance frameworks should contribute to more patients receiving optimum treatment regimes [51]. However, there are often significant hurdles to implementing the recommendations of clinical trials into routine clinical practice. The advent of managed clinical networks may improve this. Specialist heart failure clinics [52] can improve the delivery of care for heart failure patients, although the majority of patients with heart failure are still not seen in a specialized clinic. As many patients with heart failure have a limited prognosis, optimum care must include approaches which minimize symptoms and distress. In this regard, the palliative aspects of heart failure management are being increasingly recognized [53].

While this article has concentrated on the drug management of patients with chronic heart failure, additional treatments are available for those with acute heart failure [54]. In general terms, it appears that positive inotropes have limited impact on mortality and if anything are arrhythmogenic. Patients with heart failure may also have additional
symptoms, and angina is not infrequently encountered. Those patients with angina who undergo coronary artery by-pass surgery may develop improvements in left ventricular systolic function especially if they have a pre-existing area of hibernating myocardium. Treatment of coexistent problems such as hypothyroidism or anaemia may also improve symptoms for those patients who are symptomatic [55]. Erythropoietin may also be useful in those patients who have coexistent renal disease. Cardiac rhythm problems may require anticoagulation for atrial fibrillation, and resynchronization therapy for some groups may result in symptomatic benefit.

Conclusions

This article has evaluated some of the key issues in the diagnosis and management of older patients with chronic heart failure. The diagnosis is sometimes not easy to make on clinical grounds, given the wide range of symptoms often encountered in the older patient. As such, patients should be investigated with an ECG, chest X-ray and echocardiogram, where possible. Following confirmation of left ventricular systolic dysfunction, although many older patients have normal systolic function heart failure, treatment options include a carefully chosen dose of diuretic therapy, ACE inhibitor, β-blocker, digoxin or possibly an angiotensin antagonist. Treatment is best when delivered as part of a multidisciplinary team, and coordinated care strategies may improve the delivery of care for patients with heart failure. Most older patients with heart failure will be managed by their general practitioners, and although significant improvements have been made in the diagnosis and management of heart failure in hospital practice, efforts are required to facilitate the optimum management of older patients with heart failure in a community setting.

References

6 Kerzner R, Gage B, Freedland K et al. Predictors of mortality in younger and older patients with heart failure and preserved or reduced left ventricular ejection fraction. Am Heart J 2003;146:286–90.
14 Hurst JW. Observational data suggesting there are electrocardiographic abnormalities that strongly suggest the presence of chronic heart failure. *Clin Cardiol* 2005;28:154–7.


Scottish Intercollegiate Guidelines Network. Diagnosis and treatment of heart failure due to left ventricular systolic dysfunction. SIGN 1999:35.

NICE guideline CG5 Chronic Heart Failure: Management of chronic heart failure in adults in primary and secondary care July 2003.


