Current Trends in Heart Failure Readmission Rates: Analysis of Medicare Data

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ABSTRACT

Background: Despite advances in optimal pharmacologic therapy, patients with heart failure (HF) continue to have significant rehospitalization rates.

Hypothesis: We sought to provide current estimates on rates of readmission for Medicare patients with HF, and identify factors associated with an increased chance of readmission.

Methods: We used Medicare data from the 5% sample Standard Analytical File Limited Data Set for the years 2002 through 2004 to calculate readmission rates for HF. Clinical factors associated with readmission rates were identified using multivariate logistic regression.

Results: We identified 28,919 patients accounting for 38,849 HF hospitalizations in the 5% sample for 2003. These numbers project to an estimated 578,380 patients with 776,980 HF hospitalizations. In-hospital mortality was 4.4% with an average length of stay of 5.5±5.4 d. In the 6—9 mo following the initial HF admission, 60% of patients had 1 or more readmissions for any cause. Heart failure accounted for 28% of all readmissions. Factors associated with readmission for HF after the initial HF hospitalization included age <65 y, geographic location, previous hospitalization, length of stay of initial HF hospitalization >7 d, not receiving a cardiac device implant at the time of initial HF hospitalization, and history of comorbidities including diabetes, myocardial infarction, peripheral vascular disease, and stroke.

Conclusions: Medicare patients with HF continue to have significant morbidity and one of the highest in-hospital mortality rates of any HF patient population. Factors associated with worse outcomes after an initial HF hospitalization can be used to identify patients who require aggressive therapy and follow-up.

Key words: heart failure, hospital readmission rates

Introduction

Approximately 5 million adults in the United States have a diagnosis of heart failure (HF). From 1979–2003, hospital discharges for HF increased by 174% from 399,000 to 1,093,000.[1] Despite advances in pharmacologic therapy with angiotensin-converting enzyme inhibitors, β-blockers, and aldosterone antagonists,[2–6] patients with HF account for over 12–15 million office visits and over 6.5 million hospital days each year.[7]

Patients hospitalized for HF are at high risk for readmission, with a 6-mo readmission rate as high as 50%.[8] Studies show that comprehensive discharge planning, including medication counseling and review along with increased communication and follow-up, can help reduce readmissions.[9] In addition, the use of implantable cardiac devices combined with optimal medical therapy has successfully reduced hospitalization rates for patients with HF.[10]

Many prior studies on readmission rates have been limited to single-center experiences over a period of several years. While studies of this type provide useful information, the results may not be representative of current practice or extendable to the general population. The goals of this retrospective, observational study are to provide current estimates on rates of readmission for Medicare patients with HF, summarize the reasons for these readmissions, and identify factors associated with an increased chance of readmission for a disease that is expected to cost more than $34.8 billion in 2008.[1]

Methods

This analysis was based on Medicare data from the Centers for Medicare and Medicaid Services (5% sample Standard Analytical File Limited Data Set) for years 2002–2004; the most recent years for which complete data were available at the time this analysis was conducted. The 5% sample is created by selecting records with a health insurance claim number ending in 05, 20, 45, 70, or 95. This sampling technique is consistent each year, allowing the ability to identify records associated with the same beneficiary across years.

All patients included in the analysis had a hospital discharge during 2003 with a principal implantable cardioverter-defibrillator (ICD)-9 discharge diagnosis code of 428.0 through 428.9 (HF) or 398.91 (rheumatic HF). Due to privacy concerns, actual hospitalization dates are not recorded in the public health database. Instead, hospitalizations are recorded by calendar-year quarter. This proved a challenge when a patient had other hospitalizations in the

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quarter of the initial HF hospitalization, which occurred for 30% of the patients. In 60% of these cases (18% of the overall study cohort) the initial hospitalization was identified as the admission associated with payment of the Medicare deductible or as the admission not associated with in-hospital death. In the remaining 40% (12% of the overall study cohort), the initial hospitalization was determined randomly. This approach is consistent with methods used in the analysis of large public databases.[11]

Readmissions in the 2 quarters after the initial HF hospitalization were identified. Again, follow-up times between initial hospitalization and readmissions could not be precisely determined. Follow-up periods ranged from 6 mo for patients whose initial hospitalizations occurred at the end of a quarter to 9 mo for patients whose initial hospitalizations occurred at the beginning of a quarter. Baseline patient characteristics were limited to age, gender, race, geographic location, previous hospitalizations for any reason, previous HF hospitalizations, length of stay of the initial HF hospitalization, implant or replacement of a pacemaker or ICD during the initial HF hospitalization, and comorbidities. Comparisons were made between baseline characteristics of patients who were readmitted for any reason during the 6–9 mo after their initial HF hospitalization and baseline characteristics of patients who neither died nor reentered the hospital. Associations between baseline characteristics and rates of readmission were examined using multivariate logistic regression method, which included factors for each baseline characteristic. Odds ratios were calculated to compare readmission rates within each characteristic.

Results

We identified 28,919 patients accounting for 38,849 HF hospitalizations in the Medicare sample for 2003. These numbers project to an estimated 578,380 patients with 776,980 HF hospitalizations. The in-hospital mortality rate associated with the initial HF hospitalization was 4.4%. The results presented here are based on patients surviving their initial HF hospitalization.

In the 6–9 mo prior to the first HF hospitalization, 51% of patients had 1 or more hospitalizations for any cause. A previous HF hospitalization in the preceding calendar year was identified for 18% of patients, and 2 or more previous HF hospitalizations were identified in 6% of patients.

Table 1 shows baseline demographics for patients surviving the initial HF hospitalization in 2003. The majority of patients included in this sample were 65 y of age or older (89%), Caucasian (83%), and female (56%). More than one-third (37%) had diabetes. States in the southern region of the US census had the largest percentage of patients (41%). The average length of stay for the initial HF hospitalization was 5.5±5.4 d, with approximately 20% of patients hospitalized for more than 7 d; and 3% of patients had an initial implant

TABLE 1: Patient demographics for Medicare patients surviving the initial heart failure hospitalization in 2003.

Age (y)	
<65	11%
65 – 74	26%
75 – 84	39%
≥85	2 4%
Sex	
Female	56%
Male	44%
Race	
Caucasian	83%
African-American	13%
Other	4%
US census region*	
Northeast	20%
Midwest	26%
South	41%
West	11%
Length of stay for initial heart failure admission	
Mean±Standard deviation	5.5±5.4
≤7 d	80%
>7 d	20%
Comorbidities	
Diabetes	37%
Hypertension	44%
Myocardial infarction	12%
Peripheral vascular disease	6%
Stroke	4%
Coronary artery disease	45%
Device implant during initial heart failure hospitalization**	3%
Hospitalization in previous 6 to 9 mo	51%
Hospitalization for heart failure in previous calendar year	18%

*US Census Regions: Northeast — Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; Midwest — Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; South — Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; West — Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming **Initial implant or replacement of cardiac pacemaker or implantable cardioverter-defibrillator with or without cardiac resynchronization therapy.

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TABLE 2: Patient demographics for Medicare patients who were readmitted compared with patients who neither died nor were readmitted within 6 to 9 mo of their initial heart failure hospitalization in 2003

	Patients readmitted within 6 to 9 mo	Patients who neither died nor were readmitted within 6 to 9 mo	p-value*
Age (y)			
<65	13%	11%	<0.001
65 — 74	26%	28%	
75 — 84	38%	40%	
≥85	22%	22%	
Sex			
Female	56%	56%	0.893
Male	44%	44%	
Race			
Caucasian	81%	83%	0.003
African-American	14%	13%	
Other	4%	4%	
US Census Region			
Northeast	21%	19%	<0.001
Midwest	26%	27%	
South	42%	41%	
West	10%	12%	
Length of stay for initial heart failure admission			
Mean±Standard deviation	5.7±6.0	4.7±3.9	
≤7 d	79%	85%	<0.001
>7 d	21%	15%	
Comorbidities			
Diabetes	39%	36%	<0.001
Hypertension	42%	50%	<0.001
Myocardial infarction	13%	12%	0.111
Peripheral vascular disease	6%	5%	<0.001
Stroke	5%	4%	0.010
Coronary artery disease	47%	45%	0.010
Device implant during initial heart failure hospitalization	2.6%	4.1%	<0.001
Hospitalization in previous 6 to 9 mo	56%	40%	<0.001
Hospitalization for heart failure in previous calendar year	21%	13%	<0.001

*p-value for chi-square test comparing distributions between patient groups.

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TABLE 3: Comparison of rates for readmission following initial heart failure admission

Effect	Odds ratio	95% Confidence Interval
Age (y)		
<65 (reference)	1.00	
65–74	0.83	(0.75, 0,91)
75–84	0.83	(0.76, 0.91)
85+	0.94	(0.85, 1.04)
Female	0.99	(0.94, 1.05)
Race		
Caucasian (reference)	1.00	
African-American	1.05	(0.97, 1.14)
Other	1.17	(1.02, 1.36)
Region		
Northeast (reference)	1.00	
Midwest	0.91	(0.84, 0.98)
South	0.96	(0.89, 1.03)
West	0.85	(0.77, 0.94)
Hospitalization for heart failure in previous calendar year	1.58	(1.46, 1.70)
Hospitalization in previous 6 to 9 mo	1.67	(1.58, 1.76)
Length of stay >7 d	1.52	(1.41, 1.63)
Device implant during initial heart failure hospitalization	0.62	(0.53, 0.72)
Diabetes	1.13	(1.07, 1,20)
Hypertension	0.78	(0.74, 0.82)
Myocardial infarction	1.06	(0.98, 1.15)
Peripheral vascular disease	1.17	(1.04, 1.31)
Stroke	1.17	(1.03, 1.34)
Coronary artery disease	1.04	(0.99, 1.10)

or replacement of a pacemaker or ICD at the time of their initial HF hospitalization.

Readmission and Death

In the first 6–9 mo following the first admission for HF, 60% of patients had at least 1 readmission, with an average of 2.2 readmissions per patient. Heart failure was by far the most frequent reason for readmission (28% of all readmissions in this period), with 9% of patients readmitted for HF more than once. The next most frequently reported principal discharge diagnosis for readmission was pneumonia (4.2%). Approximately 8% of patients not readmitted died within the first 6–9 mo following their initial HF hospitalization.

Table 2 compares demographics of patients who were readmitted within 6–9 mo of their initial HF hospitalization with demographics of patients who neither died nor reentered the hospital. Patients readmitted after their initial HF hospitalization had greater lengths of stay during their initial hospitalization, were in the hospital more often during the previous year, and were more likely to have diabetes, peripheral vascular disease, stroke, and coronary artery disease. These patients were also less likely to have received a pacemaker or ICD at the time of their initial HF hospitalization, and were less likely to have hypertension.

A multivariate logistic regression model was used to identify factors associated with readmission for any cause within the first 6–9 mo of the initial HF hospitalization (Table 3). This analysis excluded patients who died. Patients younger than 65 y of age at the time of the initial HF hospitalization had an increased likelihood of readmission compared with patients between 65 and 85 y of age. Minority patients other than African-Americans were at a higher risk of readmissions compared with Caucasians. Compared with patients in the Northeast, patients in the Midwest and West were at a lower risk of readmission. Other factors associated with increased readmission were previous HF hospitalization, previous hospitalization for any reason, length of stay >7 d, diabetes, peripheral vascular disease, and stroke. Patients having hypertension or receiving a cardiac device implant at the time of the initial HF hospitalization had a decreased risk of readmission.

Discussion

This retrospective analysis of Medicare patients after an initial HF hospitalization demonstrates that, despite significant advances in HF management, these patients continue to experience substantial rehospitalization rates. The present analysis confirms other studies in this area, yet offers a different perspective.

Heart failure accounted for 28% of all readmissions during the first 6–9 mo after the initial HF hospitalization. This rate is significantly higher than the 18% of all readmissions reported in a similar population hospitalized in Connecticut between 1991 and 1994.[8] The population included in the present analysis had significant morbidity with a 60% readmission rate for any cause at 6–9 mo after discharge for the initial HF hospitalization compared with a readmission rate of 44% in the previous report. It is interesting that the second and third reasons for readmission (pneumonia and chronic obstructive pulmonary disease exacerbation)

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in this population are diagnoses that can easily be confused with HF. This patient population had a high incidence of comorbidities such as diabetes, peripheral vascular disease, and stroke, which all influence readmission rates. A comorbidity of hypertension was negatively associated with readmission. Although the reasons for this are not clear, the negative association between hypertension, heart failure, and mortality has been described elsewhere.[11]

The Medicare population included in this analysis had an in-hospital mortality rate of 4.4%, and a mean length of stay of 5.5±5.4 d for treatment of HF. These are higher than the in-hospital mortality (3.9%) and length of stay (4.3 d) reported from the Acute Decompensated Heart Failure National Registry (ADHERE),[12] an observational study of primarily Medicare and Medicaid patients with HF. Although the 4.4% mortality rate in this population is higher than what has been seen in recent HF trials,[13] it is similar to the mortality rates reported from analyses of large Medicare databases.[14,15]

There are similarities between the data used in the present analysis and the ADHERE registry. Both datasets evaluated an elderly HF population. The Medicare HF population reported 89% of the patients to be at least 65 y old, while the ADHERE registry reported an average age of 75.3 y. Both groups demonstrate a high rate of hospitalizations 6 mo prior to the qualifying HF hospitalization. This observation is important because HF patients older than 65 y have consistently been shown to have lower survival rates than HF patients younger than 65 y.[16] However, our results indicate that Medicare patients under the age of 65 (11% of the patient cohort) demonstrate significant rehospitalization rates compared with Medicare patients over age 65. This could be due to sicker patients in the younger Medicare population, since these patients must have certain disabilities or end-stage renal disease to be eligible for Medicare coverage.

Brown and colleagues recently reported on racial and ethnic differences in the prevalence of HF hospitalizations among Medicare patients.[17] The present analysis of Medicare data further identifies an increase in the rate of hospital readmissions in HF patients who are neither African-American nor Caucasian. The reasons for this difference are not clear; nevertheless, this might be due to differences in discharge status, which were reported by Brown et al. The authors noted that African-American, Hispanic, and Asian patients were more likely than Caucasian patients to be discharged home instead of to a skilled nursing facility. This could lead to an increased chance of hospital readmission. Rathore et al. reported hospitalization rates in African-American Medicare patients with HF. They concluded that African-American patients had slightly higher readmission rates, but lower mortality rates up to 1 y after hospitalization than their Caucasian partners.[18] Overall, these results suggest that culturally competent preventive strategies are needed to treat specific patient populations.

It is interesting that, in the logistic regression models, lack of a cardiac device implant after the initial hospitalization was associated with greater readmission rates and mortality. All of the biventricular pacing and defibrillator trials in HF required that patients be free from HF hospitalization for a specified period prior to implant. This was required to assure that patients were on a stable HF regimen prior to receiving a cardiac implant. Although only 3% of patients received a cardiac device during their initial hospitalizations, these findings are thought provoking regarding proper timing of a cardiac device (if indicated) relative to HF hospitalization. This observation is limited in that the type of cardiac device received by the patients is unavailable in the database used for this analysis, as is the mode of death after their initial HF hospitalization.

Study Limitations

This analysis used the Medicare Standard Analytical File Limited Data Set, a 5% sample of Medicare claims. This data set, while representative of the Medicare population, has several limitations. First, there is the lack of extensive clinical information that prevents detailed adjusted analyses. For example, the data provided no indication of disease severity or New York Heart Association (NYHA) classification. Second, the Limited Data Set does not provide the exact date of each hospitalization, requiring the use of other information in the data set to place events in chronological order. This was especially challenging when hospitalizations occurred in the same calendar-year quarter.

Conclusion

Despite a trend of decreased hospitalization for HF in Medicare patients, current readmission rates for HF appear not to have changed much over the past 10 y, indicating that HF is still a persistent and important healthcare issue. Medicare patients with HF continue to have significant morbidity and one of the highest in-hospital mortality rates of any HF patient population. Despite their limitations, large public health databases can be used to identify current trends in readmissions for HF patients. Factors associated with worse outcomes after an initial HF hospitalization can be used to identify patients who require aggressive therapy and follow-up.

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