Adherence to Heart Failure Quality-of-Care Indicators in US Hospitals

Analysis of the ADHERE Registry

Gregg C. Fonarow, MD; Clyde W. Yancy, MD; J. Thomas Heywood, MD; for the ADHERE Scientific Advisory Committee, Study Group, and Investigators

Background: Quality-of-care indicators have been developed for patients hospitalized with heart failure. However, little is known about current rates of conformity with these indicators or their variability across hospitals.

Methods: Data from 81,142 admissions occurring between July 1, 2002, and December 31, 2003, at 223 academic and nonacademic hospitals in the United States participating in the Acute Decompensated Heart Failure National Registry (ADHERE) were analyzed. Rates of conformity with the 4 Joint Commission on Accreditation of Healthcare Organizations core performance measures—discharge instructions (HF-1), assessment of left ventricular function (HF-2), use of angiotensin-converting enzyme inhibitors in patients with left ventricular systolic dysfunction (HF-3), and smoking cessation counseling (HF-4)—as well as length of stay and in-hospital mortality rates were computed.

Results: Across all hospitals, the median rates of conformity with HF-1, HF-2, HF-3, and HF-4 were 24.0%, 86.2%, 72.0%, and 43.2%, respectively. Rates of conformity at individual hospitals varied from 0% to 100%, with statistically significant differences between academic and nonacademic hospitals. Statistically significant positive independent predictors of overall conformity included the prevalence of comorbidities and the use of more intense pharmacologic management. Median hospital length of stay varied from 2.3 to 9.5 days, and in-hospital mortality varied from 0% to 11.1%.

Conclusions: Among hospitals providing care for patients with heart failure, there is significant individual variability in conformity to quality-of-care indicators and clinical outcomes and a substantial gap in overall performance. Establishing educational initiatives and quality improvement systems to reduce this variability and eliminate this gap would be expected to substantially improve the care of these patients.

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Despite major advances in the management of heart failure (HF), this disorder remains a substantial cause of morbidity and mortality. Heart failure is responsible for almost 1 million hospital discharges annually.1,2 Although recent therapeutic developments have improved the lives of patients with HF, these patients remain at substantial risk for recurrent acute exacerbations. In fact, up to 50% of discharged patients are rehospitalized within 6 months.3 Furthermore, death rates are high; an estimated 11.6% of patients with HF die within 30 days, and 33.1% die within 1 year of their first HF hospitalization.4 These statistics emphasize the need to improve HF care.

Evidence-based clinical practice guidelines have been developed for the treatment of patients with HF,5-7 and components of these guidelines have been adapted to create core performance measures for patients hospitalized with HF,8-10. However, little is known regarding current adherence to these standard-of-care measures or the degree of variation in adherence among hospitals caring for patients with HF. The objective of the present evaluation is to assess (1) overall adherence to the 4 HF core performance measures identified by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO),10 (2) variations in adherence among hospitals, (3) in-hospital outcomes, and (4) variations in these outcomes in US hospitals participating in the Acute Decompensated Heart Failure National Registry (ADHERE).

See also pages 1455 and 1458

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Group Information: The ADHERE Scientific Advisory Committee and Study Group members appear on page 1476. A list of hospitals participating in ADHERE can be found at http://www.adhereregistry.com.

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tients hospitalized for acute decompensated HF (ADHF). Academic and nonacademic hospitals from all regions of the United States participate in this registry, and their demographics are representative of the nation’s hospitals as a whole. For the purposes of the ADHERE, an academic center is defined as any center that is affiliated with an accredited medical school. The large size of this registry allows for robust subanalyses of ADHF data; institutional data can be compared with aggregate national data and with data gathered by other institutions and in different geographic regions. In addition, the JCAHO has certified the ADHERE as a source of core measure compliance documentation.

The methods of the ADHERE have been described in detail elsewhere. In summary, medical record review was performed to collect information on patient characteristics, interventions, and outcomes and included data from initial presentation through hospital discharge. These data were entered into the registry using an electronic case report form and a Web-based electronic data capture system. Hospital participation was not contingent on the use or formulary inclusion of any particular therapeutic agent or regimen. Participating hospitals supplied data on consecutive eligible admissions if they numbered 75 or fewer in 1 month. If the number of eligible admissions exceeded 75 in 1 month, participating hospitals had the option of providing data on all eligible admissions or on a random sample of eligible admissions chosen according to established JCAHO methods.

This analysis is based on all data entered into the ADHERE between July 1, 2002, and December 31, 2003. During this period, data from 256 hospitals and 81,543 hospitalization episodes were entered into the registry. Data from hospitalizations at centers enrolling fewer than 30 eligible admissions during the study were excluded.

### OUTCOME MEASURES

The principal outcome measure was overall hospital adherence to each of the 4 HF core performance measures as defined by the JCAHO. These previously validated performance measures are defined as follows: supplying the patient or caregiver with written instructions and guidance on specific aspects of postdischarge care (HF-1), adequate assessment of left ventricular (LV) function (HF-2), prescription of an angiotensin-converting enzyme (ACE) inhibitor on discharge in appropriate patients with documented LV systolic dysfunction (HF-3), and counseling of appropriate patients regarding smoking cessation (HF-4) (Table 1). Additional outcome measures included median inpatient length of stay and in-hospital mortality rates calculated on a hospital basis.

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Criterion Met or Acceptable Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF-1: Discharged patients with heart failure with written instructions or educational materials given to the patient or caregiver at discharge or during the hospital stay that address all of the following: Activity level Diet Discharge medications Follow-up appointment Weight monitoring What to do if symptoms worsen</td>
<td>Discharge instructions. For discharged patients with or without home health services, documentation of written instructions or educational materials given to the patient or caregiver must address all of the following: Activity level after discharge Diet and fluid intake after discharge Names of all discharge medications Follow-up with a physician, nurse practitioner, or physician assistant after discharge Weight monitoring after discharge What to do if heart failure symptoms worsen after discharge</td>
</tr>
<tr>
<td>HF-2: Patients with heart failure with documentation in the hospital record that LV function was assessed before arrival or during hospitalization or that it is planned for after discharge</td>
<td>LV function assessment. In cases in which there is no reason documented by a physician, nurse practitioner, or physician assistant for not assessing LV function, there must be: Documentation that an echocardiogram, appropriate nuclear medicine test, or cardiac catheterization with a left ventriculogram was performed during this hospital stay OR Documentation that 1 of the above diagnostic tests was performed anytime before arrival OR Documentation of LV function, either as an ejection fraction or as a narrative qualitative description (eg, “Patient admitted with severe LV dysfunction”) OR Documentation of a plan to assess LV function after discharge</td>
</tr>
<tr>
<td>HF-3: Patients with heart failure with LVSD and without ACE inhibitor contraindications who are prescribed an ACE inhibitor at hospital discharge</td>
<td>ACE inhibitor. Documentation that an ACE inhibitor was prescribed at discharge in patients with LVSD who are not participating in an ACE inhibitor alternative clinical trial at the time of discharge and where there is no documentation of a potential contraindication or reason for not prescribing an ACE inhibitor at discharge (eg, ACE inhibitor allergy, moderate or severe aortic stenosis, or another reason documented by a physician, nurse practitioner, or physician assistant). LVSD is defined as documentation of an LV ejection fraction &lt;40% or a narrative description of LV function consistent with moderate or severe systolic dysfunction. When there are ≥2 documented LV functions, the LV function closest to discharge is used.</td>
</tr>
<tr>
<td>HF-4: Patients with heart failure with a history of smoking cigarettes who are given smoking cessation advice or counseling during the hospital stay</td>
<td>Adult smoking cessation advice or counseling. Documentation of smoking cessation advice or counseling in patients with a history of smoking cigarettes anytime during the year before hospital arrival. Smoking cessation advice or counseling includes prescription of a cessation aid.</td>
</tr>
</tbody>
</table>

Abbreviations: ACE, angiotensin-converting enzyme; JCAHO, Joint Commission on Accreditation of Healthcare Organizations; LV, left ventricular; LVSD, left ventricular systolic dysfunction.

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Table 1. JCAHO Core Performance Measures for Heart Failure*
The percentile ranking on each of the 4 core indicators for admissions to nonacademic hospitals. In addition, the 10th, 25th, 50th, 75th, and 90th percentiles were calculated for each core performance indicator and outcome measure across all hospitals. The percentile ranking on each of the 4 core indicators was used to construct a composite performance score for each hospital. Medical records with missing data were excluded from analyses relevant to those data. For most variables, less than 0.1% of the data was missing, with the only exceptions being smoking status on hospital admission (13% missing data) and smoking cessation counseling (9% missing data).

Differences between academic and nonacademic hospitals in baseline characteristics, adherence rates, inpatient length of stay, and in-hospital mortality rates were analyzed using 1-way analysis of variance or the nonparametric Wilcoxon test for continuous variables, as appropriate, and the χ² test for categorical variables. In addition, length of stay and mortality rate comparisons adjusted for age and sex were performed. Differences in hospital and patient characteristics for hospitals in the lowest and highest quartiles based on composite performance score were assessed using multivariate logistic regression. Correlations between variables were assessed using Pearson correlation coefficients, and changes in conformity with core performance measures across time were assessed using a Cochran-Armitage trend test. Two-sided tests were used, and P < .05 was considered statistically significant.

STATISTICAL ANALYSIS

Baseline characteristics, conformity with the 4 JCAHO HF core performance measures, inpatient length of stay, and in-hospital mortality rates were summarized descriptively for the entire population, for admissions to academic hospitals, and for admissions to nonacademic hospitals. In addition, the 10th, 25th, 50th, 75th, and 90th percentiles were calculated for each core performance indicator and outcome measure across all hospitals. The percentile ranking on each of the 4 core indicators was used to construct a composite performance score for each hospital. Medical records with missing data were excluded from analyses relevant to those data. For most variables, less than 0.1% of the data was missing, with the only exceptions being smoking status on hospital admission (13% missing data) and smoking cessation counseling (9% missing data).

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RESULTS

BASELINE AND CLINICAL CHARACTERISTICS

In total, 99.5% (81 142/81 545) of the hospital admissions in the ADHERE, representing data from 87.1% (223/256) of the participating hospitals, fulfilled the inclusion criteria for this analysis. Mean patient age at hospital admission was 72.6 years, and 48% of the admissions were for male patients (Table 2). Left ventricular function was assessed before or during 81% of the admissions, and systolic function was reduced in 51% of these cases. Admissions to academic hospitals accounted for 28% of the participating population. Several small but statistically significant differences were observed between admissions...
sions to academic vs nonacademic hospitals, including mean age at admission, sex distribution, medical history, baseline medication use, initial clinical symptoms, and prevalence of LV systolic dysfunction (Table 2).

**CORE PERFORMANCE MEASURES**

In aggregate, appropriate discharge instructions (HF-1) were provided in 20,249 (35%) of 57,062 eligible admissions, LV function assessment (HF-2) was documented in 58,257 (84%) of 69,069 eligible admissions, an ACE inhibitor was prescribed at discharge in patients with LV systolic dysfunction and no documented contraindication (HF-3) in 17,571 (72.5%) of 24,223 eligible admissions, and smoking cessation counseling (HF-4) was provided in 5,062 (48.9%) of 10,356 eligible admissions. Across all hospitals, the median rate of conformity with HF-1 was 24.0% (range, 0%-99%), with HF-2 was 86.2% (range, 14%-100%), with HF-3 was 72.0% (range, 0%-96%), and with HF-4 was 43.2% (range, 0%-100%).

**Figure 1.** Frequency distribution of conformity rates by hospital for Joint Commission on Accreditation of Healthcare Organizations core performance measures HF-1 (discharge instructions or guidance) (A), HF-2 (left ventricular function documentation obtained or scheduled) (B), HF-3 (angiotensin-converting enzyme inhibitor prescribed at discharge for left ventricular systolic dysfunction) (C), and HF-4 (smoking cessation counseling, if indicated) (D). Each bar represents an individual hospital; vertical lines above bars, the 25th, 50th, and 75th percentiles.

There were significant correlations between conformity with most of the core performance measures at individual hospitals. These correlations were all positive, that is, higher conformity with 1 core performance measure was associated with higher conformity with the other measures. The correlation was greatest for the 2 measures with the lowest overall conformity, HF-1 and HF-4 ($r = 0.52; P < .001$). In addition, significant correlations existed between conformity with HF-1 and HF-2 ($r = 0.25; P < .001$), HF-1 and HF-3 ($r = 0.16; P = .02$), and HF-2 and HF-3 ($r = 0.43; P < .001$). No significant correlations were detected between the remaining HF measures.

Academic and nonacademic hospitals differed in their conformity with the 4 performance measures. Nonacademic hospitals demonstrated significantly better median conformity with HF-1 than academic hospitals (32.5% vs 12.1%; $P < .001$), whereas academic hospitals demonstrated slightly better median conformity than nonacademic hospitals with HF-2 (87.8% vs 85.0%; $P = .03$) and HF-3 (75.0% vs 70.6%; $P = .007$). No significant differences were observed in HF-4 (Table 4).

To assess trends in JCAHO compliance across time, the data were divided by quarters based on hospital discharge date. The number of hospitalizations per quarter exceeded 13,000 except for quarter 4 of 2003 (Table 5). Conformity with HF-1 and HF-4 improved substantially during the study, whereas improvements in HF-2 were less pronounced ($P < .001$ for all) (Table 5). No sta-
A statistically significant change in conformity with HF-3 was detected. The results held when the analysis was repeated without the last quarter.

IN-HOSPITAL OUTCOMES

The median inpatient length of stay was 4.0 days (range, 2.3-9.5 days), with an approximately 2-day difference between hospitals at the 10th (3.1 days) and 90th (5.0 days) percentiles (Table 3 and Figure 2). There were no significant differences in inpatient length of stay between academic and nonacademic hospitals (Table 4).

Median in-hospital mortality was 3.5% (range, 0%-11.1%), with substantial variation between hospitals (Table 3 and Figure 2). There was a 2-fold difference in mortality between the 25th and 75th percentiles (2.4% vs 4.8%) and a 4.4-fold difference in mortality between the 10th and 90th percentiles (1.4% vs 6.1%). After adjustment for age and sex, no statistically significant differences in in-hospital mortality rates were observed between academic and nonacademic hospitals (Table 4). Finally, there was a small but significant correlation between median length of stay and in-hospital mortality rate ($r = 0.25; P < .001$).

### Table 3. Percentile Distribution of Outcome Variables Across 223 Hospitals

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percentile 10th</th>
<th>25th</th>
<th>50th</th>
<th>75th</th>
<th>90th</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF-1 compliance, %</td>
<td>0.7</td>
<td>6.1</td>
<td>24.0</td>
<td>54.3</td>
<td>70.1</td>
</tr>
<tr>
<td>HF-2 compliance, %</td>
<td>71.9</td>
<td>79.5</td>
<td>86.2</td>
<td>91.8</td>
<td>96.5</td>
</tr>
<tr>
<td>HF-3 compliance, %</td>
<td>57.6</td>
<td>64.5</td>
<td>72.0</td>
<td>82.6</td>
<td>87.5</td>
</tr>
<tr>
<td>ACE inhibitor or ARB, % *</td>
<td>68.4</td>
<td>76.5</td>
<td>83.6</td>
<td>89.7</td>
<td>93.9</td>
</tr>
<tr>
<td>HF-4 compliance, %†</td>
<td>7.6</td>
<td>22.1</td>
<td>43.2</td>
<td>68.0</td>
<td>84.9</td>
</tr>
<tr>
<td>Median LOS, d</td>
<td>3.1</td>
<td>3.7</td>
<td>4.0</td>
<td>4.6</td>
<td>5.0</td>
</tr>
<tr>
<td>Mortality, %</td>
<td>1.4</td>
<td>2.4</td>
<td>3.5</td>
<td>4.8</td>
<td>6.1</td>
</tr>
</tbody>
</table>

Abbreviations: ACE, angiotension-converting enzyme; ARB, angiotensin receptor blocker; HF-1, discharge instructions or guidance; HF-2, left ventricular function documentation obtained or scheduled; HF-3, ACE inhibitor prescribed at discharge for left ventricular systolic dysfunction; HF-4, smoking cessation counseling, if indicated; LOS, length of stay.

*HF-3 eligible patients who received a discharge prescription for an ACE inhibitor or an ARB.

†$N = 220$.

### Table 4. Comparison of Variables at Academic vs Nonacademic Hospitals on a per-Hospital Basis

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Hospitals* ($n = 223$)</th>
<th>Academic Hospitals ($n = 67$)</th>
<th>Nonacademic Hospitals ($n = 156$)</th>
<th>$P$ Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients enrolled</td>
<td>364 (305)</td>
<td>343 (325)</td>
<td>373 (297)</td>
<td>.20</td>
</tr>
<tr>
<td>Q1 (median) Q3</td>
<td>126 (286) 522</td>
<td>117 (236) 402</td>
<td>139 (313) 526</td>
<td></td>
</tr>
<tr>
<td>HF-1 compliance, %</td>
<td>31.5 (26.9)</td>
<td>22.1 (23.1)</td>
<td>35.5 (27.5)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Q1 (median) Q3</td>
<td>6.1 (24.0) 54.3</td>
<td>3.3 (12.1) 36.7</td>
<td>9.6 (32.5) 56.5</td>
<td></td>
</tr>
<tr>
<td>HF-2 compliance, %</td>
<td>84.2 (11.4)</td>
<td>86.3 (11.9)</td>
<td>83.3 (11.2)</td>
<td>.03</td>
</tr>
<tr>
<td>Q1 (median) Q3</td>
<td>79.5 (86.2) 91.8</td>
<td>83.0 (87.8) 94.0</td>
<td>77.8 (85.0) 91.1</td>
<td></td>
</tr>
<tr>
<td>HF-3 compliance, %</td>
<td>71.9 (13.2)</td>
<td>75.4 (10.9)</td>
<td>70.4 (13.9)</td>
<td>.007</td>
</tr>
<tr>
<td>Q1 (median) Q3</td>
<td>64.5 (72.0) 82.6</td>
<td>68.2 (75.0) 83.5</td>
<td>63.5 (70.6) 79.9</td>
<td></td>
</tr>
<tr>
<td>HF-4 compliance, %‡</td>
<td>45.5 (27.8)</td>
<td>41.5 (28.0)</td>
<td>47.2 (27.6)</td>
<td>.14</td>
</tr>
<tr>
<td>Q1 (median) Q3</td>
<td>22.1 (43.2) 68.0</td>
<td>20.0 (38.8) 66.7</td>
<td>27.3 (45.8) 69.7</td>
<td></td>
</tr>
<tr>
<td>Median LOS, d</td>
<td>4.2 (0.9)</td>
<td>4.2 (1.2)</td>
<td>4.1 (0.7)</td>
<td>.47</td>
</tr>
<tr>
<td>Q1 (median) Q3</td>
<td>3.7 (4.0) 4.6</td>
<td>3.6 (4.0) 4.6</td>
<td>3.8 (4.0) 4.6</td>
<td></td>
</tr>
<tr>
<td>Adjusted LOS, mean, d§</td>
<td>4.2</td>
<td>4.3</td>
<td>4.1</td>
<td>.34</td>
</tr>
<tr>
<td>Mortality, %</td>
<td>3.7 (1.9)</td>
<td>3.3 (1.6)</td>
<td>3.8 (2.0)</td>
<td>.07</td>
</tr>
<tr>
<td>Q1 (median) Q3</td>
<td>2.4 (3.5) 4.8</td>
<td>2.2 (3.3) 4.5</td>
<td>2.7 (3.7) 4.9</td>
<td></td>
</tr>
<tr>
<td>Adjusted mortality, mean, %§</td>
<td>3.7</td>
<td>3.4</td>
<td>3.8</td>
<td>.19</td>
</tr>
</tbody>
</table>

Abbreviations: HF-1, discharge instructions or guidance; HF-2, left ventricular function documentation obtained or scheduled; HF-3, angiotension-converting enzyme inhibitor prescribed at discharge for left ventricular systolic dysfunction; HF-4, smoking cessation counseling, if indicated; LOS, length of stay; Q, quartile.

*Hospitals enrolling 30 or more patients between July 1, 2002, and December 31, 2003.

†By nonparametric Wilcoxon test and analysis of variance for unadjusted and adjusted comparisons, respectively.

‡$N = 220$ (66 academic and 154 nonacademic hospitals).

§Adjusted for age and sex.

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EFFECT OF HOSPITAL AND PATIENT CHARACTERISTICS ON PERFORMANCE

Compared with hospitals in the highest quartile of composite core performance, hospitals in the lowest quartile did not differ in teaching status or geographic region; patients in these hospitals were similar regarding age, sex, insurance status, LV ejection fraction, systolic blood pressure, blood urea nitrogen level, and creatinine level. Among 28 variables identified by univariate analysis, multivariate logistic regression analysis identified multiple 4– or 5–independent variable models with good power to discriminate between hospitals in the lowest and highest quartiles. These models, all of which used a subset of 8 variables—prevalence of comorbid cardiac valvular disease, atrial fibrillation, peripheral vascular disease, and chronic renal insufficiency; in-hospital use of aspirin, oral diuretics, and intravenous diuretics; and lack of in-hospital use of angiotensin receptor blockers—had areas under the receiver operating characteristic curves that ranged from 0.89 to 0.92 compared with 0.95 for the full independent variable model. An inverse relationship between angiotensin receptor blockers and ACE inhibitor use seemed to account for the negative correlation observed between angiotensin receptor blocker use and core performance. Thus, greater prevalence of patient comorbidities and more intensive pharmacotherapy were significant independent predictors of high compliance with the core performance indicators.

COMMENT

The ADHERE offers a unique opportunity to evaluate the current state of ADHF treatment. Unlike clinical trials, this registry reflects “real-world” management from a variety of academic and nonacademic hospitals from all regions of the United States and contains far more detailed information on patient characteristics, presenting symptoms, treatments, and in-hospital outcomes than is available in previous administrative data sets or registries.13,14

GUIDELINE COMPLIANCE

Despite the publication of evidence-based guidelines and the implementation by the JCAH0 of hospital core performance measurements, this analysis demonstrates that considerable gaps currently exist in the treatment of patients with ADHF. Treatment frequently does not follow published guidelines or conform to core performance measures, potentially contributing to the high morbidity, mortality, and economic cost of this disor-
The highest conformity with a quality-of-care measure was in measurements of LV function. However, there is only moderate focus on following up these assessments with prescriptions for ACE inhibitors in appropriate patients with documented LV systolic dysfunction and only minimal focus on providing appropriate instructions for postdischarge care or smoking cessation counseling.

Although overall compliance with core performance measures was suboptimal, there was significant variation in care, with some hospitals performing at very high levels. In general, hospitals that treated patients with more comorbidity and that used more intensive pharmacotherapy had better overall compliance. This finding suggests that the wide variations in conformity may reflect differences in training, guideline familiarity, and implementation of tools and systems to ensure that recommended care is provided and documented. Developing effective strategies to optimize quality of care is critically important.

The gap in patient counseling and discharge instructions was significantly greater at academic than at nonacademic centers. Although academic centers are often expected to know and provide the most modern and advanced treatments, they do not always provide the highest quality of care, at least as judged by performance measures. In fact, several studies have found low guideline compliance at such centers. For example, studies of compliance with established National Cholesterol Education Program guidelines at large academic centers have reported the failure to prescribe statin therapy to appropriate patients with coronary artery disease. In addition, data demonstrate that this low statin use extends even to high-risk patients with coronary artery disease who receive percutaneous intervention.

PREVIOUS EVALUATIONS OF HOSPITAL PERFORMANCE

Before the institution of the JCAHO core performance measures, evaluations of hospital performance in patients with HF were limited principally to 2 variables, assessment of LV function and ACE inhibitor prescription at discharge in patients with LV systolic dysfunction. An analysis of Medicare data from 1998 and 1999 found that the median rate of conformity across states for these 2 variables was 66% and 72%, respectively. During the next 2 years, conformity with LV function assessment increased by 4%, whereas conformity with ACE inhibitor prescription decreased by 4%. The results of the present study are consistent with these findings.

The present evaluation is also consistent with previous evaluations of the variability between hospitals in quality of care and outcomes of patients hospitalized with HF. For example, in an evaluation of 30,228 hospitalized Medicare patients in 1998 and 1999, smoothed unadjusted rates of LV ejection fraction determination ranged from 30% to 67%, and ACE inhibitor prescription in eligible patients ranged from 56% to 87% across hospital referral regions; in a retrospective observational study of 15 acute care community hospitals in upstate New York, there was significant variability in mean acute length of stay (7.1-10.3 days), mean total length of stay (7.6-12.7 days), and mortality (4.3%-12.0%) despite only minimal variability in mean expected length of stay (5.2-6.1 days) and mean severity score (2.8-3.3).

The continued persistence of suboptimal compliance with these measures and the significant variability between hospitals in this compliance and in outcome variables provides a compelling rationale for the implementation of new systems to improve hospital performance.

SYSTEMS FOR PERFORMANCE IMPROVEMENT

Careful consideration of what has already been learned about bridging treatment gaps should help in designing these new systems. In an evaluation of β-blocker use after acute myocardial infarction, 4 components—high degree of shared goals, substantial level of administrative support, strong physician leadership, and high-quality data feedback—were associated with greater improvement in hospital performance. In addition, initiation of evidence-based therapies during hospitalization creates the desired impression that the therapy offers a survival advantage, enhancing long-term compliance. Furthermore, several programs, using 1 or more of these components, have successfully reduced treatment gaps. The University of California, Los Angeles, Cardiac Hospitalization Atherosclerosis Management Program provided proof of concept that hospital-based systems using standardized order sets, focused algorithms, discharge checklists, and data feedback were highly effective in improving treatment rates, goal achievement, and clinical outcomes. The Get With the Guidelines initiative is a hospital-based quality improvement program from the American Heart Association. Recent data demonstrate that this initiative is an effective means of improving hospital care. In a large, multicenter evaluation, significant improvements relative to baseline were seen in all 10 quality-of-care measures for coronary artery disease by the third quarter of Get With the Guidelines implementation. These improvements occurred equally at academic and nonacademic institutions.

The American College of Cardiology Guidelines Applied in Practice program, another hospital-based initiative that uses partnership, hospital tool kits, and key indicator tracking, showed similar improvements.

The benefits of hospital-based performance improvement systems for HF have also been demonstrated. Implementation of an HF discharge medication program at a 10-hospital integrated health care system increased the use of ACE inhibitors at discharge in appropriate patients from 63% to 95%, decreased readmission rates from 46.5% to 38.4%, and reduced 1-year mortality from 22.7% to 17.8%. The Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure is an ongoing HF quality improvement program that involves approximately 300 US hospitals. This program combines a Web-based registry that can provide real-time reports and benchmark comparisons with process-of-care improvement components, including a hospital tool kit and structured educational and collaborative opportunities. Preliminary results demonstrate that significant improvements in quality of care and reduced variability in care were achieved.
ability in care are being achieved with this initiative. An HF disease management program for ADHERE hospitals has also recently been launched.11

Thus, implementation of a hospital-based system for ADHF should enhance adherence to established guidelines and core performance measures, reducing the treatment variability from one hospital to the next. As a result, overall quality of care should improve substantially, reducing the morbidity, mortality, and economic cost associated with this disorder.

In conclusion, this analysis of the ADHERE demonstrates that substantial gaps and variations currently exist in the quality of care provided to patients hospitalized with ADHF. This care frequently deviates from that of evidence-based guidelines and core performance measures. There are also significant variations in clinical outcomes. Consequently, significant opportunities exist to improve the care of these patients. Development of an educational and quality improvement program for ADHF has the potential to considerably reduce the current variability in care, enhance guideline adherence, and improve outcomes for patients.

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REFERENCES


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26. Fonarow GC, Gawinski A. Rationale and design of the Cardiac Hospitalization Atherosclerosis Management Program at the University of California Los Angeles. Am J Cardiol. 2000;85:10A-17A.


