An economic analysis of specialist heart failure nurse management in the U.K.

Can we afford not to implement it?

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Aims Hospital activity represents the major component of health care expenditure related to heart failure. This study evaluated the economic impact of applying specialist nurse management programmes that limit heart failure-related hospital readmissions within a whole population.

Methods Using a reliable and validated estimate of the current level and cost of heart failure-related hospital activity in the U.K., we determined the thresholds at which the actual cost of establishing and applying a national service based on three different models of specialist nurse management would be equal to the ‘cost’ of bed utilization associated with preventable hospital readmissions in the year 2000. The three models of care examined were home-based, clinic-based or a combination of home plus clinic-based, post-discharge follow-up. The potential impact of this service was based on a U.K.-wide caseload of 122,000 patients discharged to home with a discharge diagnosis of congestive heart failure in that year.

Results Based on heart failure-specific patterns of hospital activity, we estimate that 47,000 of these 122,000 patients would normally accumulate a total of 594,000 days of associated hospital stay from 49,000 readmissions (for any reason) within 1 year of hospital discharge. The cost of these admissions to the National Health Service was calculated at £166.2 million. Taking into account other costs associated with such hospital activity (e.g. general practice and hospital outpatient visits) each 10% reduction in recurrent bed utilization would be associated with £18.0 million in cost savings. Alternatively, the cost of applying a U.K.-wide programme of home-, clinic- or home plus clinic-based follow-up was calculated to be £69.4, £73.1 and £72.5 million per annum, respectively. The relative thresholds at which generated ‘cost-savings’ would equal the cost of applying these programmes of care would therefore be a 38.5%, 40.6% and 40.3% reduction in recurrent bed utilization, respectively. If, as expected, a home-based programme of specialist nurse management reduced recurrent bed utilization by 50% or more, annual savings equivalent to £169,000 per 1000 patients treated would be generated.

Conclusions This is the first study to examine the economic consequences of applying a specialist nurse-mediated, post-discharge management service for heart failure within a whole population. Our findings suggest that such a service will not only improve quality of life and reduce readmissions in patients with congestive heart failure, but also reduce costs and improve the efficiency of the health care system in doing so.

Introduction

Considering the progressive ageing of the population¹ and the introduction of more effective medical treatment of coronary heart disease and, in particular, acute
myocardial infarction, resulting in improved longer-term survival rates\cite{2,3}, heart failure represents a predictable but still escalating epidemic\cite{1,4,5}. For example, consistent with previous reports from other industrialized countries\cite{6-8}, we have recently shown that the annual number of heart failure-related admissions continues to rise in the U.K.\cite{9,10}. Moreover, despite some evidence of a recent deceleration in the population rate of increase of such admissions (particularly in younger age groups)\cite{10}, the significant burden imposed by heart failure is likely to be sustained in the short to medium-term\cite{6-8}.

The disproportionate contribution of hospital activity to the overall cost of managing heart failure is well documented\cite{11}. In a recent study we estimated that hospital admissions consume approximately 70% of total health care expenditure directly attributable to heart failure in the U.K.\cite{12}. These new data show that the total, direct cost of heart failure in the U.K. has risen from 1.2% to 2.2% of NHS expenditure during the period 1990–2000\cite{12,13}.

Although the angiotensin converting enzyme (ACE) inhibitor\cite{14} and beta-blockers\cite{15} have been shown to prolong survival and reduce morbidity in heart failure, there is increasing recognition that the optimal management of heart failure, particularly following acute hospitalization, not only involves appropriate pharmacotherapy, but a coordinated programme of care that provides individualized management and promotion of self-care activities\cite{16}. Until recently, however, despite the knowledge that any community-based programme of health-care that limits heart failure-related hospital activity is likely to be cost-effective\cite{17}, there has been a paucity of data to support the formal integration of this type of programme of care into the health care system.

A series of appropriately powered, randomized controlled trials examining the effect of coordinated programmes of care to ensure the optimal post-discharge management of heart failure and involving a pivotal role for the specialist heart failure nurse, have now shown that large reductions in recurrent hospital use (30–60% less relative to usual care) can be achieved\cite{18-27}. As most of these studies have included older patients with a more even distribution of men and women, they are immediately applicable, but still escalating epidemic\cite{1,4,5}. For example, consistent with previous analyses of heart failure-related hospital activity in the U.K.\cite{9,10}, these data provide estimates of the number of patients per annum who are discharged alive from hospital, their discharge destination (e.g. to home) and recurrent hospitalization.

For the purpose of the current analysis, we used data relating to a discharge diagnosis of congestive heart failure (in any diagnostic position for the purpose of coding). This is the most common diagnosis specific to heart failure and is usually associated with a concurrent diagnosis of acute heart failure/pulmonary oedema\cite{10}.

**Post-discharge health care activity**

As above, we used the same contemporary study of heart failure-related patterns of health care utilization in the U.K.\cite{12,13} to estimate the number of outpatient and general practitioner (GP) consultations associated with the usual post-discharge management of heart failure (an average of three outpatient and four GP clinic visits per live hospital discharge). We also used these data, in conjunction with data from the Glasgow Heart Failure Nurse Liaison Service in Scotland, to estimate the proportion of patients prescribed the most common types of pharmacological agents used to treat heart failure on a dose-specific basis—diuretic (90%), ACE inhibitor (75%), digoxin (40%), warfarin (30%) and beta-blocker (10%).

**Health care costs**

The applied cost of both hospital and community-based health care specific to the management of heart failure were the same as those used in our recent economic analysis of the burden of heart failure in the U.K.\cite{12}.

As described in our previous report, hospital costs were derived from official NHS estimates\cite{31} and were calculated on a per diem basis with adjustment for inflation since audit, the typical mixture of hospitals within the U.K. (e.g. tertiary referral vs non-tertiary
referral hospital) and patterns of stay on the different types of hospital unit (e.g. specialist vs medical unit) specific to heart failure. All data were applied on an age- and sex-specific basis. The cost of post-discharge, outpatient consultations was calculated from the same official source with stratification of clinic types and therefore cost according to the unit of discharge (e.g. the proportion of discharges from cardiology vs geriatric units)\(^{11}\). Both the inpatient and outpatient cost calculations used in this analysis incorporate staffing and investigation costs (e.g. chest radiography and/or echocardiography).

The average cost of a GP consultation (including routine investigations) was obtained from the Office of Health Economics (U.K.)\(^ {32}\). The average cost of pharmacological therapy for heart failure (per prescription) was calculated from data provided by IMS Health who record sales of pharmacological agents to retail pharmacies from wholesalers within the U.K.\(^ {33}\). Consistent with our previous reports\(^ {12,13}\), we adjusted for the incremental cost of pharmacy dispensing by adding 10% to the estimated cost of prescribed pharmacotherapy.

The incremental costs associated with the establishment of a specialist heart failure nurse service were calculated using a combination of the above data and from actual costs used to establish a Heart Failure Nurse Liaison Service in Glasgow, Scotland.

**Models of post-discharge management**

The literature to date has predominantly described two models of care designed to optimize the post-discharge management of heart failure. In the first model, patients are managed via a specialist heart failure outpatient clinic (clinic-based follow-up) and the second model of care involves visits to the patient’s home (home-based follow-up). Both models of care principally rely on the appointment of a specialist heart failure nurse to provide most of the incremental health care activity designed to optimize pharmacological therapy, promote self-care (e.g. fluid and dietary management), provide a means for early detection of clinical deterioration and apply more appropriate follow-up according to the needs of the patient\(^ {12}\). There are also some limited data describing a hybrid approach involving the combination of home and clinic-based follow-up. For the purpose of this analysis, we compared the cost of establishing these three models of care on a U.K.-wide basis.

**Clinic-based service**

As described in the literature\(^ {21,22,34,35}\) a clinic-based approach to managing heart failure patients following an acute hospitalization involves the establishment of a specific heart failure clinic that is usually situated in the hospital outpatient department. While this model has, thus far, proven to be less effective than home-based intervention\(^ {12,16}\), studies suggest that it has the potential to reduce all-cause hospital readmissions by 30–40% and associated hospital bed utilization by up to 40%\(^ {21,22}\).

**Home-based service**

To date, a home-based approach has proven to be the most consistent and effective strategy in reducing heart failure-specific and all-cause hospital readmissions in typically older heart failure patients\(^ {18,20,23}\). Importantly, while this model of care has been consistently shown to reduce all-cause hospital readmissions by about 50%, it appears to have an even greater effect on associated hospital bed utilization by reducing days of readmission by up to 60% relative to usual care\(^ {18,19,20,23}\).

**Hybrid service**

Although examined in the first appropriately powered randomized study of this type\(^ {18}\), this approach has been subjected to less scrutiny than the above models of care. However, the potential economic implications of applying a hybrid service comprising home plus clinic-based follow-up was also examined on the basis that this type of approach may ultimately prove to be the most efficient and effective model of care by tailoring care more specifically to patient needs\(^ {36,37}\).

**U.K.-wide caseload of heart failure patients**

Consistent with previously reported randomized studies\(^ {18–27}\) patients fulfilling the following criteria were identified as potential recipients of this type of service:

- Discharged alive from hospital with a diagnosis of congestive heart failure or left heart failure/acute pulmonary oedema.
- Aged ≥55 years.
- Discharged to home.

The overall number of patients fulfilling these broad criteria was estimated from the predicted number and profile of hospitalized heart failure patients in the U.K. during the year 2000.

In the majority of randomized studies of this type, patients have been further selected on the basis of both direct evidence of left ventricular systolic dysfunction and persistent symptoms of heart failure despite conventional treatment. For this analysis, we have estimated that only 50% of patients would be recruited to the service based on the assumptions that only 60% of patients would have a documented history of chronic systolic dysfunction and that a further 10% of eligible patients would refuse additional intervention.

**Estimated cost of establishing a U.K.-wide service**

**Core components of expenditure**

For the purpose of this analysis, we estimated that an average of eight full-time equivalent specialist heart

\[\text{consistency with our previous reports} [12,13] \text{, we adjusted} \]

\[\text{Health Economics (U.K.)} [32] \text{. The average cost of} \]

\[\text{Nurse Liaison Service in Glasgow, Scotland.} \text{from actual costs used to establish a Heart Failure} \]

\[\text{calculated using a combination of the above data and} \text{ment of a specialist heart failure nurse service were} \]

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failure nurses are required to adequately cover a population of 1 000 000. This figure is based on the assumption that such a population would most probably generate an average caseload of 200–250 patients per nurse per annum and is consistent with recruitment rates in both randomized studies and the Glasgow Heart Failure Nurse Liaison Service in the U.K. In the current analysis, it was assumed that the total cost of employing each full-time specialist heart failure nurse would be £33 000 per annum (£264 000 per annum for eight full time equivalent salaries). Because this type of intervention appears to be most effective when adjusted to suit local health care needs (e.g. rural vs metropolitan regions), it was assumed that, on average, each geographical area containing a population of 1 000 000 would require an autonomous heart failure service — irrespective of the model of care applied. As the total U.K. population was estimated to be about 60 million in the year 2000, it was therefore assumed that 60 distinct service areas would need to be established to provide nationwide coverage. It was further assumed that each distinct service area would require an initial ‘establishment fund’ of £75 000 to facilitate the training, housing and equipping of the specialist heart failure nurses. An equivalent amount per annum would need to be provided to ensure ongoing training of the specialist heart failure nurses, to upgrade/repair essential equipment and to undertake auditing of the service to ensure standards and improved health outcomes are maintained. Each service area would also require a full-time equivalent office manager and a budget for office supplies at a cost of £18 000 per annum. The basic cost of establishing and maintaining each distinct service area would therefore be £357 000 (£21·4 million for the entire U.K.) per annum.

Additional health care costs
In coordinating an individualized programme of care, the specialist heart failure nurse often refers the patient to their GP for additional consultation in the immediate post-discharge period. In this analysis, therefore, it was assumed that patients exposed to this type of service would, on average, require two additional GP consultations (an additional cost of £36 per patient) relative to usual care. Moreover, as one of the major goals of this type of intervention is to increase the uptake of proven pharmacological agents (most notably ACE inhibitors and latterly beta-blockers and spironolactone) it was assumed that the average cost of pharmacological treatment per patient (currently estimated to be £175 per annum) would be effectively increased by 50% (an additional cost of £88 per patient).

Specific components of expenditure
For the home-based model of care only, the cost of one full-time specialist heart failure nurse co-ordinator (£40 000 per annum) for each distinct service area (i.e. per 1 000 000 population) was also added (£2·4 million per annum for the entire U.K.). The inclusion of a coordinator in the home-based model was predicated on the fact that the role of the community-based specialist heart failure nurse encompasses a broader scope of practice (linking the hospital and primary care sectors) and is further removed from traditional support structures (e.g. immediate medical advice) than the clinic-based model of care. As part of this model of care it was also estimated that each patient would receive an average of five home visits in the 12 months following initial discharge additional to usual levels of care. At a cost of £50 per visit (taking into account incremental transport, supplemental phone and investigation costs) this amounts to £250 per patient per annum.

For the clinic-based model, it was assumed that each patient would receive an average of six additional clinic visits in the 12 months following discharge relative to usual care. At a cost of £50 per clinic visit (also inclusive of additional investigational, infrastructure and patient transport costs) this amounts to £300 per patient per annum.

For the hybrid (home plus clinic-based) model the same costs for the home-based model of care (but adjusting for half the average number of home visits) were added to the cost of three additional clinic visits per patient. This amounts to £275 per patient per annum.

Table 1 summarizes the cost of implementing each type of service.

| Table 1 Cost assumptions used to calculate the cost of applying three models of specialist nurse heart failure management throughout the U.K. — per service area |
|---|---|---|
| | Home-based service | Clinic-based service | Home plus clinic-based service |
| Salary for a full-time specialist heart failure nurse (cost of 8 FTE’s) | £33 000 per annum (£264 000) | £33 000 per annum (£264 000) | £33 000 per annum (£264 000) |
| Salary for a nurse coordinator (1 FTE) | £40 000 per annum | £40 000 per annum | £40 000 per annum |
| Establishment/equipment costs | £75 000 per annum | £75 000 per annum | £75 000 per annum |
| Salary for office manager + supplies | £18 000 per annum | £18 000 per annum | £18 000 per annum |
| Home/clinic visit — travel, phone calls + investigations costs (per patient) | £50 per visit (£250) | £50 per visit (£300) | £50 per visit (£275) |
| 50% additional drug treatment | £88 per patient | £88 per patient | £88 per patient |
| Two additional GP consultations | £36 per patient | £36 per patient | £36 per patient |

FTE=full-time equivalent.

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Projected 'cost savings'

Potential ‘cost savings’ (if only nominal in nature) associated with the implementation of this type of service, were also based on our recent study of the pattern and cost of heart failure-related health care utilization. Specifically, an average cost per day of readmission avoided was calculated on an age- and sex-specific basis. It was also assumed that each prevented hospital readmission would result, on average, in four less outpatient (total cost £224) and three less GP consultations (total cost £54)\(^{[12]}\).

Sensitivity analysis

A sensitivity analysis was performed to examine the cost impact of each service model based on a range of effect on recurrent hospital stay (from 0–100%) based on the assumptions described above. As such, based on a ‘sliding-scale’ of decreasing bed utilization associated with a reduction in recurrent hospitalization occurring within 1 year of initial discharge, we identified the percentage threshold at which the cost of implementing each programme of care was equal to the cost of expected health-care utilization (e.g. a 25% reduction relative to expected bed-utilization). The relative threshold at which the cost of implementing each service model would equal the nominal savings associated with reduced bed utilization was also examined under the following conditions: (1) a 25% increase in the cost of implementing each service model; (2) a 25% decrease in the cost savings associated with each day of recurrent hospitalization avoided; (3) a 25% decrease in the expected annual caseload (equivalent to approximately one third of discharged heart failure patients per annum).

Results

Patient caseload

Based on our previous analysis of the number of heart failure-related admissions in the U.K. for the year 2000\(^{[12]}\), we estimate approximately 116 000 and 128 000 male and female patients aged 55 years and over were discharged to home for the first time (during that year) with a diagnosis of congestive heart failure. Assuming that only 50% of such patients would be enrolled into this kind of post-discharge, management programme, this would have generated a total caseload of 122 000 patients. On average, therefore, each of the 60 distinct service areas would have a throughput of approximately 2000 ‘new’ patients during the year 2000 (an average caseload of 250 patients per nurse per annum).

Cost of specialist heart failure nurse management

Baseline expenditure

As noted above, we calculate that it would cost the NHS a total of £21·4 million per annum to establish and maintain the staff and infrastructure comprising a total of 60 distinct service areas throughout the U.K. Based on a caseload of 122 000 patients and the assumption that, on average, the cost of pharmacological treatment will increase by approximately 50% due to the combination of upitation of pre-existing treatment (e.g. ACE inhibitors) and introduction of new treatment (e.g. beta-blockers) costing an additional £88 per patient, we estimate that this would cost the NHS a total of £10·7 million per annum. Lastly, based on the assumption that each model will increase the number of GP consultations by an average of two visits per patient, this additional component of expenditure would be £4·4 million per annum. Irrespective of the model implemented, therefore, we estimate that baseline expenditure would total £36·5 million per annum.

Clinic-based service

In addition to the above, the estimated cost of providing an average of six visits to a specialist heart failure clinic to these 122 000 patients would total an additional £36·6 million per annum. The overall cost of providing a U.K.-wide, post-discharge, clinic-based model of heart failure management would therefore be £73·1 million per annum or £599 per patient.

Home-based service

In contrast to the clinic-based model, the additional cost of undertaking an average of five home visits (including travel and investigational costs) and follow-up phone calls to 122 000 heart failure patients would be £30·5 million per annum (£508 000 per service area). Coupled with the additional cost of appointing a specialist nurse co-ordinator to ensure appropriate standards of care in each service area (£2·4 million per annum), the total cost of implementing a home-based model of care throughout the U.K. would therefore be £69·4 million per annum or £569 per patient.

Hybrid service

In order to implement a hybrid model of clinic and home-based management, we estimate that the combination of home plus clinic visits would cost an additional £33·6 million per annum. Overall, therefore, we estimate that such a service would cost the NHS a total of £72·5 million per annum or £594 per patient.

Figure 1 summarizes the annual cost of implementing each model of care based on a caseload of 122 000 patients per annum.

Potential economic impact of reduced hospital activity

Based on observed readmission rates in the U.K.\(^{[12]}\), we estimate that 47 000 of the 122 000 eligible patients
would accumulate a total of 49 000 readmissions (for any reason) within 1 year of hospital discharge. This activity would equate to approximately 594 000 days of recurrent hospital stay. This represents an average of 12 days of readmission per patient, although it should be noted that approximately 10% of these patients would experience multiple readmissions and accumulate a disproportionate number of hospital bed days relative to the remainder of the cohort.

The total cost of these readmissions and associated bed utilization to the NHS was estimated to be £166·2 million (an average of £3536 per patient). Taking into account reduced levels of GP and hospital outpatient consultations, we estimated that each 10% reduction in days of (all-cause) hospital bed utilization in this cohort, would result in a ‘cost saving’ of £18·0 million in health care expenditure.

Based on these assumptions, Fig. 2 shows the thresholds at which these three models of care would generate nominal savings equivalent to the cost of their implementation via reduced hospital activity. This conservative economic analysis therefore suggests that for a U.K.-wide programme of home-based specialist heart failure nurse management, this threshold would be reached if it were associated with a 38·5% reduction in recurrent bed utilization. For the clinic-based and home plus clinic-based programmes of management, the equivalent thresholds were calculated to be slightly higher at 40·6% and 40·3%, respectively.

**Sensitivity analysis**

As can be appreciated from Fig. 2, if these programmes reduced recurrent hospital bed utilization by only 30% per annum the cost of implementing the three models of post-discharge management would be greater than the nominal cost-savings achieved through reduced health care activity. For the home-based service the difference in costs would be equivalent to £126 per patient (£15·4 million per annum) — the equivalent figures being £157 (£19·1 million per annum) and £152 (£18·5 million per annum) per patient for the clinic-based and hybrid programme of management, respectively. Alternatively, if these programmes reduce recurrent hospital bed utilization by 60%, nominal savings equivalent to £169, £139

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**Figure 1** The annual cost of implementing each model of post-discharge management based on a caseload of 122 000 patients per annum.

**Figure 2** Potential cost-impact of applying three models of specialist nurse management of heart failure throughout the U.K. based on each 10% reduction in hospital bed stay associated with recurrent hospital admission. The left hand axis represents the per annum cost (£ million) of applying each service model throughout the U.K. The right hand axis indicates the savings (£ million as per left axis) associated with each 10% reduction in days of recurrent bed utilization within 12 months of the ‘index’ hospitalization.
and £143 per patient, or £20·6, £16·9 and £17·5 million per annum associated with the home-based, clinic-based and hybrid model of management, respectively, would be achieved.

A 25% increase in the cost of establishing these programmes of care would be equivalent to £86·8 million, £91·4 million and £90·6 million per annum, respectively. The thresholds at which these three models of care would provide nominal savings equivalent to the cost of their implementation via reduced hospital activity, would, in this circumstance, be equivalent to a 48%, 51% and 50% reduction in recurrent hospital bed utilization, respectively.

If this type of service was only suitable for only 91 000 patients (approximately one third of those patients aged >55 years and discharged home with a diagnosis of congestive heart failure), the cost of implementing a U.K.-wide service based on a home-based, clinic-based or hybrid model of post-discharge management would be equivalent to £58·0, £60·2 and £60·3 million per annum. With potential savings of £13·5 million per annum in this reduced cohort, the thresholds at which these three models of care would provide nominal savings equivalent to the cost of their implementation via reduced hospital activity, would, in this circumstance, be equivalent to a 43%, 45% and 45% reduction in recurrent hospital bed utilization, respectively.

### Discussion

In this unique analysis we have established a strong economic argument for the adoption of a U.K.-wide specialist heart failure nurse service as a cost-effective means to reduce (in part at least) the enormous burden imposed by heart failure on the health care system. Regardless of whether such a service implemented a home-based, clinic-based or hybrid model of care, its central component would be the creation of a large workforce of specialist heart failure nurses and appropriate infrastructure and interdisciplinary support to provide individualized care to patients with chronic congestive heart failure. In a series of randomized studies, this type of intervention has been shown to reduce recurrent hospitalization and associated hospital stay whilst improving the quality of life of individual patients — both in the short and longer-term.[18–20,23]

Whilst the cost of applying a U.K.-wide service might cost the NHS close to £75 million per annum, the cost savings associated with reduced hospital activity represent an attractive economic return. If, as expected, this service halved recurrent hospital stay, it would produce a net benefit equivalent to £20 million per annum to the NHS. In addition to being more ‘potent’ than a clinic-based approach,[18–20,23,36,37] and therefore more likely to achieve a more than halving of recurrent hospital stay, there is evidence to suggest that recruitment rates would be higher with a home-based approach.[38] However, a clinic-based approach still represents a cost-effective means to reducing hospital readmissions and may be more appropriate in some regions.[39]

### Comparison with other ‘treatments’

How do these data compare to similar analyses examining the cost impact of pharmacological agents used in the treatment of heart failure? Firstly, it should be noted that few treatments in cardiology, or indeed any other medical or surgical specialty, are actually cost neutral or produce cost savings.[40] Moreover, while both ACE inhibitors[41,42] and beta-blockers[43] have been shown to be relatively cost-effective and have been incorporated into the gold-standard treatment of heart failure, they have been largely proven in younger male cohorts.[28] Consistent with the randomized cohorts on whom this analysis is based, we have applied levels of health care activity and cost that are typical of the predominant population of older heart failure patients (hence our age selection criteria). Remarkably, we estimate that based on a 50% reduction in all-cause readmission, for every 1000 patients subject to a home-based programme of care per annum, approximately 2400 days of readmission would be avoided (a total of almost 300 000 bed-days per annum throughout the U.K.). This equates to a ‘cost saving’ of £169 000 per 1000 patients treated per annum or £42 000 per specialist heart failure nurse per annum. These data are consistent with a recent trial of this type of intervention that suggested that there was an approximate 40–50% reduction in health care expenditure in those patients subject to this type of intervention.[18–20,23] Moreover, based on the results of this and other randomized studies, it can be anticipated that not only will patients subject to specialist nurse management have improved quality of life, but that for every 1000 patients exposed to this intervention an additional 75–100 patients will remain event-free (alive and free from hospitalization) within 1 year of discharge relative to usual care.[20]

### Accuracy of estimates

The accuracy of these estimates is obviously dependent on a number of key issues. Importantly, these data are based on an accurate and validated estimate of current levels of heart failure-related health care activity and cost in the U.K.[12] If anything, we have probably under-estimated the number of patients who would benefit from such a service because heart failure admission and readmission rates overall continue to rise[10] and this type of intervention has also been shown to be effective in those patients without evidence of moderate to severe left ventricular systolic dysfunction[19,20,25]. The current estimates are also confluent with the recruitment rates to the established service in Glasgow, Scotland and are comparable to those seen in other industrialized countries.[6–8,11] We have also shown that the economic
argument for establishing a service remains strong even in the event of much lower recruitment rates. Moreover, use of more specific selection criteria to recruit ‘high risk’ patients would most probably yield a more substantial reduction in hospital bed utilization. For example, contemporary data suggest that the 10–20% of heart failure patients who require repeated hospitalizations consume almost two-thirds of health care expenditure. In addition to using contemporary data to estimate the annual caseload of patients, we have utilized accurate and valid data to estimate health care costs. The cost of heart failure-related health care activity in our previous study was derived from conservative estimates whilst in the current analysis we have used upper estimates of expenditure to estimate the cost of applying the service.

The sensitivity analysis demonstrated that even when we increased the cost of the service, or decreased the economic ‘gain’ from reduced hospital activity, the threshold at which this type of service would ‘pay’ for itself, remained close to that expected from randomized studies and pre-existing services. Moreover, by including the additional cost of greater levels of pharmacotherapy through up titration of pre-existing treatments and the addition of new ones, we have added a component of expenditure that is crucial to the gold standard management of heart failure. For example, if we were to subtract this component of treatment from the cost of the intervention, the thresholds at which the cost of providing programmes of home- and clinic-based management for heart failure would yield savings equivalent to the cost of their implementation would be a 33% and 35% reduction in recurrent bed utilization, respectively. Both of these targets are well within the anticipated effect of such a service — even in the presence of optimal pharmacotherapy. Overall, therefore, this represents a conservative analysis that is likely to have under-estimated the true economic impact of this type of intervention.

Relevance to other countries

Are these data applicable to other developed countries? The burden of heart failure appears to be remarkably similar in whatever country it is studied, with hospital activity representing the largest component of health care expenditure. This type of intervention has also been studied in a range of industrialized nations (e.g. in the United States, The Netherlands, Sweden, Australia and New Zealand) with similar outcomes derived from studies performed in different health care systems but applying similar programmes of care. Clearly, however, this type of service needs to be tailored to the individual health care system — even at a local level (hence our assumption that separate service areas would need to be established). Despite unique cost implications inherent to each health care system, the potential for cost-savings through reduced hospital activity is similar for all developed countries.

Economic impact in the future

Would the predicted cost-savings be sustained in the longer-term? Does the law of diminishing returns apply if it reduces the number of potential patients in the year 2001 and beyond? Based on current trends, it is likely that within the next 5 years more than 130 000 patients per annum will experience a ‘first-ever’ admission for heart failure in the U.K. Moreover, of the 122 000 who would not be immediately eligible for intervention in 2000, over 30 000 will be readmitted with a diagnosis of heart failure within the next year. Conversely, is it possible that this type of intervention merely prevents readmissions in the medium-term but not the longer-term and therefore proves less cost-effective with time? Although we have examined the economic impact of this type of service within 12 months, it has been demonstrated that the effects of a preventative home visit is sustained for at least 18 months (a point in time in which almost two-thirds of these patients will have died and therefore no longer at risk of readmission). These models of care are also effective in preventing further readmissions, regardless of how many previous admissions a patient has previously experienced.

Key issues for implementation

Although such a service is an economically attractive option, there are number of key, practical issues that would need to be addressed. For example, given the reliance on heart failure nurses, a large specialized workforce would need to be recruited and trained. This would obviously take time and most probably need to be done gradually to prevent critical shortages in other parts of the health care system. Moreover, this type of intervention cannot exist in a vacuum. Indeed, much consultation and planning to ensure appropriate primary and specialist care support, to both the nurse and patient, is required. However, if such a service were established it would provide a greater impetus for more consistent levels of care, and indeed, auditing to ensure that improved health outcomes result. It is also tempting to suggest that once this level of heart failure care is standardized there would be greater resources available to tackle other areas of health care activity that may alleviate the burden imposed by heart failure (e.g. preventative screening, community-based management and palliative care programmes). At the very least, while it is reasonable to suggest that this type of intervention merely reduces bed-utilization and therefore provides no direct cost savings (a position acknowledged by this economic analysis), the prospect of 200–300 000 bed days per annum being available for other purposes (e.g. in reducing surgical waiting lists) is certainly an attractive one.

Summary

In conclusion, this is the first study to examine the economic consequences of applying a specialist heart care expenditure. This type of intervention has also been studied in a range of industrialized nations (e.g. in the United States, The Netherlands, Sweden, Australia and New Zealand) with similar outcomes derived from studies performed in different health care systems but applying similar programmes of care. Clearly, however, this type of service needs to be tailored to the individual health care system — even at a local level (hence our assumption that separate service areas would need to be established). Despite unique cost implications inherent to each health care system, the potential for cost-savings through reduced hospital activity is similar for all developed countries.
failure service within a whole population. Our findings suggest that such a service will not only improve quality of life, reduced hospital readmissions and possibly prolong survival in patients with heart failure, but also reduce costs and improve the efficiency of the health care system in doing so. Overall, therefore, these data represent a strong argument for the formal adoption of this type of heart failure service — both within the U.K. and other countries where heart failure exerts such a heavy and costly burden on the hospital sector.

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References


