Hospital Strategies Associated With 30-Day Readmission Rates for Patients With Heart Failure

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Background—Reducing hospital readmission rates is a national priority; however, evidence about hospital strategies that are associated with lower readmission rates is limited. We sought to identify hospital strategies that were associated with lower readmission rates for patients with heart failure.

Methods and Results—Using data from a Web-based survey of hospitals participating in national quality initiatives to reduce readmission (n=599; 91% response rate) during 2010–2011, we constructed a multivariable linear regression model, weighted by hospital volume, to determine strategies independently associated with risk-standardized 30-day readmission rates (RSRRs) adjusted for hospital teaching status, geographic location, and number of staffed beds. Strategies that were associated with lower hospital RSRRs included the following: (1) partnering with community physicians or physician groups to reduce readmission (0.33% percentage point lower RSRRs; P=0.017), (2) partnering with local hospitals to reduce readmissions (0.34 percentage point; P=0.020), (3) having nurses responsible for medication reconciliation (0.18 percentage point; P=0.002), (4) arranging follow-up appointments before discharge (0.19 percentage point; P=0.037), (5) having a process in place to send all discharge paper or electronic summaries directly to the patient’s primary physician (0.21 percentage point; P=0.004), and (6) assigning staff to follow up on test results that return after the patient is discharged (0.26 percentage point; P=0.049). Although statistically significant, the magnitude of the effects was modest with individual strategies associated with less than half a percentage point reduction in RSRRs; however, hospitals that implemented more strategies had significantly lower RSRRs (reduction of 0.34 percentage point for each additional strategy).

Conclusions—Several strategies were associated with lower hospital RSRRs for patients with heart failure. (Circ Cardiovasc Qual Outcomes. 2013;06:444-450.)

Key Words: heart failure ■ patient readmission ■ quality improvement

Reducing hospital readmission rates is a national priority. Approximately 20% of Medicare beneficiaries are readmitted within 30 days of discharge, and these readmissions have been estimated to cost the American public >$15 billion per year.1 The National Quality Forum has endorsed hospital risk-standardized readmission rates (RSRRs) as performance measures, and the Centers for Medicare & Medicaid Services publicly report these rates. The Patient Protection Affordable Care Act of 2010 has created new incentives to reduce hospital readmissions using the publicly reported measures because hospitals with high readmission rates can lose ≤3% of their Medicare reimbursement by 2015. In response, dozens of national, state-based, and local quality campaigns and collaboratives have emerged to help hospitals reduce readmissions.

Evidence about how best to reduce readmissions is nonetheless limited. Several randomized trials2–12 have reported discharge and follow-up interventions that reduced readmissions, but less is known about the effectiveness of these strategies outside the context of a controlled trial. Observational studies of heart failure have examined a limited set of strategies, such as physician follow-up after discharge and nurse staffing,13–17 or evaluated more strategies but with small sample sizes of 100 or fewer hospitals.8,18–24 We previously documented substantial variation in strategies implemented by hospitals to
reduce readmissions, but there remains a need to determine how these strategies are related to hospital RSRRs.

Accordingly, we linked survey data about hospitals’ strategies with their RSRRs to determine which hospital strategies are associated with lower readmission rates in a large, national sample of hospitals. We focused on patients with heart failure attributable to higher readmission rates for this group and their inclusion in the national incentive program. Findings from this study may provide needed knowledge about effective strategies to reduce readmissions and improve quality of care. These methods use an approach that is similar to those used for investigating the strategies associated with faster door-to-balloon times for patients with an ST-segment–elevation myocardial infarction.

**Methods**

**Study Design and Sample**

We performed a cross-sectional study using a Web-based survey of hospitals to examine their reported use of specific hospital strategies intended to reduce readmissions for patients with heart failure. We contacted all hospitals that enrolled in either of 2 national quality initiatives to reduce readmission (ie, the Hospital to Home [H2H] National Quality Improvement Initiative or the State Action on Avoidable Rehospitalizations Initiative [STAAR]) by July 1, 2010 (n=658); surveys were completed between November 2010 and May 2011 as previously described. Of these 658 hospitals, 599 completed the survey for a response rate of 91.0%; 532 enrolled in H2H, 55 enrolled in STAAR, and 12 enrolled in both H2H and STAAR. We invited hospital participation by contacting the person registered with H2H or STAAR. Respondents were asked to coordinate with other relevant staff to complete the survey. Respondents reported various roles in the hospital, and many reported having >1 role; 60% were from quality management departments, 25% were from other clinical departments, 24% were from cardiology departments, 17% were from case management or care coordination, and 8% reported working in nonclinical roles. We obtained Internal Review Board exemption (protocol number 1008007300) for our study, which waived the need for participant consent because no identifying participant information was obtained. Additionally, all participants were provided with an information sheet to let them know what information would be collected, how it would be used and disseminated, and any risks that would be encountered by participation.

**Survey Development**

We developed the hospital survey by compiling items based on recommended strategies to reduce readmissions promulgated by quality initiatives, including H2H, STAAR, and Better Outcomes for Older Adults through Safe Transitions campaigns and collaboratives, existing literature, and clinical experience. We pretested the survey for its comprehensibility and comprehensiveness with 5 professional colleagues in roles similar to intended respondents and revised or excluded items that were ambiguous or imprecise. We then contacted the individual registered as the primary contact for the H2H or STAAR initiative to inform him or her of the purpose of the study and request participation. We instructed the individual to seek input from clinical and administrative staff to coordinate a single hospital response to the items, which were entered electronically and transmitted to a database for analysis.

**Measures**

Survey items were all close ended and included ≥30 hospital strategies, which we organized in 3 conceptual domains (see online-only Data Supplement Appendix for full questionnaire). These domains were: (1) quality improvement efforts and performance monitoring (eg, presence of a quality improvement team, partnering with community-based agencies to reduce readmission), (2) medication management (eg, how the medical reconciliation practice is performed, use of the teach-back techniques), and (3) discharge and follow-up procedures (eg, timing of follow-up appointments, home visits). We used principal components factor analysis to investigate potential approaches to summarizing the use of strategies and found evidence to support the existence of only 1 factor. Therefore, we created a summary count score (possible range, 0–10) by assigning a 1 to every strategy implemented that was positively associated with RSRRs and assigning a 1 to every strategy not implemented that was negatively associated with RSRRs. All items with 4-point responses for describing the frequency with which a strategy was implemented were dichotomized (1=usually or always; 0=sometimes or never).

We obtained data from the Annual Survey of the American Hospital Association from 2009 for hospital characteristics, including number of staffed hospital beds, teaching status (member of the Council of Teaching Hospitals and Health Systems, which is an association of 400 major teaching hospitals; having a residency program only but not a member of Council of Teaching Hospitals and Health Systems; and nonteaching), multihospital affiliation (yes or no), and ownership (for-profit, nonprofit, or government). We determined census regions from the US Census Bureau, and we ascertained the urban, suburban, or rural location designation using the 2003 Urban Influence Codes. We ascertained participation in H2H, STAAR, or both initiatives from the enrollment records of each initiative.

Our outcome was hospital 30-day RSRRs, derived using the same methods as used by Centers for Medicare & Medicaid Services for...
public reporting of 30-day RSRRs,32,33 applied to the most recent year of Medicare data available (July 2010 to June 2011).

Data Analysis
We first generated means and frequencies to describe the sample of hospitals and the prevalence of each hospital practice. We also generated RSRR means and SE, weighted by hospital volume, for each level of our explanatory variables. We examined associations between hospital characteristics and RSRRs. Before multivariable analyses, we assessed candidate independent variables for possible multicollinearity and found that no 2 variables were overcorrelated (all correlation coefficients, <0.45). We constructed a weighted multivariate linear regression model using backward elimination, where we removed, 1 by 1, nonsignificant explanatory variables (P>0.05), adjusted for hospital teaching status, geographic location, and number of staffed beds. The removal of variables did not significantly affect the fitting of the model. We also fit a similar multivariable model using the summary count score of selected strategies implemented. In exploratory analysis, we also examined whether the effects of the strategies varied across subgroups identified by hospital teaching status and number of beds, using appropriate interaction terms. Analyses excluded cases with missing values because the frequency of missing data was low (<5%). All analyses were performed in SAS, version 9.2 (Carey, NC). The research was funded by the Commonwealth Fund and the Center for Cardiovascular Outcomes Research at Yale University, supported by the National Heart, Lung, and Blood Institute.

Results
Hospital Characteristics
Of the 599 hospitals that completed the survey (91.0% response rate), 14 (2.3%) were missing RSRR data and were thus excluded, resulting in a total sample size of 585 hospitals for this study. The 14 hospitals with missing data did not differ significantly from the remaining hospitals in terms of number of beds, teaching status, geographical region, and rural/urban location (P>0.05). Of these 585 hospitals, 571 had no missing data on any of the independent variables used for modeling. Approximately 15% of the full sample were members of the Council of Teaching Hospitals and Health Systems, and an additional ≈20% had an accredited residency program (Table 1). Almost 30% had ≥400 beds, and ≈85% were urban hospitals. The mean RSRR for patients with heart failure was 24.7% with a range from 20.4% to 30.1%, which is similar to the RSRRs for heart failure nationally.34

Associations Between Reported Hospital Strategies and RSRRs
In multivariable analysis adjusted for number of staffed beds, teaching status, and census region, 6 strategies were associated with significantly lower RSRRs (Table 2), which included the following: (1) partnering with community physicians or physician groups to reduce readmission (0.33 percentage point lower RSRRs; P=0.017), (2) partnering with local hospitals to reduce readmissions (0.34 percentage point; P=0.002), (3) having nurses responsible for medication reconciliation (0.18 percentage point; P=0.002), (4) arranging a follow-up appointment before discharge (0.19 percentage point; P=0.037), (5) having a process in place to send all discharge paper or electronic summaries directly to the patient’s primary physician (0.21 percentage point; P=0.004), and (6) assigning staff to follow up on test results that return after the patient is discharged (0.26 percentage point; P=0.049). Many

Table 1. Descriptive Characteristics of Surveyed Hospitals (n=585)

<table>
<thead>
<tr>
<th>Hospital teaching status</th>
<th>n (%)</th>
<th>RSRR†</th>
<th>P Value‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Council of Teaching Hospitals member</td>
<td>90 (15.4)</td>
<td>25.1 (0.15)</td>
<td>&lt;0.001§</td>
</tr>
<tr>
<td>Has accredited residency training</td>
<td>114 (19.6)</td>
<td>24.4 (0.15)</td>
<td></td>
</tr>
<tr>
<td>Nonteaching</td>
<td>379 (65.0)</td>
<td>24.7 (0.08)</td>
<td></td>
</tr>
<tr>
<td>Number of staffed beds</td>
<td></td>
<td></td>
<td>0.898</td>
</tr>
<tr>
<td>&lt;200</td>
<td>196 (33.8)</td>
<td>24.6 (0.10)</td>
<td></td>
</tr>
<tr>
<td>200–399</td>
<td>216 (37.2)</td>
<td>24.8 (0.11)</td>
<td></td>
</tr>
<tr>
<td>400–599</td>
<td>98 (16.9)</td>
<td>24.7 (0.13)</td>
<td></td>
</tr>
<tr>
<td>≥600</td>
<td>70 (12.1)</td>
<td>24.7 (0.21)</td>
<td></td>
</tr>
<tr>
<td>Census region</td>
<td></td>
<td></td>
<td>0.083</td>
</tr>
<tr>
<td>New England</td>
<td>39 (6.7)</td>
<td>24.6 (0.24)</td>
<td></td>
</tr>
<tr>
<td>Middle Atlantic</td>
<td>57 (9.8)</td>
<td>25.1 (0.28)</td>
<td></td>
</tr>
<tr>
<td>East North Central</td>
<td>123 (21.1)</td>
<td>24.9 (0.13)</td>
<td></td>
</tr>
<tr>
<td>West North Central</td>
<td>45 (7.7)</td>
<td>24.5 (0.24)</td>
<td></td>
</tr>
<tr>
<td>South Atlantic</td>
<td>119 (20.5)</td>
<td>24.6 (0.13)</td>
<td></td>
</tr>
<tr>
<td>East South Central</td>
<td>51 (8.8)</td>
<td>24.9 (0.19)</td>
<td></td>
</tr>
<tr>
<td>West South Central</td>
<td>52 (8.9)</td>
<td>24.4 (0.11)</td>
<td></td>
</tr>
<tr>
<td>Mountain</td>
<td>33 (5.7)</td>
<td>24.8 (0.33)</td>
<td></td>
</tr>
<tr>
<td>Pacific</td>
<td>63 (10.6)</td>
<td>24.2 (0.16)</td>
<td></td>
</tr>
<tr>
<td>Geographic location</td>
<td></td>
<td></td>
<td>0.362</td>
</tr>
<tr>
<td>Urban</td>
<td>493 (84.7)</td>
<td>24.8 (0.07)</td>
<td></td>
</tr>
<tr>
<td>Suburban</td>
<td>59 (10.1)</td>
<td>24.7 (0.18)</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>30 (5.2)</td>
<td>24.2 (0.32)</td>
<td></td>
</tr>
<tr>
<td>Ownership type</td>
<td></td>
<td></td>
<td>0.631</td>
</tr>
<tr>
<td>For-profit</td>
<td>126 (21.7)</td>
<td>24.6 (0.12)</td>
<td></td>
</tr>
<tr>
<td>Nonprofit</td>
<td>401 (68.9)</td>
<td>24.7 (0.08)</td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>55 (9.5)</td>
<td>24.8 (0.21)</td>
<td></td>
</tr>
<tr>
<td>Multihospital affiliation</td>
<td></td>
<td></td>
<td>0.288</td>
</tr>
<tr>
<td>Yes</td>
<td>416 (71.5)</td>
<td>24.7 (0.07)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>166 (28.5)</td>
<td>24.8 (0.14)</td>
<td></td>
</tr>
<tr>
<td>Participation in quality initiative</td>
<td></td>
<td></td>
<td>0.220</td>
</tr>
<tr>
<td>H2H only</td>
<td>519 (88.7)</td>
<td>24.7 (0.07)</td>
<td></td>
</tr>
<tr>
<td>STAAR only</td>
<td>54 (9.2)</td>
<td>25.1 (0.20)</td>
<td></td>
</tr>
<tr>
<td>Both H2H and STAAR</td>
<td>12 (2.1)</td>
<td>24.6 (0.30)</td>
<td></td>
</tr>
<tr>
<td>RSRR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>24.7 (1.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>24.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode</td>
<td>24.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variance</td>
<td>1.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>20.4–30.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

H2H, indicates Hospital-to-Home Initiative; RSRR, risk-standardized readmission rate; and STAAR, State Action on Avoidable Rehospitalizations Initiative.

*Number missing by item ranged from 2 to 5; percentages are based on valid responses.
†RSRR per 100 patients, weighted by hospital volume.
‡P values derived from t tests and analyses of variance as appropriate.
§RSRRs for nonteaching hospitals significantly different from Council of Teaching Hospitals member hospitals (P=0.016) and from hospitals with an accredited residency program (P=0.033); RSRRs for Council of Teacher Hospitals significantly different from residency hospitals (P<0.001).
Table 2. Adjusted Associations Between RSRRs for Patients With Heart Failure and Hospital Strategies* (n=571)

<table>
<thead>
<tr>
<th>Percentage Point</th>
<th>Change in RSRRs</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital has partnered with community physicians or physician groups to reduce readmission rates</td>
<td>-0.33 (0.14)</td>
<td>0.017</td>
</tr>
<tr>
<td>Hospital has partnered with other local hospitals to reduce readmission rates</td>
<td>-0.34 (0.15)</td>
<td>0.020</td>
</tr>
<tr>
<td>Higher frequency of nurses responsible for performing medication reconciliation at discharge†</td>
<td>-0.18 (0.06)</td>
<td>0.002</td>
</tr>
<tr>
<td>Greater frequency with which patients leave the hospital with an outpatient follow-up appointment already arranged†</td>
<td>-0.19 (0.09)</td>
<td>0.037</td>
</tr>
<tr>
<td>Greater proportion of patients for whom a paper or an electronic discharge summary are sent directly to the patient’s primary MD‡</td>
<td>-0.21 (0.07)</td>
<td>0.004</td>
</tr>
<tr>
<td>Someone within the hospital is assigned to follow up on test results that return after the patient is discharged</td>
<td>-0.26 (0.13)</td>
<td>0.049</td>
</tr>
<tr>
<td>Higher frequency of outpatient and inpatient prescription records linked electronically†</td>
<td>0.18 (0.06)</td>
<td>0.003</td>
</tr>
<tr>
<td>All patients or their caregivers receive written emergency plan on discharge†</td>
<td>0.38 (0.13)</td>
<td>0.004</td>
</tr>
<tr>
<td>Reliable process is in place to ensure outpatient physicians are alerted to the patient’s discharge within 48 h of discharge</td>
<td>0.42 (0.14)</td>
<td>0.003</td>
</tr>
<tr>
<td>Hospital regularly calls patients after discharge to either follow up on postdischarge needs or provide additional education†</td>
<td>0.34 (0.13)</td>
<td>0.010</td>
</tr>
<tr>
<td>Hospital teaching status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Council of Teaching Hospitals member</td>
<td>0.61 (0.21)</td>
<td>0.005</td>
</tr>
<tr>
<td>Has residency training</td>
<td>-0.23 (0.16)</td>
<td>NS</td>
</tr>
<tr>
<td>Nonteaching</td>
<td>REF</td>
<td>…</td>
</tr>
<tr>
<td>Census region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New England</td>
<td>-0.25 (0.29)</td>
<td>NS</td>
</tr>
<tr>
<td>Middle Atlantic</td>
<td>REF</td>
<td>…</td>
</tr>
<tr>
<td>East North Central</td>
<td>-0.07 (0.21)</td>
<td>NS</td>
</tr>
<tr>
<td>West North Central</td>
<td>-0.28 (0.29)</td>
<td>NS</td>
</tr>
<tr>
<td>South Atlantic</td>
<td>-0.14 (0.23)</td>
<td>NS</td>
</tr>
<tr>
<td>East South Central</td>
<td>0.45 (0.27)</td>
<td>NS</td>
</tr>
<tr>
<td>West South Central</td>
<td>-0.47 (0.29)</td>
<td>NS</td>
</tr>
<tr>
<td>Mountain</td>
<td>0.02 (0.39)</td>
<td>NS</td>
</tr>
<tr>
<td>Pacific</td>
<td>-0.73 (0.29)</td>
<td>0.013</td>
</tr>
<tr>
<td>Number of staffed beds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;200</td>
<td>0.29 (0.24)</td>
<td>NS</td>
</tr>
<tr>
<td>200–399</td>
<td>0.52 (0.19)</td>
<td>0.007</td>
</tr>
<tr>
<td>400–599</td>
<td>0.36 (0.19)</td>
<td>NS</td>
</tr>
<tr>
<td>≥600</td>
<td>REF</td>
<td>…</td>
</tr>
</tbody>
</table>

Model $R^2=16.9\%$. NS indicates nonsignificant (P>0.050); REF, reference category to which others are compared in their association with outcomes; and RSRRs, Risk-Standardized 30-Day Readmission Rates.

*RSRR is a percentage; model was weighted by hospital volume, and independent variables were derived with backward elimination, removing variables with P>0.05.
†Modeled as a 4-point variable (never, sometimes, usually, always); change in RSRR is for a 1-U change in this 4-point measure.
‡Modeled as a 4-point variable (none, some, most, all); change in RSRR is for a 1-U change in this 4-point measure.

of these strategies were implemented by less than two thirds of the hospitals (Table 3).

Some reported strategies were associated with higher RSRRs in multivariable analysis (Table 2), which included the following: (1) more frequently linking outpatient and inpatient prescription records electronically (0.18 percentage point higher RSRRs; $P=0.003$), (2) providing all patients or their caregivers a written emergency plan on discharge (0.38 percentage point; $P=0.004$), (3) having a reliable process to ensure outpatient physicians were alerted about the patient’s discharge within 48 hours of discharge (0.42 percentage point; $P=0.003$), and (4) regularly calling patients after discharge to follow up on postdischarge needs or provide additional education (0.34 percentage point; $P=0.010$).

Hospitals that had a higher summary score for strategies had significantly lower RSRRs ($B=-0.34; \text{SE}=0.04; P<0.001$; Figure). Dummy variables for participation in H2H compared with STAAR, for geographic location, and ownership types were nonsignificant in multivariable analysis and dropped from the final model. The results did not differ significantly among subgroups of hospitals of differing teaching status or number of beds ($P$ values for interactions, >0.05), although we had limited statistical power to examine subgroup effects.

Discussion

Several hospital strategies were associated with lower RSRRs in this national study, and implementing more of the selected strategies was associated with greater reductions in RSRRs. The effect sizes of individual strategies were modest, which might be expected given the many factors involved with the readmission process as well as the likelihood of inconsistent implementation of strategies. Nevertheless, together the strategies had a more prominent effect. Given the prevalence of heart failure, even relatively modest effects could improve transitions in care for >850,000 patients per year and also could have effects for the readmission penalty of any individual hospital. Among the 6 strategies that were associated with lower RSRRs, most were implemented by <30% of hospitals, and only 7% of hospitals implemented all 6 strategies. Council of Teaching Hospitals and Health Systems hospitals also had higher RSRRs than nonteaching hospitals possibly because of the challenges of a complex care environment.

Many of the strategies associated with lower RSRRs are consistent with the widely endorsed belief that better integration of hospital care and primary care is needed to reduce readmissions. Previous studies have documented that many discharged patients do not attain prompt outpatient follow-up visits, and, for those who do, discharge summaries are frequently incomplete at the time of that visit. In this study, several strategies stood out that may reflect more effective communication links between the hospital and follow-up care. Hospitals that arranged a follow-up appointment before discharge, had a process in place to send all discharge paper or electronic summaries directly to the patient’s primary physician, and assigned staff to follow up on test results that return after the patient is discharged had significantly lower RSRRs. Furthermore, the strategy with the largest association with lower RSRRs was partnering with local healthcare providers (with community physicians or physician groups and with...
Table 3. Hospital Use of Strategies to Reduce Readmissions (n=571)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital has partnered with community physicians or physician groups to reduce readmission rates</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>297 (52.0)</td>
</tr>
<tr>
<td>No</td>
<td>274 (48.0)</td>
</tr>
<tr>
<td>Hospital has partnered with other local hospitals to reduce readmission rates</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>147 (25.7)</td>
</tr>
<tr>
<td>No</td>
<td>424 (74.3)</td>
</tr>
<tr>
<td>Frequency with which nurses are responsible for performing medication reconciliation at discharge</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>64 (11.2)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>62 (10.9)</td>
</tr>
<tr>
<td>Usually</td>
<td>53 (9.3)</td>
</tr>
<tr>
<td>Always</td>
<td>392 (68.7)</td>
</tr>
<tr>
<td>Frequency with which patients leave the hospital with an outpatient follow-up appointment already arranged</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>21 (3.7)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>246 (43.1)</td>
</tr>
<tr>
<td>Usually</td>
<td>250 (43.8)</td>
</tr>
<tr>
<td>Always</td>
<td>54 (9.5)</td>
</tr>
<tr>
<td>Proportion of patients for whom a paper or an electronic discharge summary sent directly to primary MD</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>43 (7.5)</td>
</tr>
<tr>
<td>Some</td>
<td>163 (28.6)</td>
</tr>
<tr>
<td>Most</td>
<td>213 (37.3)</td>
</tr>
<tr>
<td>All</td>
<td>152 (26.6)</td>
</tr>
<tr>
<td>Someone within the hospital is assigned to follow up on test results that return after the patient is discharged</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>206 (36.1)</td>
</tr>
<tr>
<td>No</td>
<td>365 (63.9)</td>
</tr>
<tr>
<td>Frequency with which outpatient and inpatient prescription records linked electronically</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>344 (60.3)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>104 (18.2)</td>
</tr>
<tr>
<td>Usually</td>
<td>68 (11.9)</td>
</tr>
<tr>
<td>Always</td>
<td>55 (9.6)</td>
</tr>
<tr>
<td>All patients or their caregivers receive written emergency plan on discharge</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>326 (57.1)</td>
</tr>
<tr>
<td>No</td>
<td>245 (42.9)</td>
</tr>
<tr>
<td>Reliable process is in place to ensure outpatient physicians are alerted to the patient’s discharge within 48 h of discharge</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>231 (40.5)</td>
</tr>
<tr>
<td>No</td>
<td>340 (59.5)</td>
</tr>
<tr>
<td>Hospital regularly calls patients after discharge to either follow up on postdischarge needs or provide additional education</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>357 (62.5)</td>
</tr>
<tr>
<td>No</td>
<td>214 (37.5)</td>
</tr>
</tbody>
</table>

local hospitals) to reduce readmissions. Our findings highlight the importance of the full system of care and underscore the potential value of greater coordination between hospital and other providers for addressing readmissions.

Unexpectedly, we also found that some strategies, which seem to link hospitals and outpatient care more closely and have been recommended by quality alliances, were associated with higher RSRRs. This paradoxical finding could not only be the result of reverse causation but may also be conveying unintended consequences of these interventions. If this is reverse causation, it is not clear why we would have also observed several recommended strategies that were associated with lower RSRRs. Another possibility is that the quality of implementation of reported strategies may vary, with some hospitals reporting the strategy but not implementing it in the most effective way, or the measurement of the strategy may be imperfect. These measurement issues would dampen the observed effects and may explain smaller effect sizes, in both directions, and nonsignificant findings.

Also, it is possible that the unanticipated results may signal unintended effects of implementing more comprehensive discharge and follow-up processes. Providing emergency plans detailing for patients and family caregivers when and how to return to the hospital, contacting patients to assess follow-up needs, and linking the inpatient and outpatient medication records easily may all contribute to reducing the difficulty of coordinating a return to the hospital and of readmission. Reducing the informational and logistical barriers to hospitalization may increase readmissions when the practice is designed to reduce readmissions. These interventions may inadvertently lower the threshold for readmission. This effect was apparent in 1 randomized, controlled trial, which found patients with extensive postdischarge follow-up by physicians and nurses experienced higher readmission rates. Although postdischarge follow-up may improve overall communication, these may also result in higher RSRRs. Such an explanation would lead to caution for hospitals assuming that such strategies can only improve their RSRRs. It may be that these interventions are useful but must be implemented in a way that supports outpatient care.

Our findings should be interpreted in light of several limitations. First, the data are cross-sectional and, therefore, may be limited by residual measured or unmeasured confounders, and causality may not be inferred. Nevertheless, several of the associations are plausible and consistent with some randomized, controlled trials, and having contemporary and national data provides greater description of current strategies and their links with RSRRs. Second, we have limited information about the methods of implementation, and, although some strategies were not significantly associated with RSRRs in this national sample, they may be effective in individual hospitals. Experimentation to tailor strategies to fit local circumstances should be encouraged. In addition, some strategies reported at the time of survey may not have been implemented for long enough to be reflected in the RSRR data. Third, we did not assess the influence of socioeconomic patient profiles of hospitals, such as race or income composition, which is beyond the scope of the present inquiry. We did, however, use the same methodology applied by Centers for Medicare & Medicaid
Services to calculate hospital RSRRs. Fourth, hospitals that participated in this study are self-selected and may have a particular interest in quality improvement for heart failure care. Therefore, findings from this study may not be representative of the experience of patients treated in other hospitals in the United States. Finally, we were unable to assess organizational culture in this quantitative study, which has been shown in multiple outcomes studies\textsuperscript{20,37–40} to be an essential component of improvement efforts. Future work, which examines more nuanced features of successful hospitals and partnering outpatient clinicians, using qualitative methods, would be beneficial for understanding the key components and trajectories of improvement in the area of readmissions.

In sum, our study has identified several strategies that are more prominent in hospitals with lower RSRRs; these add to the literature because they reflect national patterns of current strategies and outcomes. These strategies were implemented by a minority of hospitals. At the same time, the study highlights some unexpected findings that suggest some strategies meant to reduce readmissions may be associated with increased RSRRs, potentially attributable to removal of communication or informational barriers to readmission. These findings raise questions about the implementation of these strategies and suggest that reducing readmissions for the >850 000 patients per year hospitalized with heart failure may require interventions that extend beyond those strategies hospitals are currently implementing. Overall, our knowledge of the factors that affect readmissions is still in an early phase. Recognition of the importance of readmissions as a measure of quality is still very recent. We may need to use more mixed methods techniques, with qualitative studies of hospital strategies and culture, as well as engagement with outpatient organizations, to understand which complex interventions are influential and in which settings they are most effective.

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**Disclosures**

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Hospital Strategies Associated With 30-Day Readmission Rates for Patients With Heart Failure
Elizabeth H. Bradley, Leslie Curry, Leora I. Horwitz, Heather Sipsma, Yongfei Wang, Mary Norine Walsh, Don Goldmann, Neal White, Ileana L. Piña and Harlan M. Krumholz

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http://circoutcomes.ahajournals.org/content/suppl/2013/08/06/CIRCOUTCOMES.111.000101.DC1

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Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are CURRENTLY in place.

Hospital-to-Home (H2H) Survey Instructions

This survey typically takes about 20 minutes to complete. Please note the following:

• **Finish Later** – If unable to complete the survey in a single session, you may save your answers by clicking the *Finish Later* button located at the bottom of each page. You may return to your survey as many times as needed using your ID and password until you complete the survey.

• **Logging Out** - The survey will automatically log you out if left open and idle for more than 30 minutes. You will be required to log back in. Your answers on completed pages of the survey will be saved, but answers on the survey page left open will not be saved and will require re-entry. We suggest using the "Finish Later" button if you need to leave the survey idle for more than 30 minutes.

• **Submit Survey** - When you are satisfied that your survey is complete, click the *Complete* button located on the bottom of the last page. Once completed, you will not be able to return to your survey.

• **Discussion and Collaboration** – with others at the hospital to help answer the questions may be necessary and is welcome.

If you would like to preview the survey questions before proceeding, click on "Preview Survey", located in the left column of the Survey Home page. We are available to assist you at 203-737-6114 or email (Marcia. mulligan@yale.edu) with questions or difficulties.

Thank you very much for your time and participation!
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are CURRENTLY in place.

I. Organizational support and quality improvement (QI) efforts for reducing readmission rates

1. Reducing preventable readmissions is a written objective for your hospital.
   - Strongly agree
   - Agree
   - Not sure
   - Disagree
   - Strongly disagree

2. Does your hospital have any quality improvement teams devoted to reducing preventable readmissions for the following types of patients?
   a. Patients with heart failure
      - Yes
      - No
   b. Patients with acute myocardial infarction
      - Yes
      - No
   If “No” to both, skip to #4

3. Please indicate who belongs to any of the quality improvement teams devoted to reducing readmission rates

<table>
<thead>
<tr>
<th>QI team members for team focusing on readmission for patients with HF</th>
<th>QI team members for team focusing on readmissions for patients with AMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>a. Senior management of the hospital</td>
<td></td>
</tr>
<tr>
<td>b. Hospital governing board members</td>
<td></td>
</tr>
<tr>
<td>c. Physicians</td>
<td></td>
</tr>
<tr>
<td>d. Advanced practice nurses or physician assistants</td>
<td></td>
</tr>
<tr>
<td>e. Nurses</td>
<td></td>
</tr>
<tr>
<td>f. Pharmacists</td>
<td></td>
</tr>
<tr>
<td>g. Social workers and/or case managers</td>
<td></td>
</tr>
<tr>
<td>h. Quality Improvement/Quality Management staff</td>
<td></td>
</tr>
<tr>
<td>i. Patient or family representatives</td>
<td></td>
</tr>
<tr>
<td>j. Others, specify:</td>
<td></td>
</tr>
</tbody>
</table>
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are **CURRENTLY** in place.

II. Participation in readmission collaboratives or campaigns

4. For each of the following please indicate if your hospital participates in any of the collaborative or campaigns.

   a. State Action on Avoidable Rehospitalizations (STAAR)/IHI
      O Yes  O No  O Don’t know

   b. Interventions to reduce acute care transfers (INTERACT)
      O Yes  O No  O Don’t know

   c. Centers for Medicare & Medicare/Quality Improvement Organizations Care Transitions Project
      O Yes  O No  O Don’t know

   d. Better Outcomes for Older Adults through Safe Transitions (BOOST)/Society for Hospitalist Medicine
      O Yes  O No  O Don’t know

   e. Project Reengineered Discharge (RED)
      O Yes  O No  O Don’t know

   f. Hospital-to-Home (H2H)
      O Yes  O No  O Don’t know

   g. Care Transitions Intervention (Coleman)
      O Yes  O No  O Don’t know

   h. Transitional Care Model (Naylor)
      O Yes  O No  O Don’t know

   i. University HealthSystems Consortium collaborative
      O Yes  O No  O Don’t know

   j. State hospital association collaborative
      O Yes  O No  O Don’t know

   k. Local or regional collaborative
      O Yes  O No  O Don’t know

   l. Others (please specify) ________________________________
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are **CURRENTLY** in place.

III. Systems to reduce readmissions

**In-Hospital Care**

5. During a patient’s hospitalization, is the risk of death estimated in any formal way and also used in clinical care?

<table>
<thead>
<tr>
<th>O Yes</th>
<th>O No</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a. If Yes, how?</td>
<td>________________________________</td>
</tr>
</tbody>
</table>

6. During a patient’s hospitalization, is the risk of readmission estimated in any formal way and also used in clinical care?

<table>
<thead>
<tr>
<th>O Yes</th>
<th>O No</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a. If Yes, how?</td>
<td>________________________________</td>
</tr>
</tbody>
</table>

7. Does your hospital have a multidisciplinary team to manage the care of patients who are at high risk of readmission?

   | O Yes | O No |

8. Does your hospital have a reliable process in place to identify patients with heart failure at the time they are admitted?

   | O Yes | O No |

9. Does your hospital have a reliable process in place to identify patients with acute MI at the time they are admitted?

   | O Yes | O No |

10. What proportion of your patients with AMI have a cardiologist involved in their care?

    | O All |
    | O Most |
    | O Some |
    | O None |

11. What proportion of your patients with HF have a cardiologist involved in their care?

    | O All |
    | O Most |
    | O Some |
    | O None |

**Medication Reconciliation**

12. How often does each of the following occur as part of the medication reconciliation process at your hospital?

    a. Emergency medicine staff obtains medication history

       | Always |
       | Usually |
       | Sometimes |
       | Never |

4
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are CURRENTLY in place.

b. Admitting medical team obtains medication history
   - Always
   - Usually
   - Sometimes
   - Never

c. Pharmacist or pharmacy technician obtains medication history
   - Always
   - Usually
   - Sometimes
   - Never

d. Contact is made with outside pharmacies
   - Always
   - Usually
   - Sometimes
   - Never

e. Contact is made with primary physician
   - Always
   - Usually
   - Sometimes
   - Never

f. Outpatient and inpatient prescription records are linked electronically
   - Always
   - Usually
   - Sometimes
   - Never

g. We subscribe to third party prescription database that provides historical fill and refill information (e.g., Health Care Systems)
   - Always
   - Usually
   - Sometimes
   - Never

h. Other (specify): ____________________________

13. What tools are in place to facilitate medication reconciliation at your hospital? (Check all that apply)
   - Paper-based standardized form
   - Web-based tool
   - Form/tool built into electronic medical record
   - No standardized form or tool is used for medication reconciliation
   - Other, specify: ____________________________
14. Who is responsible for conducting medication reconciliation at discharge?
   a. Discharging physician, physician assistant or nurse practitioner
      □ Always
      □ Usually
      □ Sometimes
      □ Never
   b. Nurse
      □ Always
      □ Usually
      □ Sometimes
      □ Never
   c. Pharmacist
      □ Always
      □ Usually
      □ Sometimes
      □ Never
   d. Responsibility is not formally assigned
      □ Always
      □ Usually
      □ Sometimes
      □ Never
   e. Other (specify): _____________________

15. Is it a component of the discharge process to ask patients whether they can afford their medications?
    □ Yes, for all patients
    □ Yes, for some patients and/or for certain medications
    □ No, not routine

16. How often are your patients discharged from the hospital with their new medications in hand?
    □ Always
    □ Usually
    □ Sometimes
    □ Never
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are CURRENTLY in place.

**Patient/Family Education**

17. Does your hospital promote the use of teach-back techniques (having the patient “teach” new information back to the educator) for patient and family education?

- [ ] Yes
- [ ] No

18. What proportion of PATIENTS OR THEIR CAREGIVERS receive each of the following in written form at the time of discharge?

   a. Discharge instructions
      - [ ] All
      - [ ] Most
      - [ ] Some
      - [ ] None

   b. Discharge summary
      - [ ] All
      - [ ] Most
      - [ ] Some
      - [ ] None

   c. Educational information about heart failure, when relevant
      - [ ] All
      - [ ] Most
      - [ ] Some
      - [ ] None

   d. Educational information about AMI
      - [ ] All
      - [ ] Most
      - [ ] Some
      - [ ] None

   e. Action plan for patients with heart failure to help them manage changes in condition
      - [ ] All
      - [ ] Most
      - [ ] Some
      - [ ] None

   f. Personal health record (e.g., list of diagnoses, allergies, medications, physicians, contact information)
      - [ ] All
      - [ ] Most
      - [ ] Some
      - [ ] None
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are CURRENTLY in place.

- Names, doses, and frequency of all discharge medications
  - All
  - Most
  - Some
  - None

- The purpose of each medication
  - All
  - Most
  - Some
  - None

- Information about which medications are new
  - All
  - Most
  - Some
  - None

- Information about which medications have changed in dose or frequency
  - All
  - Most
  - Some
  - None

- Information about which medications are to be stopped
  - All
  - Most
  - Some
  - None

- The signs or symptoms that should prompt an immediate call to a physician or a return to the hospital
  - All
  - Most
  - Some
  - None

- Direct contact information for a specific physician to contact in case of emergency
  - All
  - Most
  - Some
  - None

- Any other type of emergency plan
  - All
  - Most
  - Some
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are CURRENTLY in place.

☐ None

Transition Process

19. Are all patients screened by a case manager using explicit criteria to identify post-discharge needs?
   O Yes       O No

20. On the day of discharge, do patients leave the hospital with an outpatient follow-up appointment already arranged?
   ☐ Always
   ☐ Usually
   ☐ Sometimes
   ☐ Never

21. Is there a reliable process in place to ensure outpatient physicians are alerted to the patient’s admission within 24 hours of admission?
   O Yes       O No

22. Is there a reliable process in place to ensure outpatient physicians are alerted to the patient’s discharge within 48 hours of discharge?
   O Yes       O No

23. How quickly is a patient’s discharge summary typically completed and available for viewing?
   O On discharge
   O Within 48 hours of discharge
   O Within 7 days
   O Within 30 days
   O There are no explicit goals or policies defining a time-frame for completing the discharge summary

24. In what proportion of patients is a paper or electronic discharge summary sent directly to the patient’s primary MD?
   ☐ All
   ☐ Most
   ☐ Some
   ☐ None

25. What proportion of patients are cared for by outpatient physicians with access to inpatient electronic records?
   ☐ All
   ☐ Most
   ☐ Some
   ☐ None

26. Is there someone within the hospital assigned to follow up on test results that return after the patient is discharged?
   O Yes       O No
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are CURRENTLY in place.

27. Is there a process in place to ensure pending test results are listed in the discharge summary?  
   O Yes   O No

**Post-acute care linkages and supports**

28. Has your hospital partnered with community home care agencies and/or skilled nursing facilities to reduce readmission rates?  
   O Yes   O No

29. Has your hospital partnered with community physicians or physician groups to reduce readmission rates?  
   O Yes   O No

30. Has your hospital partnered with other local hospitals to reduce readmission rates?  
   O Yes   O No

31. Does your hospital regularly call patients after discharge to either follow up on post-discharge needs or to provide additional education?  
   If no, skip to #34.  
   O Yes   O No

32. How long after discharge does your hospital regularly call patients? (Check all that apply, if multiple calls are made)  
   □ Within 48 hours of discharge  
   □ Within 1 week of discharge  
   □ Within 2 weeks of discharge  
   □ Within a month of discharge

33. Who conducts the calls? (Check all that apply)  
   □ Clerical staff  
   □ Care coordination/social work staff  
   □ Nurses  
   □ Pharmacist  
   □ Physician  
   □ Other, specify: _____________________________

34. For how many of your patients does your hospital arrange home visits after discharge?  
   □ All patients  
   □ Most  
   □ Some  
   □ None

35. Does your hospital run its own post-discharge clinic in which patients can been seen within 7 days of discharge?  
   O Yes   O No
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are CURRENTLY in place.

36. For how many of your patients does your hospital arrange telemonitoring after discharge?
☐ All patients
☐ Most
☐ Some
☐ None

37. How many of your patients with AMI does your hospital refer to cardiac rehabilitation after discharge?
☐ All patients
☐ Most
☐ Some
☐ None

38. How many of your patients does your hospital enroll in chronic care disease management programs after discharge?
☐ All patients
☐ Most
☐ Some
☐ None

39. Is there a physician assigned to coordinate with visiting nurse agencies about recently discharged patients in the post-discharge period?
☐ Yes ☐ No

40. For patients discharged with home health services, does your hospital provide direct contact information for a specific inpatient physician to contact in case of questions?
☐ Yes ☐ No

For the following questions, please consider patients who are transferred to skilled nursing facilities:

41. Does your hospital conduct a nurse-to-nurse report prior to transfer?
☐ Always
☐ Usually
☐ Sometimes
☐ Never

42. Does your hospital send a completed discharge summary with the patient?
☐ Always
☐ Usually
☐ Sometimes
☐ Never

43. Does your hospital send a reconciled medication list with the patient?
☐ Always
☐ Usually
☐ Sometimes
☐ Never
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are CURRENTLY in place.

44. Does your hospital send a medication administration record with the patient?
   - Always
   - Usually
   - Sometimes
   - Never

45. Does your hospital provide a direct contact number to reach the inpatient treating physician?
   - Always
   - Usually
   - Sometimes
   - Never

IV. Measures and tracking

46. Does your hospital have a designated person or group to review unplanned readmissions that occur within 30 days of the original discharge?
   - Yes
   - No
   [If NO, skip to #48]

47. How long after the unplanned readmission are cases typically reviewed?
   - Within one week of the readmission
   - Within one month of the readmission
   - Within 3 months of the readmission
   - Other (please specify) _________________________________________________
   - We do not have a set timeframe for reviewing readmissions

48. Which of the following does your hospital track for quality improvement efforts?
   a. Timeliness of discharge summaries
   - Yes
   - No
   b. Proportion of discharge summaries that are sent to primary physician
   - Yes
   - No
   c. Percent of patients discharged with a follow-up appointment
   - Yes
   - No
   d. Percent of patients discharged with a follow-up appointment within 7 days
   - Yes
   - No
   e. Accuracy of medication reconciliation
   - Yes
   - No
   f. Content of discharge instructions
   - Yes
   - No
   g. 30-day readmission rate
   - Yes
   - No
   h. Early (<7 day) readmission rate
   - Yes
   - No
   i. Proportion of patients readmitted to another hospital
   - Yes
   - No
   j. Other, specify: __________________________________________________________
Note: All questions refer to patients with acute myocardial infarction (AMI) or heart failure (HF).
Please reflect upon your hospital’s quality improvement efforts that are CURRENTLY in place.

49. Please indicate your primary role in the hospital, check all that apply:
☐ Quality improvement, quality management, quality assurance, performance management
☐ Case management/care coordination/social work/discharge planning
☐ Cardiology
☐ Other clinical role
☐ Other non-clinical role