Contemporary management of heart failure in clinical practice

J G F Cleland

Heart failure is common. It affects, depending on definition, between 1–5% of the population or between 0.5 and 3 million people in the UK. Prospective follow up of a large cohort of non-institutionalised elderly patients (aged >70 years) over six years showed that 15% developed heart failure before they died and that 24% of all deaths over this period were preceded by heart failure. Heart failure is the most common reason for admission to hospital in people aged over 60 years and complicates many more admissions. Using narrowly defined criteria, about 5% of medical beds are occupied by patients with heart failure, but broader definitions of heart failure suggest it may be 2–4 times this figure. A survey of elective, non-cardiovascular, surgical admissions suggested that 14% of patients also suffered from heart failure.

Heart failure is disabling. As reported above, heart failure is sufficiently debilitating to cause a large number of hospital admissions. It is also the most common reason for early readmission of patients. Studies conducted in non-hospitalised patients suggest that heart failure continues to cause gross impairment of the quality of life after discharge. A recent large European survey of heart failure in primary care suggested that half of patients remained moderately or severely symptomatic on therapy, perhaps because treatment was suboptimal for most patients. Heart failure is also an important risk factor for stroke and renal failure.

Heart failure is deadly. The three year mortality of patients with new onset heart failure is about 60%, with evidence of a small improvement over the last 15 years. Mortality is biphasic, with a six month mortality of 35–40% and a 7–10% six month survivors are considered, then the annual mortality in this group is about 15%. However, in-patient mortality may exceed 15%.

Importantly, heart failure is treatable. Randomised controlled trials indicate that angiotensin converting enzyme (ACE) inhibitors and β blockers may have reduced two year mortality from 34% to 14%. In patients with more severe heart failure other agents such as spironolactone and levosimendan may provide additional benefit. Large trials of antithrombotic treatment and revascularisation in patients with heart failure will provide information on whether these interventions may bring further benefits.

These are many practical guidelines—local, national, and international—for the diagnosis and treatment of heart failure. The European Society of Cardiology, by way first of a task force and later a working group on heart failure, has published guidelines for the diagnosis and treatment of heart failure, and these have recently been revised. Many different healthcare professionals, in both primary and secondary care, are involved in the management of patients with heart failure and should have intimate knowledge of these guidelines or know who to refer to if they do not.

The burden of the disease and the resources required to manage it are likely to escalate over the coming decades as the population ages. Paradoxically, improvement in the treatment of hypertension and myocardial infarction, although delaying the onset of heart failure, may increase its incidence further. Deployment of effective treatments for heart failure will increase the prevalence of heart failure by extending life.

A clear understanding of the challenge set by heart failure is thus of considerable interest for the community and health services. However, there are serious gaps in our knowledge.

**Sources of information about the natural history and management of heart failure**

Although it may appear that we know a lot about heart failure, there is still a great deal to learn. Clinical trials provide important, detailed information on the natural history of large numbers of highly selected patients with heart failure (table 1). The characteristics and management of patients in clinical practice may differ substantially from those in clinical trials. In contrast, true epidemiological studies of heart failure include small numbers of relatively unselected patients with heart failure. A third source of information is databases that report hospital discharge coding. These provide very large numbers of patients who are relatively unselected but in whom only limited clinical information is available. Information on comorbid conditions other than the principal diagnosis is often poorly recorded. There is also evidence of substantial miscoding which underestimates rather than overestimates the true contribution of heart failure to hospital admissions. Neither clinical trials nor epidemiological databases have provided information on how patients with suspected heart failure present, how they are investigated, or what the outcomes of investigation are. There are no comparative international data in secondary care to help establish whether important international differences in the management of heart failure exist.

Surveys of clinical practice, that attempt to interfere minimally with current clinical practice, provide an important link between detailed epidemiological studies and the crude data provided by hospital discharge statistics.

**Current knowledge about the management of heart failure in clinical practice**

A substantial number of published reports, usually reporting on small numbers of patients from individual centres, suggest that heart failure is not well managed. These surveys may not be representative of actual practice, either because they were conducted in selected patient groups in expert centres, in which case actual practice may be worse, or because they were conducted in response to perceived deficiencies in local practice, in which case current practice may be better than the published evidence suggests.

Many patients with heart failure are reported not to be receiving ACE inhibitors, although this may be improving. Doses used are often lower than are known to be clinically effective. It is not clear to what extent the apparent underuse of ACE inhibitors is due to appropriate withholding of treatment in patients with heart failure associated with normal systolic function, and what proportion of patients have a relative or absolute contraindication to ACE inhibitor use. The apparent therapeutic shortfall with ACE inhibitors could be appropriate or related primarily to a lack of adequate diagnosis.
The use of β blockers is even lower than for ACE inhibitors. This is to be expected given the fact that conclusive evidence of the benefits of β blockers has been acquired only within the past few years. In clinical practice, very few patients receive the combination of ACE inhibitors and β blockers.25 As with ACE inhibitors, patients with heart failure caused by problems other than left ventricular systolic dysfunction are not known to benefit.

Diagnostic uncertainty may be one of the most important reasons for under treatment. Single centre studies show that a community diagnosis of heart failure by clinical means alone appears wrong in about 50% of cases.61-63 The diagnostic uncertainty of a hospital diagnosis has not been adequately explored. Although a hospital diagnosis of heart failure by clinical means alone may be more accurate than in the community, this is a supposition. It is clear that echocardiography is not performed routinely for patients with suspected heart failure in some hospitals.64 Studies show, and guidelines reinforce, the inadequacy of diagnosis by clinical means alone.

Failure to deliver appropriate treatment for heart failure may be a direct result of a lack of adequate diagnosis.

IMPACT OF HOSPITALISATION ON CARE

The hospital is a critical point of care for heart failure because it is here that diagnosis and management are likely to be revised. Up to 80% of first diagnoses of heart failure occur at the time of hospitalisation65-67 and one third of patients with heart failure will be hospitalised within any given year.68 reflecting the more severe end of the disease spectrum in terms of morbidity and mortality. Mortality during and in the immediate aftermath of admission is high and many patients with heart failure will be rehospitalised within the following six months.69-71 Hospitalisation accounts for ~65% of healthcare costs in managing heart failure. Good medical care, based on an accurate diagnosis and appropriate treatment, is effective in reducing mortality and readmission to hospital. Accordingly, it seems appropriate to target such patients for special care and attention.

EUROPEAN SOCIETY OF CARDIOLOGY SURVEYS ON HEART FAILURE

The study group on diagnosis of the working group on heart failure of the European Society of Cardiology (ESC) has recently completed two large surveys of heart failure, one in primary care11 12 and one of hospital deaths and discharges,13 14 in member countries (table 2). These surveys were designed to assess whether the ESC guidelines on the diagnosis and treatment of heart failure are being applied appropriately in patients with suspected or confirmed heart failure. These two surveys, which included > 20 000 patients, will also provide a quantitative estimate as well as qualitative description of the disease activity related to heart failure.

The IMPROVEMENT of Heart Failure survey included > 1300 primary care physicians who enrolled > 11 000 patients from 14 European countries.11 12 To be included in the survey the patient was required to have visited the primary care physician within the last six weeks and have a diagnosis of heart failure or of prior myocardial infarction. The survey showed that primary care physicians’ knowledge about the treatment of heart failure was generally high. With few exceptions they were aware of the need for echocardiography and of the symptomatic and prognostic benefit of ACE inhibitors and β blockers, three of the key elements required for good management of heart failure. This knowledge was only partially translated into clinical practice. Most patients did get

### Table 1 Clinical characteristics and treatment of heart failure in large (n >1000) trials, epidemiological prevalence studies, studies using hospital discharge records, and surveys conducted predominantly in Europe

| Study | Number | Age (years) | Female (%) | LVSD (%) | LVOD (%) | EF (%) | Hypertension (%) | Diabetes (%) | Atrial fibrillation (%) | HFrEF (%) | Prior MI | IHD (%) | AF (%) | Diabetes (%) | Hypertension (%) | ACE inhibitors (%) | β-blockers (%) | ARBs (%) | Anticoagulants (%) | CCBs (%) | Nitrates (%) | Spironolactone (%) | β-blockers (%) | ARBs (%) | Anticoagulants (%) | CCBs (%) | Nitrates (%) | Spironolactone (%) |
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| ATLAS | 43     | 75          | 31         | 100     | 100     | 28   | 10              | 12           | 0                    | 0        | 0       | 0      | 0    | 30           | 53               | 90              | 10             | 0       | 0     | 55               | 5     | 0       | 55               | 5     | 0       |
| RALES | 44     | 75          | 37         | 100     | 92      | 28   | 10              | 12           | 0                    | 0        | 0       | 0      | 0    | 53           | 53               | 90              | 10             | 0       | 0     | 53               | 5     | 0       | 53               | 5     | 0       |
| CIBIS-II | 45     | 77          | 27         | 100     | 100     | 28   | 10              | 12           | 0                    | 0        | 0       | 0      | 0    | 53           | 53               | 90              | 10             | 0       | 0     | 53               | 5     | 0       | 53               | 5     | 0       |
| MERIT | 46     | 77          | 25         | 100     | 94      | 28   | 10              | 12           | 0                    | 0        | 0       | 0      | 0    | 53           | 53               | 90              | 10             | 0       | 0     | 53               | 5     | 0       | 53               | 5     | 0       |
| COPERNICUS | 47    | 77          | 25         | 100     | 92      | 28   | 10              | 12           | 0                    | 0        | 0       | 0      | 0    | 53           | 53               | 90              | 10             | 0       | 0     | 53               | 5     | 0       | 53               | 5     | 0       |
| Val-HeFT | 48   | 77          | 25         | 100     | 90      | 28   | 10              | 12           | 0                    | 0        | 0       | 0      | 0    | 53           | 53               | 90              | 10             | 0       | 0     | 53               | 5     | 0       | 53               | 5     | 0       |
| IMPROVEMENT-HF | 49 | 77 | 25 | 100 | 90 | 28 | 10 | 12 | 0 | 0 | 0 | 0 | 53 | 53 | 90 | 10 | 0 | 0 | 53 | 5 | 0 | 53 | 5 | 0 |

ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; CCB, calcium channel blocker; Cr, creatinine; DCM, dilated cardiomyopathy; DBP, diastolic blood pressure; HFrEF, heart failure with preserved ejection fraction; HD, heart failure with depressed ejection fraction; IHD, ischaemic heart disease; LVEF, left ventricular ejection fraction; LVOD, left ventricular outflow tract obstruction; LVSD, left ventricular systolic dysfunction; NA, not available; NYHA, New York Heart Association; SBP, systolic blood pressure.

*Type II diabetes only; †Patients with symptomatic LVSD with EF <30.
an echocardiogram and were receiving an ACE inhibitor. However, 40% of patients had been hospitalised in the previous year. For many patients, the echocardiogram was performed and the ACE inhibitor started at the time of hospitalisation. In contrast to the above, use of β blockers was low and fewer than 20% of patients were receiving a β blocker and ACE inhibitor in combination.

The EuroHeart Failure survey is part of a rolling programme of surveys into different aspects of cardiovascular disease in member countries of the European Society of Cardiology. The study was conducted in over 100 hospitals, regional centres as well as community hospitals, in 24 countries of the ESC. The survey required that each hospital review consecutive deaths and discharges over a six week period from medical wards, a small minority of which were cardiology wards. The fact that the survey looked at deaths and discharges is important, since many patients admitted with problems other than heart failure—for example, myocardial infarction or atrial fibrillation—may develop heart failure during the course of admission. The criteria for enrolment included a broad spectrum of patients with suspected or confirmed heart failure, reflecting the diagnostic as well as therapeutic burden of the disease. More than 45,000 consecutive deaths and discharges were reviewed, 24% of which were consistent with suspected or confirmed heart failure and were enrolled. This represents about 7500 patients screened and about 2000 patients with suspected or confirmed heart failure enrolled per week of the study.

Compared to the IMPROVEMENT of Heart Failure survey and despite the requirement for hospitalisation, patients in EuroHeart were probably less highly selected, since in the IMPROVEMENT survey the doctor was likely to report the patient only if they were confident of a diagnosis of heart failure. However, the results of the two surveys are remarkable more for the similarity than the difference in the populations enrolled. Age, sex, rate of investigation, comorbidity, and treatment all appear similar. The only difference is in mortality, which, for equivalent periods, was about three times higher in the EuroHeart Failure survey. Even after a correct diagnosis and appropriate treatment, patients may still fail to benefit because they do not take treatment as directed. Little information on patients’ compliance with heart failure treatment exists. The data that do exist suggest that compliance may be inadequate: only 10% in one study of digoxin and 42% in a study of ACE inhibitors. Failure to comply with lifestyle advice and pharmacological treatment could be responsible for a substantial proportion of hospital admissions for heart failure. Better patient education could improve patients’ understanding of disease, improve compliance with treatment (as well as salt, alcohol and tobacco consumption), and therefore reduce morbidity and improve survival.

Finally, the EuroHeart Failure survey will show if effective treatment has controlled patients, symptoms adequately and to what extent their quality of life remains impaired. There is a view held by some that with four classes of agents (diuretics, ACE inhibitors, β blockers, and aldosterone antagonists, digoxin possibly being a fifth) which are effective and available for managing heart failure, there is little room for improvement. This is almost certainly not true. What is remarkable is how few proven, effective treatments for heart failure exist and, possibly, how seldom they are deployed.

CONCLUSION

There is no doubt that the management of patients with heart failure is improving. The IMPROVEMENT of Heart Failure survey suggests that the theoretical knowledge of doctors about the diagnosis and treatment of heart failure is good. However, the organisation of care for patients with heart failure generally remains inadequate. Poor organisation of care results in delays in translating new diagnostic techniques and treatment from theory into practice. Audit and reorganisation of current clinical practice should now be the educational priority.

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REFERENCES

How does the UK perform against the rest of Europe? Professor Cleland: Overall, our performance compared to the rest of Europe is in line, and we are not that different from the European average. Where we do seem to be different is in the waiting times for echocardiography. The waiting time in Hungary is 1–2 weeks whereas the average waiting time in the UK is 3–4 months. So there is a huge difference. In many eastern European countries there are no waiting lists for echocardiography.

Question: What about hospital admission time?

Professor Cleland: The average duration in hospital was 11 days for these admissions. There are 120,000 days in hospital just from the index admission in this study, so it is a major problem. We recently looked at our hospital discharge records—you have to be careful how you look at these—but they indicate that at any one time out of our 1200 beds, 77 of them are occupied by patients with heart failure. There is some evidence of misdiagnosis, so this figure of 77 might be too high. On the other hand when we look at concomitant diagnoses like atrial fibrillation on discharge, we find there is a huge under-ascertainment of heart failure in the discharge records. When you put it all together, from our hospital discharge records we probably underestimate the rate of heart failure by about 50%. It should probably be about 50% higher than your hospital discharge records are showing at the moment, unless they are fundamentally different from Glasgow Royal Infirmary or Hull Royal Infirmary.

Question: How do you explain the discrepancy in the sex rates in EuroHeart when the incidence studies show a greater incidence in men?

Professor Cleland: The Hillingdon study had a tighter case definition for heart failure and probably underestimated the true incidence of heart failure; the investigators had a relatively high threshold because they wanted to be sure patients had heart failure. The presence of systolic dysfunction on imaging probably influences your diagnosis and makes you more likely to diagnose heart failure. We know that older patients are less likely to have systolic dysfunction for two reasons: one is because they probably have more heart failure through chronic hypertension rather than ischaemic heart disease, and secondly because the patients who are 75–80 with an ejection fraction of 20% do not survive very long—they are dying at such a rate that they deselect themselves from the study populations. Because women are older, there is more heart failure with preserved systolic function in that group. If you look at other epidemiological studies, and certainly if you look at hospital discharge diagnoses, it’s pretty well 50/50 in line with the EuroHeart survey.

Professor Cowie: I agree that Hillingdon used a “strict” definition of heart failure. However, although the incidence rate is higher in men than in older women, because there are so few very elderly men in the population the actual number of men and women suffering from heart failure is more equally balanced in the general population.

Question: There have been several references already to the difficulty of atrial fibrillation and heart failure. Do you have any feel for how many of those patients will still fulfil the definition of heart failure once cardioverted?

Professor Cleland: That is what atrial fibrillation there is a decline of atrial function which you can restore by correction of atrial fibrillation. We see a lot of patients who have had pulmonary oedema on a chest x-ray and require diuretic therapy, are breathless, fit the clinical diagnosis of heart failure, but who have a relatively preserved ventricular function, dilated atria, and atrial fibrillation. In that population, if you took away the atrial fibrillation you would take away large amounts of the heart failure. I like to talk in lay terms of hearts as being weak, stiff or confused; the confused ones are those in atrial fibrillation. I’m sure it is a cause of the heart failure and not just a complication of it.
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