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Congestive Heart Failure Case Management: A Fiscal Analysis

PEZHMAN ELIASZADEH, M.P.H.,[1,2] HALE YARMOHAMMADI, M.D.,[1] HAQ NAWAZ, M.D., M.P.H.,[1,2] JOSETTE BOUKHALIL, M.D.,[1,2] and DAVID L. KATZ, M.D., M.P.H.[1,2]

ABSTRACT

A cost-benefit analysis was performed to evaluate the effects of a community hospital-based Chronic Disease Management Program (CDMP) for congestive heart failure on hospitalization rates and costs of care. The CDMP consists of dietary, exercise, and pharmacy counseling as well as close follow-up by a case manager. Twenty-seven patients were enrolled with an average age of 72.5 years. The CDMP significantly reduced costs of care, emergency visits, admissions, and length of stay. Chronic disease management for congestive heart failure is feasible and effective in the community hospital setting, and third-party reimbursement for such programs is warranted.

INTRODUCTION

CONGESTIVE HEART FAILURE (CHF) is a significant public health problem that currently affects an estimated 4.8 million Americans.[1] Approximately 400,000 new cases of CHF are diagnosed annually.[2] Despite recent advances in the treatment of CHF, the disease is expected to remain both debilitating and very costly.[3] One-year survival among CHF patients has been reported to be 57% among men and 64% among women, and 5-year survival is 25% and 38% among men and women, respectively.[4] Among elderly patients suffering from CHF, 29% to 47% are readmitted within 3 to 6 months of their initial discharge.[5,6] At least half of those readmissions are potentially preventable.[6] CHF is the single most common cause of hospital admission in the United States,[1,7] resulting in more than 5 million hospital-days annually.[8] Inpatient expenditures associated with CHF exceed $8 billion annually. The direct yearly cost of CHF in 1996 was more than $10 billion,[9] and indirect costs are estimated to exceed $1.5 billion.[10] Pharmacologic advances have improved treatment options for CHF,[11–13] resulting in improved short-term and intermediate-term survival. However, pharmacologic advances have had little impact on morbidity and quality of life; patients generally remain symptomatic with a reduced exercise capacity.[3] Approximately 44% of CHF patients are readmitted within 6 months of an index hospital admission.[14]

A multidisciplinary approach to the outpatient management of CHF can improve functional capacity and reduce the rate of rehospitalization.[5,15] Rich et al.[5] showed a reduction in the rehospitalization rate in subjects relative to controls and reduced the overall cost of care by a modest $460 per patient.

Given the enormous public health toll asso-

[1]Yale-Griffin Prevention Research Center, Derby, Connecticut.
[2]Department of Epidemiology and Public Health, Yale University School of Medicine, New Haven, Connecticut.

ciated with CHF, even when managed with optimal pharmacotherapy and outpatient support teams, there is a critical need for cost-effective interventions, which improve both prognosis and utilization. Multidisciplinary patient management programs produce clinical benefits[16] and have been considered cost effective,[17] but cost-benefit data are not available. Previous studies have relied on in-hospital costs, ignoring the costs of outpatient physician and emergency room visits.[5,15] We therefore conducted a cost-benefit analysis of CHF case management at a community hospital.

METHODS

Data were collected from the Chronic Disease Management Program (CDMP) for CHF at Griffin Hospital in Derby, Connecticut.

Subjects

All subjects had a diagnosis of CHF and had been hospitalized for CHF at least once in the past. Patients in New York Heart Association Class IV heart failure were excluded. Subjects were enrolled upon their physician's referral. Thirty patients were enrolled in the CDMP between June 1997 and April 1998. Of the 30 participants in the study, there were 19 males and 11 females. Two male patients and one female patient did not participate in any of the treatment regimen protocol and were excluded from the study. This resulted in a final sample of 27 patients. For patients who had been enrolled in the program at least 1 year prior to this study ($n = 13$), data were gathered for a 1-year period before enrollment and compared to data gathered for a 1-year period after enrollment. For patients who had been in the program at least 6 months but less than 1 year ($n = 14$), data were gathered for the 6-month period before enrollment and compared to data gathered for a 6-month period after enrollment.

The CDMP

The program, modeled after that of Rich et al.,[16] is a multidisciplinary approach to supporting patients with CHF in an outpatient setting. The program specifically targets compliance with medications, understanding of the CHF disease process and associated signs and symptoms, a facility with access to medical care, and dietary management. The program provides information about the benefits of exercise to the enrollees but does not include a supervised exercise program. Patients enrolled in the CDMP continued to receive all routinely indicated medical care. Interventions included a 2-hour group education session within 1 to 2 weeks of hospital discharge (or enrollment), a 30-minute tutorial with a hospital nutritionist regarding proper diet, a 1-hour tutorial with the hospital pharmacist, and a weekly telephone follow-up by a case manager throughout the duration of the program. Patients were asked to keep a log of their weight, their compliance with medications, dietary intake, and activity patterns. Patient logs were reviewed with case managers on a regular basis. All subjects provided demographic information at enrollment. They also completed a mental health survey; a quality of life survey; and instruments assessing their knowledge of medications, signs and symptoms of CHF, and the effect of diet on CHF.

Outcome measures

The principal outcome measures included the mean number of hospital days; the mean number of hospitalizations; and the average healthcare cost, including the study intervention billed at standard rates for subjects in each group (6- and 12-month cohorts) before and after enrollment. Relevant healthcare utilization and cost variables include emergency room utilization, hospital admissions, and outpatient care as well as the total combined cost. Data were collected from the review of medical records, computer records, and CDMP program records. The finance department of the Griffin Hospital provided detailed cost analysis.

The rate of rehospitalization to Griffin and other hospitals was obtained from Griffin Hospital admission records and from subject interviews. Reported admissions to other hospitals were confirmed by contact with the relevant admitting department after obtaining consent

from the subject. The finance department at Griffin Hospital tabulated a cost of care over the study period. Direct hospital costs, as well as patient charges, were recorded for the study protocol interventions and for all inpatient services utilized by the subjects during the study period. The case manager also recorded the frequency of outpatient visits. For each subject, total cost of care and total medical care charges were calculated for the entire study period and were reviewed with the finance department prior to analysis.

To determine total healthcare utilization charges after enrollment into the CDMP, financial and utilization data were accessed for the periods before and after enrollment. The cost of each step within the program was calculated based on data provided by the finance department at Griffin Hospital. These costs included emergency room utilization and charges, number of hospital admissions, admitting diagnosis, length of stay, charges related to admissions, outpatient utilization, and charges. The costs associated with the CDMP also included the cost of administering the patient education program and supporting the case manager's time.

Emergency room utilization information was obtained from Griffin Hospital's medical records. Outpatient visits for the period before enrollment were self-reported by each patient. To preserve confidentiality, the average cost, rather than cost information for a specific procedure, was provided. Case managers verified this information by contacting the patient's physicians to compare study records with those of the physicians. The cost of outpatient visits was determined by calculating the prevailing rate in Derby, Connecticut, for primary care physician visits and specialty care physician visits. Six primary care physicians and six cardiologists were contacted to determine their fee structure. Of the physicians who were contacted, three primary care physicians and three cardiologists responded. Primary care physician visits were calculated at a charge rate of \$60.67 (SD = \$4.04), and cardiology visits were calculated at a rate of \$141.67 (SD = \$38.19). The costs of patient visits to noncardiologist specialists were assumed to be approximately equal to cardiology care charges.

Total charges consisted of emergency room charges, inpatient charges, and outpatient charges. Total charge per patient per month was determined by dividing each participant's total charges by the number of months being analyzed for that patient. The number of inpatient days for each patient consisted of the total number of hospital days the patient had during each study period (i.e., pre- and post-enrollment). The average length of stay was calculated by dividing each patient's total hospital days by the number of admissions they had during each period. In addition to the pre- and postenrollment periods, a comparable period of time before the pre-enrollment period was analyzed as well. This before-study period was then compared with the pre- and post-enrollment periods to assess the trends that emerged for the study participants.

Statistical analysis

All data were entered into Microsoft Excel 97® and then transported and analyzed using the SAS statistical software package (SAS version 6.12, SAS Institute, Cary, NC). A paired t test was performed to assess the differences in the rate of hospitalization, total healthcare cost, emergency room cost, outpatient cost, and length of stay before and after enrollment into the CDMP. A two-tailed alpha level of 0.05 was used to define significance.

RESULTS

Demographic information is provided in Table 1. As shown in Table 2, the combined average emergency room charges for both cohorts was \$436.56 during the pre-enrollment period and \$91.02 during the post-enrollment period (\$345.55 decrease, $p = 0.03$). Inpatient charges averaged \$14,862.96 at pre-enrollment and \$5,101.50 at post-enrollment (\$9,761.45 decrease, $p = 0.0275$). Average length of stay per admission fell by 1.6 days (4.8 days pre- to 3.2 days post-enrollment), although this difference failed to reach statistical significance ($p = 0.187$).

Total charges per patient averaged \$15,746.92 at pre-enrollment and \$5,777.06 at

Table 1. Demographic Characteristics of Study Subjects ($n = 27$)

	Total	*6-Month cohort* (n = *14*)	*12-Month cohort* (n = *13*)
Average age (mean years ± SD)	72.5 ± 11.5	71.1 ± 12.3	74 ± 10.9
Males	74.4 ± 9.9 ($n = 17$)	73.7 ± 10.7	75.25 ± 9.5
Females	69.2 ± 13.9 ($n = 10$)	66.4 ± 15.0	72 ± 13.7

postenrollment ($9,969.86 decrease, $p = 0.0242$). Total charges per patient per month fell from $2,097.57 at pre-enrollment to $722.91 at postenrollment ($1,374.65 decrease, $p = 0.0289$). Although emergency room charges and inpatient charges decreased between the pre- and postenrollment periods, outpatient charges increased ($137.14, $p = 0.0936$).

Table 3 displays pre- and postenrollment utilization. There were 50% fewer admissions (0.926 vs. 0.444, $p = 0.025$) and 50% fewer emergency room visits ($p = 0.1$) after enrollment. An increase ($p = 0.09$) was observed in the number of outpatient visits after enrollment.

Among patients in the 6-month cohort, there were 15 admissions during the pre-enrollment period and 4 admissions postenrollment. Among patients in the 12-month cohort, there were 10 admissions during the pre-enrollment period and 7 during the year after.

Figures 1 and 2 display the trends in hospital admissions and average length of stay, respectively, among the before-study period, pre-enrollment, and post-enrollment periods. From the before-study period through the pre-enrollment period, subjects exhibited an increase in hospital admissions and in average inpatient days. During the post-enrollment period, hospital admissions and average inpatient days both decreased to levels below the before-study period.

DISCUSSION

The results of this study closely resemble those reported by Rich et al.,[5] corroborating the benefits of a multidisciplinary, nurse-directed intervention to improve quality of life and reduce treatment costs among patients with CHF. This study further demonstrates that such a program is feasible in the community hospital setting, offers sustained clinical benefit, and produces a considerable net financial savings.

Noncompliance among patients with CHF is believed to contribute to the use of expensive in-hospital services more often than is necessary.[18] To prevent this cycle, Block et al.[18] argue that a disease management protocol led by a multidisciplinary team of healthcare professionals can be a more cost-effective way to treat patients with CHF while preventing readmission. The disease management team can provide valuable patient and family education, help increase compliance, assist patients in improving their quality of

Table 2. Comparison of Healthcare Costs and Length of Stay for Pre- and Post-enrollment Periods

Variable	*Pre-enrollment*	*Post-enrollment*	*Difference between pre and post*	p
Emergency room charges	$436.56	$91.02	$345.55	0.0300
Inpatient charges	$14,862.96	$5,101.50	$9,761.45	0.0275
Average inpatient days	4.33	1.63	2.7	0.0295
Average length of stay ($n = 7$)	4.81	3.23	1.6	0.1870
Outpatient charges	$447.40	$584.54	$137.14	0.0936
Total charges	$15,746.92	$5,777.06	$9,969.86	0.0242
Total charges/patient/month	$2,097.57	$722.91	$1,374.65	0.0289

TABLE 3. COMPARISON OF THE NUMBER OF VISITS TO A HEALTHCARE FACILITY BEFORE AND AFTER ENROLLMENT IN THE CHRONIC DISEASE MANAGEMENT PROGRAM

Variable	*Pre-enrollment*	*Postenrollment*	*% Change reduction from post- to pre-enrollment*	p
Hospital admissions	0.926	0.444	−52%	0.0250
Emergency room visits	0.519	0.259	−50%	0.1476
Outpatient visits	4.444	5.741	+28%	0.0937

life, and reduce the need for and cost of hospitalization.[18]

Limited epidemiologic data exist regarding the association between the prognosis of CHF and the cost of care. Due to the lack of reliable data to compare any successive year changes in the costs of care associated with patients surviving CHF, we compared post-enrollment costs to the pre-enrollment period. Although an accurate estimate of how much greater costs would likely be in the post-enrollment period is not readily available in the published literature, it is expected that during the post-enrollment period costs associated with treating CHF would equal or exceed the costs observed during the pre-enrollment period. This analysis rests upon the fact that CHF is both chronic and progressive.[4,19] Senni et al.[20] reported that among 137 patients with CHF, 57% demonstrated reduced systolic function after their initial diagnosis. Zannad et al.,[19] in a study of a community-drawn sample of patients with CHF, reported that 81% either died (35.4%) or were hospitalized (45.6%) within 1 year of enrollment. Although neither the power nor the design of the CDMP evaluation is conducive to evaluating survival, it is nevertheless important to note that no deaths were observed during the study period. Naturally, the sickest patients with heart failure are not only the most likely to be readmitted but are also the most likely to die; therefore, mortality competes with both the rate of readmission and the costs associated with CHF care. It would be expected, then, that with no mortality in the CDMP cohort, a functional decline would be expected

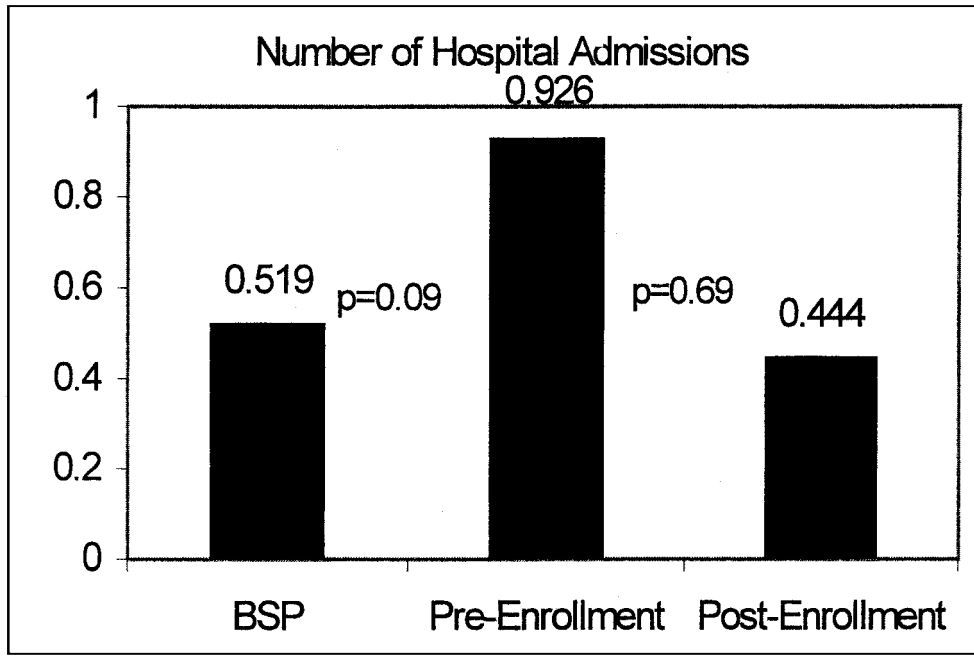

FIG. 1. Comparison of the number of hospital admissions during the before-study period (BSP), pre-enrollment, and postenrollment period.

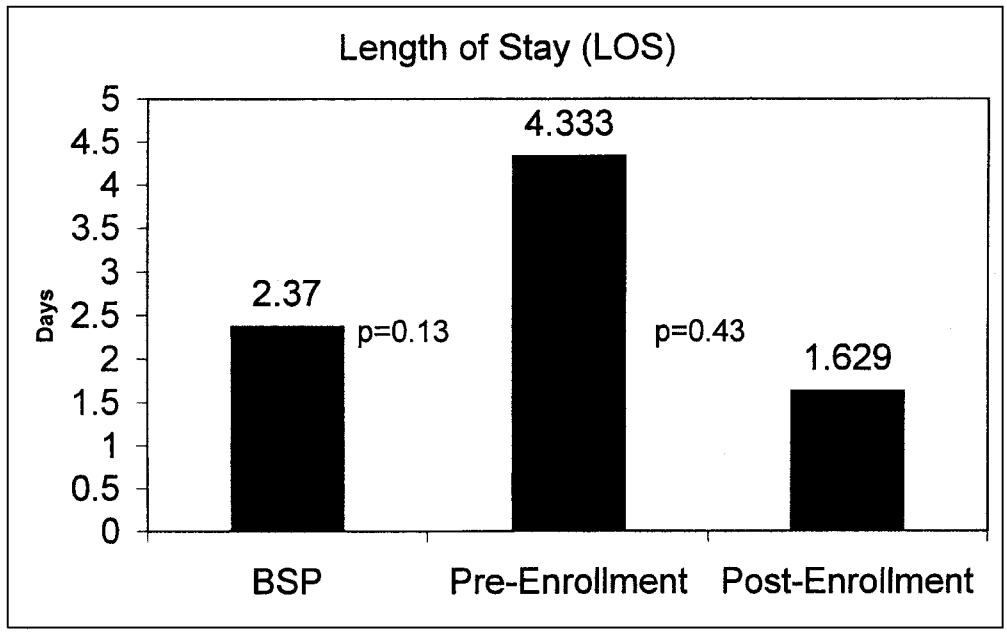

FIG. 2. Comparison of the length of stay during the before-study period (BSP), pre-enrollment, and postenrollment periods.

during each subsequent year of survival. Indeed, independent of any cost savings, a decline in mortality is an important benefit.

It can be argued that market forces and pressure from insurance agencies would lead to reduced hospital days. However, this is not supported by the published literature. To the contrary, CHF is associated with an increasing readmission rate and high mortality. Rich et al.[16] reported a readmission rate of 29% to 47% within 3 to 6 months of initial discharge for elderly patients. Vinson et al.[6] reported a 47% readmission rate within 3 months of initial discharge among elderly patients.

Among the 6-month cohort, only 30% of the patients admitted during the pre-enrollment period had one or more readmissions within the 6-month postenrollment period. Comparing this rate to the 47% benchmark for 6-month readmission after initial discharge, we note that patients in this cohort were readmitted less often than expected. The same analysis among patients in the 12-month cohort reveals a 1-year readmission rate of 57.1%, which is considerably lower than the 81% combined mortality and readmission rate observed by Zannad et al.[19] There were almost 75% fewer admissions during the first 6 months of the postenrollment period as there were during pre-enrollment.

Although not statistically significant, the average length of stay among patients who had at least one admission during both pre- and postenrollment decreased by 1.6 days. Thus, those patients who were readmitted stayed fewer days in the hospital. This provides further evidence that the CDMP prevented the degree of clinical deterioration that occurred prior to enrollment.

A similar trend emerges among both hospital admissions and inpatient days when patients are observed through the three periods examined in this study (i.e., before-study period, pre-enrollment, and post-enrollment). Prior to CDMP enrollment, healthcare utilization did in fact rise over two subsequent observation periods, consistent with expectation. Length of stay and hospital admissions then decreased during the postenrollment period.

Emergency room visits fell postenrollment as well. However, we observed an increase in outpatient utilization. We interpret this to mean that study subjects detected early signs of decompensation and had facilitated access to care. The CDMP effectively substituted non-

emergent for emergent outpatient care. Our findings corroborate those of The Advisory Board Company,[21] which also found evidence to suggest that case management programs can be clinically effective while lowering costs. Similar to the methodology used in the CDMP study, The Advisory Board Company[21] also compared pre-case-management to post-case-management results.

As healthcare costs and utilization are expected to either remain constant or increase over time after an initial diagnosis of CHF, the results of this study indicate significant cost savings associated with enrolling patients in the CDMP. Total monthly charges per patient decreased by $1,374.65. Taken over a 6-month period of time, these savings amounted to $8,247.90 per participant. Reducing that figure by the cost of administering the CDMP (i.e., $1,096.53 for a 6-month period), there is still a net savings of $7,151.37 per participant.

The two principal limitations of this study are its small sample size and lack of a concurrent (and preferably randomly generated) control group. A small sample size reduces power to detect clinically important outcomes. Because significant outcome effects were observed in this study, the sample size was clearly adequate to demonstrate the program's benefits. A randomly assigned control group was not considered ethical, given the anticipated benefits of the program and lack of any conceivable toxicity. Thus, the program was made up of the first 30 eligible subjects. A nonrandomly assigned control was not used, because patients ineligible or unwilling to participate differ systematically from study participants. Despite this limitation, the data here provide convincing evidence of program benefit given their consistency with prior literature and the natural history of CHF. A lesser limitation was our inability to obtain actual charge data for all outpatient visits. The application of estimated outpatient charges nonetheless allows for valid pre- and post-enrollment comparisons.

In conclusion, we have demonstrated the feasibility of comprehensive case management for CHF in the community hospital setting. We have further demonstrated that such a program results in reduced hospitalization and substantial reductions in utilization and cost of care. Replication of this program and coverage of its costs by third-party payers are indicated to yield improved clinical outcomes for participating patients while generating a profit for the sponsoring institutions and savings for the insurers.

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Address reprint requests to:
David L. Katz, M.D., M.P.H.
Yale-Griffin Prevention Research Center
130 Division Street
Derby, CT 06418

E-mail: david.katz@yale.edu