Characteristics of Patients Hospitalized With Acute Decompensated Heart Failure Who Are Referred for Hospice Care

Paul J. Hauptman, MD; Sarah J. Goodlin, MD; Margarita Lopatin, MS; Maria Rosa Costanzo, MD; Gregg C. Fonarow, MD; Clyde W. Yancy, MD; for the ADHERE Scientific Advisory Committee and ADHERE Study Group

Background: Hospice is a potential option for patients with end-stage heart failure whose symptoms and clinical status have progressed despite maximal medical therapy. However, little is known about hospice referral practices when patients are admitted because of acute decompensated heart failure.

Methods: Data from the Acute Decompensated Heart Failure Registry (ADHERE) were analyzed from October 1, 2001, to December 31, 2005, accounting for 182,898 patient episodes with known disposition from 307 hospitals. Demographic data, clinical characteristics, and medical management were compared in the group discharged to hospice vs patients discharged to home or to intermediate-care facilities. Hospitals, stratified by frequency of discharge of patients to hospice, were evaluated for adherence to performance measures. Temporal trends according to discharge category were analyzed using analysis of variance, and predictors of hospice referral were determined by multivariate analysis.

Results: The hospice cohort composed 1.6% (n=3010) of the total sample. Patients referred to hospice were generally older, more likely to have been admitted because of antecedent heart failure in the preceding 6 months, more likely to receive intravenous inotropic therapy, less likely to receive angiotensin-converting enzyme inhibitors, and less likely to undergo a procedure (eg, dialysis or cardiac catheterization) during the hospitalization. The median rate of hospice referral increased from 0.8% in 2001 to 1.3% in 2005 (P<.008). Hospitals in the upper quartile of hospice referrals had comparable or higher rates of adherence to quality indicators for heart failure than did hospitals in the lowest quartile. Variables obtained at admission that were associated with hospice referral included older age (per 10-year increment; odds ratio [OR], 1.63; 95% confidence interval [CI], 1.57-1.68), lower serum sodium concentration (per 5-mEq/L [to convert to millimoles per liter, multiply by 1.0] increment; OR, 0.81; 95% CI, 0.78-0.83), lower systolic blood pressure (per 10–mm Hg increment; OR, 0.86; 95% CI, 0.85-0.88), higher serum urea nitrogen concentration (per 10-mg/dL [to convert to millimoles per liter, multiply by 0.375] increment; OR, 1.20; 95% CI, 1.18-1.21), and absence of lipid-lowering drug therapy (use of drug OR, 0.69; 95% CI, 0.63-0.75).

Conclusions: A small percentage of patients admitted to acute care hospitals with decompensated heart failure are referred to hospice at rates increasing with time. Hospitals that refer patients to hospice are more likely to be in compliance with heart failure performance measures. Further investigation is required to determine if the hospice option is appropriately selected and if it should be offered to a broader cohort of patients.

Trial Registration: clinicaltrials.gov Identifier: NCT00366639


Heart failure (HF) is a chronic disease that disproportionately affects the older population. It is a leading cause of hospitalizations, readmissions, and ambulatory visits in the Medicare cohort. Despite overall progress in drug and device interventions, patients with chronic advanced New York Heart Association class IIIb [ie, marked limitation in activity due to symptoms, even during less-than-ordinary activity; comfortable only at rest] or IV [ie, severe limitations; experiences symptoms even while at rest] HF and stage D disease despite maximal medical therapy have a guarded prognosis. Treatment options in this subgroup of patients with HF are largely limited to ventricular replacement strategies (ie, heart transplantation and left ventricular assist systems), protocol therapy, and home inotropic therapy. Recent guidelines and the summary statements of a consensus panel and others have included language that supports the concept that pa-
Individual patients are units of analysis. The hospice benefit, developed on a model of end-stage cancer, is not widely offered to patients with HF. The percentage of patients in hospice with a primary diagnosis of advanced cardiac disease is about 12% of the patient census, and little is known about hospice referral practices for persons with advanced HF. We examined the Acute Decompensated Heart Failure National Registry (ADHERE) database, a multicenter observational registry involving voluntary reporting of data for patients with HF hospitalized at acute care hospitals having a primary diagnosis of HF. Our goal was to describe the patients with HF referred directly from acute care hospitals to hospice in the United States, including demographic data, clinical characteristics at hospital admission, and in-hospital interventions. We sought to identify variables associated with hospice referral and to evaluate quality of care by measuring the degree to which hospitals with patients referred to hospice are in compliance with HF quality indicators established by the Joint Commission on Accreditation of Health Care Organizations (JCAHO).

### METHODS

#### DATA COLLECTION

Data from ADHERE were used for this investigator-initiated analysis. The registry contains data for patients hospitalized with acute decompensated HF in community, tertiary, and academic centers from all regions of the United States. The detailed methods of the registry have been described. In brief, participating acute care hospitals retrospectively entered data for hospitalized patients who were at least 18 years old and who received a discharge diagnosis of HF or for whom the principal focus of treatment during hospitalization was HF. Each registry record ended with patient discharge, transfer out of the hospital, or in-hospital death; thus, follow-up data after hospitalization are unavailable. In the registry, HF is defined as either new onset or decompensation of chronic HF with symptoms severe enough to warrant hospitalization. To preserve patient confidentiality, direct patient identifiers were not collected. As a result, individual hospitalization events rather than individual patients are units of analysis.

#### DATA MANAGEMENT

Outlier data were routinely screened using preset variables at data entry. Some variables (eg, New York Heart Association class, insurance status, and body mass index) were missing a substantial percentage of data points, which precluded inclusion in several analyses. Assessment of left ventricular ejection fraction (LVEF) before or during hospitalization was unavailable in 17% of records (26% missing quantitative determinations). However, serum urea nitrogen concentration and creatinine concentration were missing in less than 2% of the records.

#### DEFINITION OF COHORTS

As of May 1, 2006, the registry included data for 187,575 patient episodes dating back to October 1, 2001. Excluded from the analysis were 1939 cases (1.04%) with discharge dates in 2006 and 2738 cases (1.48%) with disposition recorded as “unknown,” “not specified,” or “left against medical advice.” The final data set contained 182,898 patient episodes with known disposition from 307 hospitals (median, 363 patient episodes; interquartile range, 101-879 patient episodes per hospital).

We categorized hospitalizations into 5 groups on the basis of discharge status, that is, discharge to home with self-care; discharge to home with additional care, which could include any combination of additional outpatient care with home health service organization care or home intravenous drug treatment; discharge to rehabilitation institution, which could include nursing home, rehabilitation facility, or short- or long-term care hospital; discharge with hospice enrollment; or death during hospitalization.

#### ANALYTICAL PLAN

For the primary analysis, demographic data, clinical characteristics, and medical management were compared in the group discharged to hospice vs those patients discharged to home or to intermediate-care facilities, using analysis of variance and the χ² and Wilcoxon tests as appropriate. Two-sided P values are reported. Because of multiple pairwise comparisons, only P < .0125 was considered statistically significant, using the Bonferroni correction. We also evaluated the percentage of patients discharged to different discharge categories according to region of the United States (Mid-Atlantic, Midwest, Northeast, South, and West) and academic status of the hospital. Comparisons were made using χ² and Fisher exact tests as appropriate. An additional comparison between the hospice cohort and those patients who died during the acute hospitalization was performed. Hospitals were stratified by quartiles in terms of frequency of discharges to hospice and compared in terms of adherence to JCAHO quality measures for HF care.

Three periods for ADHERE enrollment (October 1, 2001, through December 31, 2002; January 1, 2003, through December 31, 2003; and January 1, 2004, through December 31, 2005) were examined to identify changes in frequency of hospice discharges with time. Characteristics of patients discharged to hospice during these periods were compared using analysis of variance and χ² tests. Use of angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers, and β-blockers were evaluated by quarter of discharge for each disposition group, and temporal changes were assessed using the Cochran-Armitage test for trend.

A group of 25 variables was selected on the basis of previous studies in the literature to evaluate univariate and multivariate predictors of discharge to hospice vs all other alive discharges combined in all categories. Seven of the variables were eliminated because they had more than 5% missing values (QRS interval and atrial fibrillation on admission electrocardiogram, LVEF < 40%, congestion on admission chest radiograph, body mass index, hospitalization in the preceding 6 months, and presence of active malignant neoplasm). Of the remaining 18 variables (ie, chronic dialysis [before admission]; history of diabetes; dyspnea or fatigue at rest reported at admission; use of ACE inhibitor, angiotensin receptor blockers, or both; use of β-blocker; use of lipid-lowering agent; use of digoxin; age, per 10-year increase; serum urea nitrogen level, per 10-mg/dL increase; serum sodium level, per 5-mEq/L [to convert to millimoles per liter, multiply by 1.0] increase; systolic blood pressure per 10-mm Hg increase; academic vs nonacademic status of hospital; race [black or other]; sex; history of cerebrovascular accident or transient ischemic attack; serum creatinine level > 2.0 mg/dL [to convert to micromoles per liter, multiply by 88.4]; and hemoglobin concentration were missing in less than 2% of the records.

©2007 American Medical Association. All rights reserved.
level <12.0 g/dL [to convert to grams per liter, multiply by 10.0]), several were dichotomized (eg, hemoglobin values ≥11.0 g or <11.0 g and serum creatinine ≥2.0 g/dL or <2.0 g/dL); others, including age, systolic blood pressure, and serum urea nitrogen and serum sodium concentrations, were treated as continuous variables based on a monotonous relationship with outcomes.

Variable selection using the χ² score statistic suggested that a model with 10 variables would be as accurate as a model incorporating all 18 variables. Specifically, the branch and bound algorithm of Furnival and Wilson was used to find models with the highest likelihood score statistic for a given model size. The model with 10 variables had an area under the receiver operating curve comparable to that of the full model (0.778), whereas a smaller model limited to 5 variables had a slightly lower area under the receiver operating curve (0.768); both are presented. Reported P values are not adjusted for multiple comparisons. All analyses were carried out using SAS software (version 8.2; SAS Institute Inc, Cary, North Carolina).

RESULTS

Among the 182,898 eligible hospitalization patient HF episodes between October 1, 2001, and December 31, 2005, 113,539 patients (62.1%) were discharged to home with self-care, 27,013 (14.8%) were discharged to home with additional care, 32,269 (17.6%) were discharged to another institution, and 3,010 (1.6%) were referred to hospice (Figure 1). The number of patients who died in hospital was 7,067 (3.9%).

DEMOGRAPHIC DATA AND HOSPITAL COURSE IN DISCHARGE GROUPS

Baseline demographic data and medical histories for the patients discharged alive from the hospital are given in Table 1. Compared with other discharge groups, patients referred to hospice were older (mean±SD age, 80.2±10.8 years) than all other patients except for those discharged to other institutions (mean±SD age, 79.4±11.5 years), had higher active malignant neoplasm rates, and were more likely to have have been hospitalized because of HF within the preceding 6 months (P<.001).

At admission, LVEF was assessed or recorded in 83.1% of subjects, and the rates of LVEF evaluation were similar between groups. Compared with other discharge groups, patients referred to hospice had a lower LVEF (mean±SD, 33.4%±17.4%) and a significantly higher likelihood of a recorded LVEF less than 25% or a category of severe impairment (P<.001 for both). Hospice patients more commonly had an initial symptom of fatigue and were more likely to have a wide QRS complex (Table 2).

Table 1. Patient Demographic Data and Medical History

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hospice Care (n=3,010)</th>
<th>Other Institution (n=32,269)</th>
<th>Home, Additional Care (n=27,013)</th>
<th>Home, Self-care (n=113,539)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean±SD, yb</td>
<td>80.2±10.8</td>
<td>79.4±11.5c</td>
<td>75.3±12.8</td>
<td>69.3±14.2</td>
</tr>
<tr>
<td>Female sex</td>
<td>54.1</td>
<td>62.9</td>
<td>57.0d</td>
<td>47.2</td>
</tr>
<tr>
<td>Medical history</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active malignant neoplasm</td>
<td>12.7</td>
<td>5.5</td>
<td>5.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>39.6</td>
<td>37.0d</td>
<td>34.6</td>
<td>27.6</td>
</tr>
<tr>
<td>Hospitalization with HF in the last 6 mo</td>
<td>44.9</td>
<td>31.7</td>
<td>36.0</td>
<td>29.1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>66.5</td>
<td>74.0</td>
<td>75.0</td>
<td>74.7</td>
</tr>
<tr>
<td>Renal insufficiency</td>
<td>43.5</td>
<td>33.7</td>
<td>33.4</td>
<td>27.2</td>
</tr>
<tr>
<td>TIA or CVA</td>
<td>20.8</td>
<td>22.9d</td>
<td>18.8d</td>
<td>14.1</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>37.9</td>
<td>44.1</td>
<td>45.8</td>
<td>44.5</td>
</tr>
<tr>
<td>COPD</td>
<td>36.0</td>
<td>33.0d</td>
<td>35.2</td>
<td>29.6</td>
</tr>
<tr>
<td>Implantable cardioverter defibrillator</td>
<td>9.1</td>
<td>4.3</td>
<td>7.6d</td>
<td>7.9d</td>
</tr>
<tr>
<td>Primary insurance: Medicare or Medicaid</td>
<td>89.4</td>
<td>88.7f</td>
<td>84.9</td>
<td>74.1</td>
</tr>
</tbody>
</table>

Abbreviations: COPD, chronic obstructive pulmonary disease; CVA, cerebrovascular accident; HF, heart failure; TIA, transient ischemic attack.

- Data are given as percentage of cases and P values are derived from χ² test unless otherwise indicated. All P values represent pairwise comparisons with the hospice care cohort. All comparison not otherwise specified were P<.001.
- P values are derived from 1-way analysis of variance.
- P<.001
- P<.01
- Assessed by the investigator and included chronic renal insufficiency, chronic renal failure, and end-stage renal disease.
- P not significant.
- P=.02.
During hospitalization, the hospice cohort was far more likely to receive intravenous inotropic or vasodilator therapy than other patients discharged alive but was subjected to the least number of procedures compared with all other patient groups (Table 3). Cardiac catheterization and dialysis were performed in 2.7% and 4.0%, respectively, of this cohort, compared with 11.6% and 5.7%, respectively, of patients discharged to home with self-care. Intravenous diuretic use was similar in all discharge groups. The time to receipt of first diuretic was significantly longer for patients referred to hospice (mean ± SD, 10.7 ± 27.5 hours) than for those who were discharged to home with additional care (mean ± SD, 7.7 ± 21.6 hours) or self-care (mean ± SD, 6.7 ± 23.1 hours). In addition, weight change was least often assessed during hospitalization and decreased less from baseline in the hospice group.

The rates of in-hospital administration of ACE inhibitors or angiotensin receptor blockers and β-blockers were lowest in the group referred to hospice. Further, fewer hospice patients were prescribed ACE inhibitors or angiotensin receptor blockers (29.0%) or β-blockers (37.0%) at discharge than were those discharged to other levels of care, in whom use of ACE inhibitors or angiotensin receptor blockers and β-blockers ranged from 51.7% to 68.8% and 53.6% to 64.3%, respectively. However, during the course of the study, β-blocker use increased both at admission and at discharge across all disposition categories.
The median hospital length of stay was shortest for patients discharged to home with self-care (3.9 days); the median length of stay for hospice patients (6.2 days) was similar to that for patients transferred to other institutions (6.0 days) (Figure 2). These 2 groups also had similar rates of intensive care unit use (20.5% and 19.4%, respectively; P = .15) and number of intensive care unit days (mean ± SD, 4.5 ± 4.4 days vs 5.0 ± 6.7 days; P = .09).

HOSPITAL CHARACTERISTICS
Discharge of patients with HF to hospice ranged from 0% to a maximum of 9.1% of admissions. Nonacademic hospitals were slightly more likely to discharge patients to hospice than were academic hospitals (1.7% vs 1.5%; P < .001); in addition, patients in nonacademic hospitals were more likely to be discharged to other institutions (19.8% vs 13.6%; P < .001). In terms of geographic location of hospitals, discharges to hospice varied from 1.0% of subjects enrolled in the Mid-Atlantic to 2.0% in the Midwest (P < .001).

COMPLIANCE WITH JCAHO HF PERFORMANCE MEASURES
Hospitals in the upper quartile of hospice referrals had comparable or higher rates of adherence to JCAHO quality indicators for HF compared with hospitals with no hospice referrals (Figure 3). Adherence did not vary with hospital size. However, when the indicator for discharge planning, chosen because of wide variability in compliance, was used to divide hospitals into higher (>50%) and lower (≤50%) compliance categories, those with lower compliance tended to refer patients to hospice less often. Specifically, of the 106 hospitals with high compliance, 41% were in the upper quartile of hospice referral; of the 201 hospitals with low compliance, only 17% were in the upper quartile of hospice referral (P < .001).

TEMPORAL CHANGES
During the study period, the median rate of hospice referral increased from 0.8% in 2001-2002 to 1.3% in 2004-2005 (P = .008). This change in rate of hospital discharge to hospice was also seen when the analysis was limited to those hospitals that contributed patient data on a continual basis throughout the data collection period. The rate of hospice referral increased among the hospitals in the upper quartile of hospice discharge from 1.5% in 2002 to 2.7% in 2005. The percentage of total alive discharges referred to hospice by quartile is shown in Figure 4.

FACTORS ASSOCIATED WITH HOSPICE REFERRAL
Baseline predictors of hospice referral at discharge are given in Table 4 for a model with 10 variables. The comparable model with 5 variables (age, serum urea nitrogen level, systolic blood pressure, serum sodium level, and use vs nonuse of lipid-lowering agents) demonstrates relatively similar odds ratios. These variables are determined at admission and are significant at P < .001.

COMPARISON WITH PATIENTS WHO DIED DURING HOSPITALIZATION
Compared with patients who died during hospitalization, hospice patients were older (mean ± SD, 80.2 ± 10.8 years vs 77.6 ± 12.3 years; P < .001) and less likely to have diabetes (37.9% vs 41.7%; P < .001) or to have received long-term dialysis (3.1% vs 5.3%; P < .001). The 2 groups were similar insofar as history of cardioverter defibrillator implantation, myocardial infarction, hypertension, or presence of edema at admission. However, the hospice patients were significantly less likely to undergo catheterization, to receive mechanical ventilatory assistance, or to undergo dialysis while hospitalized (9.8% vs 36.9%; P < .001) or to receive inotropic therapy (26.0% vs 44.7%; P < .001). Conversely, hospice patients had greater weight loss (mean ± SD weight change from admission to discharge, −2.1 ± 5.2 kg [to convert to pounds, multiply by 2.2] vs −1.0 ± 0.6 kg; P < .001) and a slightly
shorter length of stay (mean±SD, 7.8±6.3 days vs 8.4±10.4 days; P=.001) compared with patients who died.

Patients hospitalized because of HF have high morbidity and are at risk of death. Hospice care is an option for those patients with advanced disease who neither benefit from nor tolerate conventional therapies, who request or agree to a shift toward palliative care, and who are not likely to survive 6 months. Although the hospice model of care was first developed for patients with cancer, HF is recognized as a condition for which hospice care is appropriate in its terminal stages. However, few data are available that provide insight into current practice of hospice referral in patients with HF in the United States.

In ADHERE, we found that only a small percentage of patients admitted to an acute care hospital having a diagnosis of HF are referred to hospice. Nevertheless, to our knowledge, the analysis presented herein includes the largest cohort studied to date. Compared with other dispositions in this study, patients referred to hospice at discharge had a lower quantitative LVEF, lower body mass index, and a greater likelihood of an initial symptom of fatigue than the other groups of hospitalized patients with HF. Unlike patients who died in-hospital, patients referred to hospice were less likely to undergo a procedure or receive intravenous vasoactive therapy.

Several publications have proposed indications for hospice referral in patients with HF. Hospice care under Medicare is appropriate for patients deemed to have a likely 6-month life expectancy by their physician and the hospice medical director. Guidelines for hospice referral recommend that the patient should demonstrate severe limiting symptoms and poor prognosis despite optimal medical therapy or documentation of intolerance to therapy. Weight loss or cachexia and fatigue associated with physical frailty and active malignant neoplasm likely are important comorbidities that are consistent with the guidelines for referral to hospice care. Although we have no data about physician decision making in ADHERE, the patients referred to hospice seem to reflect these recommendations. Overall referral rates to hospice were low, but there was a substantial increase in rates of hospice discharge during the period used for data collection in the registry.

The long length of hospital stay suggests that either the decision to discharge to hospice was not made until later during the hospitalization or that once the hospice referral was made, the process of actually transferring the patients to hospice care was lengthy. A more timely initiation of referral may be warranted in those patients who

![Hospice Discharges by Quarter](http://example.com/hospice-discharges.png)

**Figure 4.** Temporal trend in discharge to hospice as a percent of total alive discharges. Q indicates year quarter.

<table>
<thead>
<tr>
<th>Table 4. Predictors of Hospice at Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>ACE inhibitor or ARB</td>
</tr>
<tr>
<td>Long-term dialysis</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>Dyspnea at rest</td>
</tr>
<tr>
<td>Fatigue</td>
</tr>
<tr>
<td>Lipid-lowering agent</td>
</tr>
<tr>
<td>Age per 10-y increment</td>
</tr>
<tr>
<td>SUN level per 10-mg/dL increase</td>
</tr>
<tr>
<td>Serum sodium level per 5-mmol/L increase</td>
</tr>
<tr>
<td>Systolic BP per 10-mm Hg increase</td>
</tr>
</tbody>
</table>

Abbreviations: ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; BP, blood pressure; CI, confidence interval; OR, odds ratio; SUN, serum urea nitrogen.

*Odds ratios are adjusted for the other variables in the model.*
seem to be candidates for hospice care. Recently published risk stratification models may help in the earlier identification of patients hospitalized because of HF for whom hospice is an appropriate care option.20-21 Predictors of hospice referral in our study population included advanced age, low serum sodium level, low systolic blood pressure, elevated serum urea nitrogen level, and absence of lipid-lowering therapy. These variables are easily obtained when a patient comes to the hospital and likely reflect the advanced nature of the underlying HF. However, the degree to which a predictive model for hospice can be prospectively applied and facilitate decision making will require further study.

The lower use of evidence-based therapies in the patient population referred for hospice may not represent a quality issue; it is possible that the inability to tolerate ACE inhibitors and β-blockers is a marker for advanced disease and a less favorable outcome.22 Hospitals with the highest quartile of referrals to hospice were generally in greater compliance with JCAHO performance measures for HF, suggesting that the observed differences in referral rates are not likely related to inappropriate (ie, early) hospice disposition. Nevertheless, it would be helpful to obtain postdischarge outcome data for patients referred to hospice to determine whether the estimates of high early mortality in this cohort were accurate. Further, we highlight that current performance measures are confined to just a few care processes,23 and important populations with HF (eg, patients with preserved left ventricular systolic function and patients discharged to hospice) are excluded from many indicators. Measuring and reporting only a subgroup of patients with HF may encourage hospitals and providers to reallocate efforts toward the rewarded dimensions of care at the expense of the unmeasured and unrewarded dimensions.

The choice of discharge location varied between geographic regions and by academic status. Regional variations in care for persons with advanced disease and variations in practice between academic and community hospitals have been previously identified.24,25 Hospice use is also known to be more common in areas with fewer hospital beds per capita and higher enrollment in managed care.26,27

Alternatives to hospice referral exist. The use of home parenteral continuous inotropic therapy, currently a benefit under Medicare if infusions are administered through a long-term indwelling central catheter, is recognized as a palliative option that can be provided with or without hospice care. Because the costs of this therapy are often substantially higher than the per diem reimbursement provided to hospice organizations by Medicare, not all hospice programs accept patients who are receiving continuous intravenous inotropic therapy.28,29 Nevertheless, patients receiving such therapy have a limited life expectancy, consistent with the intent of the Medicare hospice benefit.28,31

LIMITATIONS OF THE STUDY

This study provides a retrospective overview of the characteristics of patients hospitalized with acute decompensated HF in a large contemporary registry that is representative of a national cohort.32 However, data about survival or care delivered after discharge were not collected. Many potentially important predictors were excluded from the multivariate model on the basis of a rate of missing data of more than 5%. In addition, many previously identified prognostic factors, such as respiratory rate, dementia, and electrocardiographic characteristics at admission, were not captured in this database; therefore, we cannot apply certain established predictive models to predict outcomes in the patient subgroups defined by discharge status. In addition, we cannot comment on the appropriateness of hospice referrals per se, the thoroughness of attempts at optimal medical therapy, or the effect of these decisions on quality of life.

FUTURE DIRECTIONS

Prospective evaluation of decision-making steps is needed to better understand hospice referral for patients hospitalized with HF. Longitudinal follow-up, especially in patients transferred to long-term care facilities, should be included in HF registries; these data would facilitate an evaluation of outcomes after hospital discharge.

To our knowledge, ours is the largest cohort of patients hospitalized with HF and referred to hospice studied to date and our findings provide insights into current practice. Patients referred to hospice are likely to be older, have systolic dysfunction, and experience fatigue as the initial symptom. They are less likely to receive standard evidence-based care and receive less aggressive inpatient care compared with patients who do not survive the hospitalization. Additional investigation is needed to characterize the appropriateness of hospice referral; the role of early implementation of palliative care interventions based on prognostic models; and outcomes, especially quality of life, after hospice referral.

Accepted for Publication: June 1, 2007.

Author Affiliations: Division of Cardiology, Saint Louis University School of Medicine, St Louis, Missouri (Dr Hauptman); Patient-Centered Education & Research, Salt Lake City, Utah (Dr Goodlin); Scios Inc, Mountain View, California (Ms Lopatin); Midwest Heart Specialists, Lombard, Illinois (Dr Costanzo), David Geffen School of Medicine, University of California–Los Angeles (Dr Fonarow); and Heart and Vascular Center, Baylor University Medical Center, Dallas, Texas (Dr Yancy).

Correspondence: Paul J. Hauptman, MD, Division of Cardiology, FDT-15, Saint Louis University Hospital, 3635 Vista Ave, St Louis, MO 63110 (hauptmpj@slu.edu).

Author Contributions: Study concept and design: Hauptman, Goodlin, and Yancy. Acquisition of data: Hauptman and Fonarow. Analysis and interpretation of data: Hauptman, Goodlin, Lopatin, Costanzo, Fonarow, and Yancy. Drafting of the manuscript: Hauptman, Goodlin, and Yancy. Critical revision of the manuscript for important intellectual content: Goodlin, Lopatin, Costanzo, and Fonarow. Statistical analysis: Lopatin and Fonarow. Obtained funding: Fonarow. Administrative, technical, and material support: Hauptman, Costanzo, and Fonarow. Study supervision: Hauptman and Fonarow.

CONCLUSIONS


©2007 American Medical Association. All rights reserved.
Financial Disclosure: Scios, Inc provided statistical support, in part, for this study through ADHERE. Dr Hauptman has received research grants from Abbott Laboratories, Acorn Cardiovascular, GlaxoSmithKline (GSK), the National Institutes of Health, NovaCardia Inc, Novartis International AG, ORQIS Medical, and Otsuka Pharmaceutical Group; and is or has been on the speakers bureau or has received honoraria in the last 5 years from AstraZeneca, GSK, Johnson & Johnson, and King Pharmaceuticals Inc; and is or has been a consultant for BioControl Medical Ltd, GSK, NovaCardia Inc, and Otsuka Pharmaceutical Group. Dr Goodlin has received educational grants from Abbott Laboratories, Medtronic, and Scios, Inc; research grants from the Mayday Fund; and unrestricted funding from the Byrne Foundation. Ms Lopatin was an employee of Scios, Inc. Dr Costanzo is or has been on the speakers bureau or has received honoraria in the last 5 years from CHF Solutions, Inc, Medtronic, and Scios, Inc; is or has been a consultant for CHF Solutions, Inc; and is a member of the ADHERE Scientific Advisory Committee. Dr Fonarow has received research grants from Amgen, Inc, Biosite, Inc, Boston Scientific/Guidant, Bristol-Myers Squibb, GSK, Medtronic, Merck & Co, Pfizer Inc, Sanofi Aventis, and Scios, Inc; is or has been on the speakers bureau or has received honoraria in the last 5 years from Amgen Inc, AstraZeneca, Biosite, Inc, Bristol-Myers Squibb, Boston Scientific/Guidant, GSK, Kos Pharmaceutical, Inc, Medtronic, Merck & Co, NitroMed, Inc, Pfizer Inc, Sanofi Aventis, Scios, Inc, Schering Plough Corp, St Jude Medical, Takeda Pharmaceutical Co, and Wyeth; and is or has been a consultant for Biosite, Inc, Bristol-Myers Squibb, Boston Scientific/Guidant, GSK, Medtronic, Merck & Co, NitroMed, Inc, Pfizer, Inc, Sanofi Aventis, Schering Plough Corp, Scios, Inc, and Wyeth. Dr Yancy has received research grants from GSK, Medtronic, NitroMed, Inc, and Scios, Inc; is or has been on the speakers bureau or has received honoraria in the last 5 years from GSK and Novartis International AG; and is or has been a consultant for AstraZeneca, GSK, Medtronic, NitroMed, Inc, and Scios, Inc.

Previous Presentation: This study was presented as a poster at the Eighth Annual Scientific Meeting of the Heart Failure Society of America; September 13, 2004; Toronto, Ontario, Canada.

REFERENCES