Who Has Higher Readmission Rates for Heart Failure, and Why?
Implications for Efforts to Improve Care Using Financial Incentives

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Background—Reducing readmissions for heart failure is an important goal for policymakers. Current national policies financially penalize hospitals with high readmission rates, which may have unintended consequences if these institutions are resource-poor, either financially or clinically.

Methods and Results—We analyzed national claims data for Medicare patients with heart failure discharged from US hospitals in 2006 to 2007. We used multivariable models to examine hospital characteristics, 30-day all-cause readmission rates, and likelihood of performing in the worst quartile of readmission rates nationally. Among 905,764 discharges in our sample, patients discharged from public hospitals (27.9%) had higher readmission rates than nonprofit hospitals (25.7%, \( P<0.001 \)), as did patients discharged from hospitals in counties with low median income (29.4%) compared with counties with high median income (25.7%, \( P<0.001 \)). Patients discharged from hospitals without cardiac services (27.2%) had higher readmission rates than those from hospitals with full cardiac services (25.1%, \( P<0.001 \)); patients discharged from hospitals in the lowest quartile of nurse staffing (28.5%) had higher readmission rates than those from hospitals in the highest quartile (25.4%, \( P<0.001 \)). Patients discharged from small hospitals (28.4%) had higher readmission rates than those discharged from large hospitals (25.2%, \( P<0.001 \)). These same characteristics identified hospitals that were likely to perform in the worst quartile nationally.

Conclusions—Given that many poor-performing hospitals also have fewer resources, they may suffer disproportionately from financial penalties for high readmission rates. As we seek to improve care for patients with heart failure, we should ensure that penalties for poor performance do not worsen disparities in quality of care. (Circ Cardiovasc Qual Outcomes. 2011;4:53-59.)

Key Words: heart failure ■ quality of care ■ outcomes research ■ readmissions

Decreasing readmissions has the potential to simultaneously lower costs and improve quality, and therefore has become an important target for policymakers. Several legislative efforts in this area focus on reducing payments to those with the highest readmission rates, and likelihood of performing in the worst quartile of readmission rates nationally. Among 905,764 discharges in our sample, patients discharged from public hospitals (27.9%) had higher readmission rates than nonprofit hospitals (25.7%, \( P<0.001 \)), as did patients discharged from hospitals in counties with low median income (29.4%) compared with counties with high median income (25.7%, \( P<0.001 \)). Patients discharged from hospitals without cardiac services (27.2%) had higher readmission rates than those from hospitals with full cardiac services (25.1%, \( P<0.001 \)); patients discharged from hospitals in the lowest quartile of nurse staffing (28.5%) had higher readmission rates than those from hospitals in the highest quartile (25.4%, \( P<0.001 \)). Patients discharged from small hospitals (28.4%) had higher readmission rates than those discharged from large hospitals (25.2%, \( P<0.001 \)). These same characteristics identified hospitals that were likely to perform in the worst quartile nationally.

Conclusions—Given that many poor-performing hospitals also have fewer resources, they may suffer disproportionately from financial penalties for high readmission rates. As we seek to improve care for patients with heart failure, we should ensure that penalties for poor performance do not worsen disparities in quality of care. (Circ Cardiovasc Qual Outcomes. 2011;4:53-59.)

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The most common cause of both hospitalizations and readmissions in the Medicare program is heart failure (HF), leading to nearly 1.4 million hospitalizations and $17 billion in spending in 2007 alone.\(^6\) Approximately 1 in 4 HF patients is readmitted to the hospital within 30 days of discharge;\(^7\) the combination of high 30-day readmission rates and large variations between hospitals in these rates\(^7,8\) suggests tremendous opportunity for improvement.

The first step in improving readmission rates for HF is to better understand why some hospitals perform well whereas others struggle. Insights into which types of hospitals perform better can help policymakers and clinical leaders design programs and interventions that most effectively facilitate quality improvement. Prior studies have examined patient characteristics that lead to an increased risk of readmission for HF;\(^9\) but few studies have evaluated hospital characteristics. One study found no difference between teaching and nonteaching hospitals, small versus large hospitals, or public versus private hospitals but used a methodology that tends to reduce variability in outcomes;\(^7\) another study using the same methodology reported no difference in readmission rates between hospitals with or without heart transplant capability.\(^1\)

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However, we have little empirical data on which types of hospitals have higher readmission rates, and therefore should be the targets of quality improvement interventions and are particularly likely to face financial penalties. Specifically, we know little about whether hospitals that have few financial and clinical resources have higher readmission rates. To evaluate financial resources, we examined public hospitals, which often lack the resources to invest in services such as patient education and discharge planning, and hospitals located in counties with median incomes below the 25th percentile nationally. To identify hospitals with limited clinical resources, we examined hospitals without cardiac services, such as a dedicated cardiac intensive care unit or the ability to perform cardiac catheterization or cardiac surgery and hospitals with low levels of nurse staffing. We also examined small hospitals, which generally have both fewer clinical resources (fewer specialists) and limited financial resources (smaller reserves, less access to capital). We postulated that these same characteristics would influence a hospital’s likelihood of performing in the worst quartile of readmission rates nationally, a cut-point used in many current and proposed pay-for-performance programs to financially penalize hospitals.

**WHAT IS KNOWN**

- Decreasing readmissions is seen as having the potential to simultaneously lower costs and improve quality and therefore has become an important target for policymakers.
- There is significant variability in hospitals’ performance on readmission rates across the nation; little is known about why some hospitals perform well whereas others perform poorly.
- Legislative efforts in this area, including the recently passed Patient Protection and Affordable Care Act, focus on reducing payments to those with the highest readmission rates; if poorly performing hospitals are also resource-poor, either financially or clinically, these payment reductions could lead to an increase in existing gaps in performance.

**WHAT THE STUDY ADDS**

- Hospitals with limited resources, either financial, clinical, or both, namely publicly owned hospitals, hospitals located in counties with low median income, hospitals with fewer cardiac capabilities or lower nurse staffing levels, and small hospitals, had higher readmission rates for heart failure.
- Thus, because some of the most financially and clinically resource-poor hospitals in the country are among the worst performers for heart failure readmissions, quality improvement efforts that rely on penalties and rewards may further widen the quality gap.

### Methods

**Data**

We used the Medicare Provider Analysis Review (MedPAR) 100% files from 2006 and 2007, which have data on hospitalizations for Medicare Fee-for-Service enrollees, and examined hospitalizations with the primary discharge diagnosis of HF (ICD-9 codes 398.91, 404.x1, 404.x3, 428.0 to 428.9) occurring between January 1, 2006, and November 30, 2007. Patients discharged in December 2007 were excluded for lack of a full 30 days of follow-up. We followed the Centers for Medicare and Medicaid Services (CMS) methodology for classifying “index admissions” as a result, patients could be included in the sample more than once. Thus, although our analysis is carried out at the discharge level, we refer to the individual discharges as patients for ease of presentation. We excluded federal hospitals (run by the Departments of Defense or Veterans Affairs) and those located outside the 50 states and the District of Columbia. This yielded 4567 acute-care hospitals caring for Medicare patients in 2006 to 2007. Based on recommendations from The Joint Commission on sample size for performance analysis, we excluded hospitals with fewer than 25 discharges for Medicare patients with HF over the 23-month period, leaving 4091 hospitals and 905 764 discharges in our sample (99.5% of eligible discharges from nonfederal hospitals in the 50 US states and the District of Columbia between January 2006 and November 2007).

We obtained hospital characteristics from the 2007 American Hospital Association survey, including hospital size, cardiac services, ownership, nurses on staff, proportion of hospitalized patients with Medicaid or Medicare insurance, membership in the Council of Teaching Hospitals, location, and region. Nurse-to-census ratios were calculated by dividing the number of full-time equivalent nurses on staff by 1000 patient-days. We used the Area Resource File to determine median income for the county in which each hospital was located.

### Risk-Adjusted Readmission Rates

The primary outcome for this analysis was the likelihood of 30-day all-cause readmission rate for patients with HF; the unit of analysis was the discharge. As per CMS recommendations, transfers out were excluded; transfers in were retained. Readmissions were assigned to the hospital from which the patient was discharged. We adjusted for patient characteristics using the Elixhauser comorbidity adjustment scheme, which has been derived and validated on administrative data and is the approach developed by the federal government’s Agency for Healthcare Research and Quality. The CMS currently instead uses a Bayesian shrinkage model, in which, after clinical risk adjustment, a hospital’s measured readmission rate is then combined in a weighted fashion with national readmission rates, and this combined average is released to the public. Although this approach probably is more appropriate for public reporting, weighted averaging dramatically reduces variability in the data, particularly for small hospitals. As a consequence, only 5% to 9% of Medicare hospitals are measurably different from the national average using this method. Because we were particularly interested in examining performance of small hospitals, we chose to use a fixed-effects approach rather than the shrinkage method. Further, given that our work is not focused on publicly identifying performance for any single individual hospital but instead identifying differences in performance for groups of hospitals, the fixed-effects approach may afford better information about which types of hospitals have lower readmission rates than others. Further details of this approach and comparison to other approaches are provided in the Appendix (Appendix Tables 1a-b and 2).

### Hospital Characteristics

We examined 5 primary hospital characteristics and their relationship to readmission rates: 2 based on potential lack of financial resources (ownership, median income in each hospital’s county), 2 based on potential lack of adequate clinical resources (cardiac services, nurse staffing levels), and 1 based on both types of vulnerabilities (type). We examined ownership using three categories: public, private for-profit, and private nonprofit. Median county income was divided into quartiles for this analysis. Hospitals with some but not all cardiac services (presence of a cardiac intensive care unit, ability to perform cardiac catheterization, ability to perform cardiac surgery) were designated as having “partial” cardiac ser-
Table 1. Patient Characteristics

<table>
<thead>
<tr>
<th>Hospital Characteristics</th>
<th>n</th>
<th>Age (Mean)</th>
<th>Female</th>
<th>Nonwhite</th>
<th>Diabetes Without Complications</th>
<th>Diabetes With Complications</th>
<th>Hypertension</th>
<th>CKD</th>
<th>Valvular Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Public</td>
<td>112 744</td>
<td>79.5</td>
<td>56.8%</td>
<td>19.8%</td>
<td>26.2%</td>
<td>12.9%</td>
<td>7.7%</td>
<td>13.4%</td>
<td>12.4%</td>
</tr>
<tr>
<td>For-profit</td>
<td>123 425</td>
<td>79.5</td>
<td>56.1%</td>
<td>19.3%</td>
<td>27.9%</td>
<td>10.8%</td>
<td>7.3%</td>
<td>12.3%</td>
<td>12.4%</td>
</tr>
<tr>
<td>Nonprofit</td>
<td>669 595</td>
<td>80.1</td>
<td>56.0%</td>
<td>14.2%</td>
<td>26.6%</td>
<td>8.9%</td>
<td>6.2%</td>
<td>12.3%</td>
<td>12.4%</td>
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<tr>
<td>Median county income</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Lowest quartile</td>
<td>115 931</td>
<td>79.8</td>
<td>59.4%</td>
<td>16.9%</td>
<td>31.4%</td>
<td>5.6%</td>
<td>56.6%</td>
<td>24.3%</td>
<td>1.4%</td>
</tr>
<tr>
<td>2nd lowest quartile</td>
<td>177 522</td>
<td>79.8</td>
<td>56.3%</td>
<td>10.8%</td>
<td>29.0%</td>
<td>5.9%</td>
<td>57.3%</td>
<td>28.6%</td>
<td>2.0%</td>
</tr>
<tr>
<td>3rd lowest quartile</td>
<td>256 849</td>
<td>79.7</td>
<td>55.6%</td>
<td>14.8%</td>
<td>27.0%</td>
<td>5.9%</td>
<td>58.4%</td>
<td>31.4%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Highest quartile</td>
<td>355 462</td>
<td>80.2</td>
<td>55.4%</td>
<td>17.3%</td>
<td>25.1%</td>
<td>5.8%</td>
<td>58.7%</td>
<td>31.6%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Cardiac capability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>224 462</td>
<td>80.5</td>
<td>58.6%</td>
<td>14.4%</td>
<td>28.8%</td>
<td>5.5%</td>
<td>56.6%</td>
<td>25.4%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Partial</td>
<td>283 730</td>
<td>80.3</td>
<td>57.5%</td>
<td>13.6%</td>
<td>26.9%</td>
<td>6.2%</td>
<td>57.8%</td>
<td>30.1%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Full</td>
<td>397 572</td>
<td>79.4</td>
<td>53.8%</td>
<td>17.1%</td>
<td>26.5%</td>
<td>5.8%</td>
<td>58.5%</td>
<td>32.6%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Nurse-to-census ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest quartile (fewest nurses)</td>
<td>182 394</td>
<td>80.3</td>
<td>57.8%</td>
<td>17.9%</td>
<td>28.4%</td>
<td>6.1%</td>
<td>58.2%</td>
<td>27.9%</td>
<td>1.9%</td>
</tr>
<tr>
<td>2nd lowest quartile</td>
<td>305 249</td>
<td>79.9</td>
<td>56.2%</td>
<td>17.1%</td>
<td>27.4%</td>
<td>5.8%</td>
<td>58.6%</td>
<td>30.1%</td>
<td>2.3%</td>
</tr>
<tr>
<td>3rd lowest quartile</td>
<td>278 958</td>
<td>79.8</td>
<td>55.2%</td>
<td>13.8%</td>
<td>26.5%</td>
<td>5.8%</td>
<td>57.6%</td>
<td>31.5%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Highest quartile (most nurses)</td>
<td>139 163</td>
<td>80.0</td>
<td>55.7%</td>
<td>10.9%</td>
<td>26.7%</td>
<td>5.8%</td>
<td>56.1%</td>
<td>29.7%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Hospital size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>140 379</td>
<td>80.7</td>
<td>58.7%</td>
<td>8.9%</td>
<td>29.4%</td>
<td>5.1%</td>
<td>53.4%</td>
<td>22.7%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Medium</td>
<td>503 930</td>
<td>80.1</td>
<td>56.6%</td>
<td>14.5%</td>
<td>27.0%</td>
<td>6.1%</td>
<td>57.9%</td>
<td>30.2%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Large</td>
<td>262 806</td>
<td>79.3</td>
<td>53.9%</td>
<td>20.4%</td>
<td>26.5%</td>
<td>5.7%</td>
<td>59.9%</td>
<td>33.6%</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

CKD indicates chronic kidney disease, moderate to severe. 

*P*<0.001 for comparison between subgroups of each hospital characteristic.

vices, and those with all 3 were designated as having “full” cardiac services. Nurse staffing levels were obtained as described above and divided into quartiles for ease of presentation. We defined hospital size using well-established designations: small (fewer than 100 beds), medium (100 to 399 beds), and large (400 or more beds).

### Analysis

We examined the characteristics of the patients and hospitals in our sample and describe those characteristics as median values (with 25th and 75th percentiles) for continuous data or number (percent) for categorical data. We subsequently created a set of multivariate logistic regression models, using generalized estimating equations, in which the response probability distribution was binary; this allowed us to use logistic regression but also to account for clustering of patients within hospitals. All models for risk-adjusted readmission included both patient characteristics and within-hospital clustering. We first ran models with patient characteristics and each predictor of interest independently and subsequently added hospital characteristics including size, membership in a system, teaching status, ownership, location, and census region to the final model. Each patient’s length of stay was retained in the model as an additional marker of severity.

To characterize hospitals that could be at risk of reimbursement cuts under the policy changes or pay-for-performance programs described above, we identified the hospitals in the worst quartile of adjusted readmission rate and labeled them as “poor performers.” We then created a logistic regression model at the hospital level, retaining all variables used in multivariate linear regression, to determine the impact of each hospital characteristic on the odds of being designated a poor performer. To make our findings durable to changes in the specific cutoff chosen under various potential proposals, we also modeled the odds of being in the worst decile of readmission rates; these results were qualitatively similar and are available in the appendix (Appendix Table 3).

Finally, we were also interested in examining the hospitals that were potentially financially or clinically under-resourced but fared well on readmissions metrics. We first used interaction tests to examine whether the effects of any specific characteristic was moderated through 1 of the other 4. We found no consistent pattern in the interaction tests. We then compared key characteristics for the subsets of hospitals that fell above or below the national median readmission rate in each category (ie, small hospitals that had readmission rates above versus below the national mean).

A 2-sided probability value of <0.05 was considered to be statistically significant. All analyses were performed using SAS software (version 9.2, Cary, NC).

### Results

There were 905 764 discharges included in our analysis. Patients discharged from larger hospitals, hospitals with full cardiac services, and hospitals in counties with lower median income were generally younger and were more likely to be minorities. Patients discharged from these hospitals also had a higher burden of comorbidities including hypertension, moderate to severe chronic kidney disease, and valvular disease (Table 1).

The 4091 hospitals in our final sample had a median unweighted risk-adjusted 30-day readmission rate of 25.7% (interquartile range, 22.1% to 30.0%; Figure). Nearly 22% of hospitals were under public ownership, 16% were for-profit, and the rest (62%) were nonprofit (Table 2). Median county income was $26 780. Overall, half of hospitals had no
specialized cardiac services, 30% had partial cardiac services (cardiac catheterization, cardiac surgery, or cardiac intensive care unit, but not all 3), and 20% had full cardiac services. Median nurse-to-census ratio was 6.4 per 1000 patient days.

Forty-three percent of the hospitals were small (<100 beds), 46% were medium (100 to 399 beds), and 11% were large (400 or more beds).

In bivariate comparisons, we found that the likelihood of readmission was significantly higher for patients discharged from both for-profit and public institutions compared with private nonprofit hospitals and higher in hospitals located in counties with low median income (Table 3). Patients discharged from hospitals without cardiac services and hospitals with partial cardiac services also had higher readmission rates than those with full cardiac services. Patients discharged from hospitals with lower nurse staffing had higher readmission rates, as did patients discharged from small hospitals.

In multivariable models that adjusted for each of the other covariates of interest as well as additional important hospital characteristics, ownership, county income, cardiac capability, nurse staffing, and hospital size all remained independently associated with the likelihood of readmission, although the differences were somewhat attenuated (Table 3). We repeated these analyses at the hospital level using the bayesian shrinkage approach; the results for ownership, income, cardiac capability, and nurse staffing were still present although the size of the effect was substantially smaller (Appendix Table 2a-b). As anticipated, the impact of hospital size on readmission was no longer significant under the bayesian shrinkage approach. Finally, when we examined outcomes within the subsets of hospitals that were probably “stressed” (ie, small hospitals) and examined differences in the key characteristics (ie, income in county, ownership, cardiac capability, and nursing levels) between high and low performers, we found results similar to our overall findings (Appendix Table 3).

We found that the same characteristics associated with higher readmission rates were associated with considerably higher odds of being in the worst quartile of HF readmission rates and therefore potentially at risk of financial penalties.
There is broad interest among policymakers in improving the quality of care for HF patients, with a growing focus on reducing readmissions. We found that patients discharged from hospitals that tend to be resource-poor either for financial reasons, clinical reasons, or both—specifically, publicly owned hospitals, hospitals located in counties with low median income, hospitals without cardiac capability or with low nurse staffing, and small hospitals—had consistently higher 30-day readmission rates. Although many of these differences were modest in size, for the hospitals, they translated into significantly higher odds of having HF readmission rates in the worst quartile nationally. When we chose other thresholds, such as the worst decile nationally, our results did not change meaningfully. Our findings suggest that if CMS or private pay-for-performance programs use cut-points to determine financial penalties, these institutions may be at greater risk for reduced payments.

We found that patients discharged from public hospitals in the United States had modestly higher readmission rates than those discharged from nonprofit hospitals, although the effect was attenuated by adding county income to the model. Public hospitals already have insufficient and inconsistent funding, factors that have been independently linked with poor-quality care, and have previously been shown to have more

Discussion

There is broad interest among policymakers in improving the quality of care for HF patients, with a growing focus on reducing readmissions. We found that patients discharged from hospitals that tend to be resource-poor either for financial reasons, clinical reasons, or both—specifically, publicly owned hospitals, hospitals located in counties with low median income, hospitals without cardiac capability or with low nurse staffing, and small hospitals—had consistently higher 30-day readmission rates. Although many of these differences were modest in size, for the hospitals, they translated into significantly higher odds of having HF readmission rates in the worst quartile nationally. When we chose other thresholds, such as the worst decile nationally, our results did not change meaningfully. Our findings suggest that if CMS or private pay-for-performance programs use cut-points to determine financial penalties, these institutions may be at greater risk for reduced payments.

We found that patients discharged from public hospitals in the United States had modestly higher readmission rates than those discharged from nonprofit hospitals, although the effect was attenuated by adding county income to the model. Public hospitals already have insufficient and inconsistent funding, factors that have been independently linked with poor-quality care, and have previously been shown to have more
difficulty improving performance on publicly reported quality metrics.23–25 Whether the higher readmission rates are due to underinvestment in case management and discharge planning or due to caring for a more challenging and vulnerable patient population with less access to follow-up care is unclear. Indeed, studies have shown that socioeconomic status affects the risk of readmission for patients with HF, probably because of differential access to care.26,27 This is congruent with our finding that patients discharged from hospitals in counties with a lower median income have higher readmission rates, suggesting that the economic context surrounding hospitals and the patients they care for is important to their chances of having low readmission rates. If public hospitals or hospitals located in poor communities are financially penalized for high readmission rates, disparities in care could be further exacerbated.

We found that better clinical capacity, whether defined as the presence of specific cardiac services or as a high level of nurse staffing, was associated with lower readmission rates for patients with HF, even after controlling for other hospital characteristics; we also found that clinical capacity explained some—though not all—of the impact of hospital size on readmissions. We suspect that our measures of cardiac services are markers of expertise in caring for cardiac patients, which in turn leads to better outcomes. Prior studies have shown that hospitals with cardiac surgical capability tend to have better adherence to process of care guidelines for myocardial infarction,28,29 but there are no data that we are aware of that examines how hospitals with or without these services fare on outcomes for HF. Prior studies have also found that higher nurse staffing leads to better inpatient care and outcomes,17,30 but the impact of nurse staffing on readmissions has not, to our knowledge, previously been explored. Finding ways to help hospitals without advanced cardiac services, perhaps through partnerships or alliances with more advanced hospitals, could lead to improved access to cardiac care at smaller or more remote hospitals and better outcomes for the Americans who receive their care there. Addressing nurse staffing levels might be more difficult; there is no national standard for staffing levels,17 and the nationwide nursing shortage, coupled with the economic challenges faced by hospitals in hiring new staff, present significant barriers.

Patients discharged from small hospitals had higher readmission rates, even after we adjusted for the availability of cardiac services at these hospitals. Whether this finding reflects inexperience with inpatient HF management, lack of adequate discharge planning, or lack of access to outpatient follow-up is unclear. Given that small rural hospitals often have fewer resources, less funding, fewer physicians and other care providers per capita, and fewer specialists,13 our findings may not come as a surprise. Further, small hospitals may have fewer financial resources and may not be able to easily justify investments in HF-specific discharge planning, care coordination, and transitions of care, elements that may reduce readmissions for patients with HF.31,32 If hospital payments for readmissions are reduced, given their already-poor performance, further diminishing their resources with financial penalties may pose new challenges. As a result, small hospitals might transfer their sickest patients to larger referral centers or avoid them altogether—diminishing their own proficiency with treating HF patients and reducing access for their patient population.

Others have examined hospital characteristics and readmission rates. Krumholz et al13 found little difference in readmission rates for patients with HF between large and small hospitals, between teaching and nonteaching hospitals, and between hospitals with different ownership. However, they used a different method of risk adjustment,15 as discussed above, which almost surely explains the differences in the findings. Recent studies have found no difference in readmission rates between hospitals that perform well on the Hospital Quality Alliance quality measures and hospitals that perform poorly on these measures,8,34 leaving us with little information to predict which hospitals might ultimately face financial penalties. Thus, our findings that there are specific hospital characteristics that are related to readmission rates may be helpful as policymakers grapple with how to target efforts in this area.

Limitations
Because we used administrative data, our risk adjustment was limited in its ability to account for variations in severity of illness across hospitals. However, although administrative data are imperfect, they are standardized, validated, and used for public reporting. Furthermore, patients discharged from large hospitals and those with complex cardiac services—patients who fared better in our analysis—appeared to be sicker; inadequate risk adjustment could therefore lead us to underestimate differences in readmission rates between these hospitals and their counterparts with a less sick population. We focused on Medicare patients; these patients make up more than 80% of HF admissions,35 and whether our findings apply to non-Medicare patients is unclear.

Another important group to consider is the group of hospitals that defy the trends and perform well despite their lack of financial or clinical resources. In our analyses, we did not find that the impact of each of the examined factors on outcomes varied significantly as a function of the other factors—for example, we found that cardiac services were associated with lower readmission rates at small, medium, and large hospitals alike. However, it is likely that hospitals that are able to do well despite the challenges they face have important other advantages, such as a committed leadership, highly trained staff, or advanced electronic health record and decision support systems, that we could not measure in this study. This is an important area for future research, particularly as we attempt to design interventions to improve care at poorly performing hospitals that may lack financial or clinical resources.

Finally, the primary motivation behind this work is that vulnerable hospitals might fall further behind if they are penalized for high readmission rates. However, it is also possible that in the face of such cuts, these same vulnerable hospitals may respond by implementing programs that will lead to lower readmission rates; we have little empirical data to guide us in this regard. Future studies will be needed to determine whether these hospitals have the capability to respond to looming penalties ahead.
Conclusions
We examined patterns of readmissions among US hospitals and found that hospitals with limited resources, either financial, clinical, or both, namely publicly owned hospitals, hospitals located in counties with low median income, hospitals with fewer cardiac services or lower nurse staffing levels, and small hospitals, had higher readmission rates for HF. Given that some of the most financially and clinically resource-poor hospitals in the country are among the worst performers for HF readmissions, quality improvement efforts that rely on penalties and rewards may further widen the quality gap. Concerted efforts are needed to understand why these hospitals perform poorly, why the top hospitals perform well, and how best to design interventions and partnerships to improve the quality of care for all HF patients, regardless of where they seek medical care.

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Disclosures
None.

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