

Cost of treating heart failure in an Irish teaching hospital

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Abstract:

Background The prevalence of heart failure is between 3 and 20 per 1000 population however this may exceed 100 per 1000 in those over the age of 65 years. It has been estimated that 1 to 2% of total healthcare resources are consumed in the management of this condition.

Aim As hospital costs account for approximately 70% of this expenditure we determined the cost of treating heart failure in an Irish teaching hospital.

Methods The costing evaluation was from the hospital perspective and the strategy used was a microcosting detailed collection of resources used.

Results The average cost of a hospital admission for the treatment of cardiac failure was IR£2,146. The average cost per day was calculated at IR£193. Approximately 75% of hospital costs were associated with ward costs whereas medications accounted for just 3.5% of total costs.

Conclusion The availability of Irish cost data is essential for the assessment of the cost effectiveness of therapeutic interventions for the treatment of heart failure in our healthcare system

Introduction

The diagnosis of heart failure is made in the presence of appropriate symptomatology e.g. breathlessness, fatigue, peripheral oedema in addition to objective evidence of cardiac dysfunction. The morbidity and mortality associated with symptomatic chronic heart failure is high with a one year mortality rate of 20 to 30% for moderate and over 50% for severe heart failure.¹ The overall prevalence of heart failure is 3 to 20 per 1000 population but exceeds 100 per 1000 in those over 65 years.² This prevalence is increasing in developed countries due in part to the increasing elderly population and the modern management of conditions such as myocardial infarction and hypertension. In the UK it is estimated that 5% of general internal medical admissions are due to cardiac failure and that these admissions exceed those for myocardial infarction.^{3,4} Therefore it is not surprising to note that between 1 and 2% of total healthcare resources are consumed in the management of this condition. Costs associated with hospital admissions account for up to 70% of this expenditure.⁵

In Ireland, figures for 1998 indicate that there were approximately 4,700 patients discharged from hospital where the principal diagnosis was considered to be cardiac failure. When all diagnoses of cardiac failure are considered this figure approaches 18,000. In this study, we determined the cost of treating patients who presented to a teaching hospital with a diagnosis of cardiac failure. This information will be helpful in estimating the resources that are consumed in the management of this condition in our healthcare system. Furthermore, it will provide valuable Irish cost data which may be utilised in determining the cost-effectiveness of interventions for the treatment of heart failure.

Method:

Quantification of resource used:

Thirty patients with a primary diagnosis of cardiac failure who were admitted to St. James's hospital between January 1999 and March 2000 were randomly selected using the Hospital In - Patient Enquiry system. A review of the medical records was conducted for each patient and a database constructed to encapsulate all resources used. Details of demography, risk factors, referral source, medical cover, length of stay in each ward, number and type of diagnostic procedure, number of treatment procedures and quantity of medication received in hospital were collected for each patient.

Assignment of unit costs:

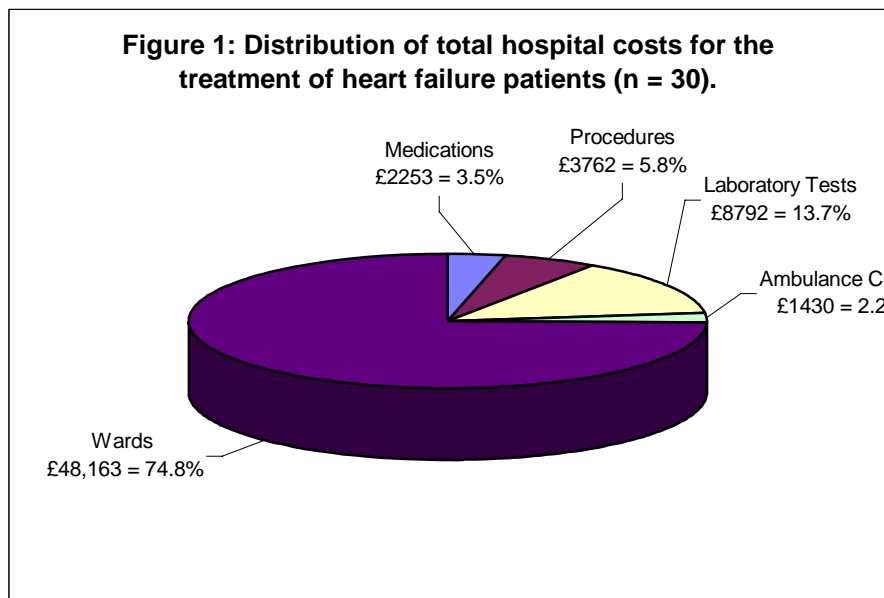
The costing evaluation in this study was from the hospital perspective and the strategy used was a microcosting approach with detailed collection of resources used. The therapeutic classification and drug acquisition costs were derived from the September 1999 edition of the Irish Monthly Index of Medical Specialities (MIMS). Hospital pharmacy was consulted for any medication not included in MIMS. The finance department provided bed day costs which included costs for nursing and allied staff, blood products and consumables. Physician and pharmacy costs were calculated as a product of the salary (plus PRSI) paid to the staff allocated to the appropriate wards and the proportion of overall bed occupancy for the cohort patients in these wards. Costs associated with overheads (including administration and hotel

costs) were based on bed occupancy per ward for the cohort patients and square footage of each ward as a proportion of total area of the hospital. Other consultation costs including speech therapy, physiotherapy, medical social worker, and dietician were based on an hourly rate calculated from average base salary, inclusive of PRSI. Procedure costs were obtained from the relevant directorates and included materials plus staffing. Investigation costs were provided by the relevant laboratories and are consistent with costs charged to external customers.

Results:

The mean age of the thirty patients (19 female) admitted with cardiac failure was 76 years (range 58 to 91 years). Eight patients were smokers, fifteen ex-smokers and seven were non smokers. Seven patients had a history of diabetes mellitus of which six were non insulin dependent. Ten patients had hyperlipidaemia. The underlying cause for heart failure was ischaemic heart disease (63%), hypertension (33%), hypothyroidism (17%), cardiomyopathy (10%) and valvular heart disease (7%). Some patients had more than one underlying cause. Atrial fibrillation was present in nine patients (30%). All patients were classified as having moderate (NYHA class 3, n = 18) or severe (NYHA class 4) heart failure. For ten patients this was their first admission to hospital with heart failure for the remaining twenty it represented readmission with recurrent failure. The average length of stay was 11.1 days (range 3 to 40 days). The total cost of hospital care for the thirty patients admitted with cardiac failure was IR£64,400. Therefore the average cost of a hospital admission for the treatment of cardiac failure was IR£2,146 (range IR£753 to IR£6,624). The average cost per day was calculated at IR£193. The overall costing was subdivided into ward costs, procedures, laboratory costs, hospital medications and ambulance costs (Figure 1). Ward cost (including staff and administration costs, blood products and other consumables) was the area of greatest expenditure accounting for 74.8 % of all costs in treating a patient with cardiac failure.

The total cost of medications was IR£2,253 accounting for 3.5 % of the total cost of treating heart failure. The highest expenditure was on antibiotics, administered to 23 patients, at IR£814 (36 % of medication costs) and bronchodilators IR£434 (19 % of costs) used to treat 25 patients. The beta agonist dobutamine was administered to two patients at a cost of IR£242 (11 % of drug costs). Fifty three percent of patients received the anticoagulants warfarin or heparin costing IR£198. Another eleven patients received either clopidogrel or aspirin at IR£12. Of note 83 % of patients were treated with ACE inhibitors costing IR£70.68 or 3 % of total drug costs. All patients were treated with a loop diuretic, in combination with a thiazide in four patients and a potassium sparing diuretic (spironolactone) in two patients. Diuretic cost was approximately 2 % of total drug expenditure. Nitrate medications accounted for 2 % and beta blockers which were used in three patients cost IR£0.81. The remainder of drug costs (18 %) arose from prescribing antiarrhythmics, analgesics, oral hypoglycaemics, thyroxine, corticosteroids, gastrointestinal and antidepressant medications.



Discussion:

The prevalence of heart failure is predicted to increase by up to 70 % by the year 2010 and therefore is set to become a major public health problem.⁶ These estimates are based in part on the increasingly elderly population. The mean age of the patients in this study was 76 years and the average length of stay in hospital was 11.1 days. This compares favourably with UK figures where the mean length of stay for cardiac failure related hospitalisation has been reported as 11.4 days on acute medical wards and 28.5 days on acute geriatric wards.^{3,4} In the US the average length of stay has been estimated to be in the range of 8 to 11 days.^{7,8} In addition to length of stay readmission rate is an important contributor to the cost associated with cardiac failure. In the UK approximately one third of patients are readmitted within 12 months of discharge.^{3,4} In our study two thirds of the patients were readmissions for treatment of heart failure.

Studies to date indicate that the direct cost of heart failure in developed countries is between 1% and 2% of total healthcare expenditure. Furthermore, it has been suggested that up to 70% of this expenditure is attributable to hospitalisation costs.⁵ The results of our study show that the average cost of an admission for management of heart failure in the Irish healthcare setting is IR£2,146. Therefore the average cost per day for treating cardiac failure was IR£193. Approximately 75% of hospital costs may be attributed to ward costs i.e. IR£1,605 per admission.

Investigations accounted for 19.5% of total costs and reflect diagnostic procedures in addition to laboratory tests used to monitor therapy. Coronary heart disease is the commonest cause of cardiac failure in Western countries and was seen in 63% of our patients.⁹ When considered alone or in combination coronary heart disease and hypertension accounted for 70% of cases of heart failure. Diagnostic procedures accounted for 5.8% of costs i.e. IR£125 per admission. The ECG is abnormal in the majority of patients with heart failure (90%) and the combination of a normal ECG and chest x-ray makes a diagnosis of heart failure very unlikely. As all patients had an ECG and chest x-ray these investigations accounted for 55% of procedure costs. Echocardiography is the single most useful non invasive test in the assessment of left ventricular failure and ideally should be conducted in all patients with suspected heart failure.¹⁰ However, there are resource implications and this investigation was performed in 37% of our patients.

Drug treatment accounted for 3.5% of the total costs in the management of cardiac failure. Diuretics which are effective in providing symptomatic relief remain the first line treatment and whilst administered to all patients accounted for just 2% of drug costs. The ACE inhibitors are considered the cornerstone of heart failure therapy as their beneficial effects on morbidity and mortality have been demonstrated in large clinical trials. These beneficial effects are evident in all grades of cardiac failure ranging from mild to moderate (Munich mild heart failure study, vasodilator heart failure trials (V-HeFT) and the left ventricular dysfunction trial (SOLVD-T) to severe heart failure (CONSENSUS I).^{11,12,13} In addition to the clinical endpoint benefits mentioned, treatment with ACE inhibitors reduce hospital admission rates e.g. in the CONSENSUS I study patients not receiving enalapril spent 19.6% of their study days in hospital compared with 15% for those treated with enalapril.¹³ As hospitalisation accounts for the majority of healthcare expenditure for cardiac failure it is not surprising that five independent economic analyses demonstrate ACE inhibitors to be very cost effective.⁵ In a 1993 UK study, cost effectiveness was maximised by general practitioner initiated treatment and by the earlier introduction of ACE inhibitors in the inpatient setting. For ACE inhibitor therapy on day one where hospital costs were in excess of £200 per day, savings were predicted.¹⁴ The importance of achieving the recommended maintenance dose of ACE inhibitor (e.g. captopril 25 - 50 mg three times daily, enalapril 10 mg twice daily, lisinopril 5 - 20 mg once daily or perindopril 4 mg once daily) was suggested by the prospective assessment trial of lisinopril and survival (ATLAS) where patients randomised to high dose i.e. lisinopril 32.5 - 35 mg (in contrast to low dose lisinopril 2.5 - 5.0 mg) had a significant reduction in the combined end point of all cause mortality and all cause admission to hospital.¹⁵ Therefore all patients with cardiac failure should be treated with an ACE inhibitor unless contraindications exist or they are unable to tolerate the therapy. In our study 83% of patients received an ACE inhibitor which compares favourably with overall European and US prescribing rates of 50 to 60%.¹⁶ The new angiotensin II receptor antagonists e.g. losartan are appropriate alternatives where patients cannot tolerate ACE inhibitors. The combination of nitrate and hydralazine is an alternative regimen in patients with severe renal dysfunction where ACE inhibitors and angiotensin II receptor antagonists are contraindicated.

Digoxin was used to treat thirteen patients in our study including the nine patients with atrial fibrillation. Studies such as the Randomised Assessment of Digoxin on Inhibitors of the Angiotensin-Converting Enzyme (RADIANCE) and Prospective Randomised Study of Ventricular Failure and the Efficacy of Digoxin (PROVED) trials have suggested that worsening heart failure and hospitalisation occurred less often in patients treated with digoxin.^{17,18} Similarly, data from the Digitalis Investigation Group Study demonstrates that digoxin had no effect on overall mortality in patients receiving diuretics and ACE inhibitors but it did reduce the number of hospital admissions.¹⁹ The cost effectiveness of digoxin is highlighted by US economic analyses indicating savings to the US healthcare system in the region of US\$100 million to US\$400 million per annum.²⁰

The results of recent placebo controlled trials demonstrate the beneficial effects of β blockers and the potassium sparing diuretic spironolactone when added to standard therapy in patients with heart failure. The addition of a β blocker has been demonstrated to reduce mortality and the frequency of hospitalisation e.g. in the Cardiac Insufficiency Bisoprolol Study II (CIBIS II) addition of bisoprolol to standard therapy reduced mortality and hospital admission due to worsening heart failure by 32% over the mean follow up period of 1.3 years. A preliminary economic analysis of the study suggested that administration of β blockers could result in a 5 to 10% reduction in the overall expenditure in the management of heart failure.²¹ In our study

three patients (10%) received a β blocker as treatment of heart failure reflecting perhaps the difference between the trial situation where patients were relatively young (mean age = 61 years in CIBIS II study), predominantly male with left ventricular systolic dysfunction in contrast to patients in the community who are older (mean age in our study = 76 years) and have coexisting disorders (the majority of our patients had coexisting lower respiratory tract infection hence the large expenditure on antibiotics and bronchodilators). Two of our patients were treated with spironolactone 25 mg per day in addition to ACE inhibitors and loop diuretics. This therapeutic approach has been demonstrated to reduce mortality by 30% and decrease the frequency of hospitalisation by 35%.²²

Conclusion:

Up to 70% of expenditure in the management of heart failure is related to hospital admission. This study presents Irish cost data following admission to a teaching hospital. The average cost of such an admission was IR£2,146 with the average cost per day estimated at IR£193. The availability of such data is essential for the assessment of the cost effectiveness of therapeutic interventions for the treatment of cardiac failure in the Irish healthcare system.

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Legend

Figure 1.

Distribution of total hospital costs for the treatment of heart failure patients.