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Predictors of Excess Heart Failure Readmissions

Implications for Nursing Practice

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In this study of California, Massachusetts, and New York hospitals, 6 factors predicted 27.6% of readmissions for patients with heart failure (HF). We found that higher admissions per bed, teaching hospitals, and poor nurse-patient communication increased HF readmissions. Conversely, the HF readmissions were lower when nurse staffing was greater, more patients reported receiving discharge information, and among hospitals in California. The implications for nursing practice in the delivery of care to patients with HF are discussed. **Key words:** *discharge instructions*, *heart failure*, *nurse-patient communication*, *readmissions*, *reimbursement*, *secondary data analysis*

EVIDENCE SUGGESTS that education provided by nurses prior to hospital discharge improves outcomes such as increased patient satisfaction and decreased hospital readmissions for individuals with chronic illnesses.[1] One of the highest incidences of 30-day hospital readmissions occurs in individuals with heart failure (HF).[2] Costs associated with HF readmissions were estimated to be at $34 billion in 2008.[3] As a result of these high costs, agencies such as the Centers for Medicare & Medicaid Services (CMS) are evaluating ways to incentivize hospitals to decrease the number of readmissions and improve outcomes for individuals with high-risk chronic conditions, such as HF.[4]

The CMS, the American Hospital Association (AHA) and the Agency for Healthcare Research and Quality have individually collected data about hospitals capturing the cost, quality, and outcomes of hospital care. To date, no studies have examined patients' perceptions of the quality of care as measured by the Hospital Consumer Assessment of Health Care Providers System (HCAHPS) indicator associated with higher than expected readmission ratios. In this article, we report factors such as hospital type, number of admissions, and nurse-patient communication measured by the AHA survey (2009),[5] the HCAHPS survey (2011),[6] and the CMS (2008-2011)[2] that were associated with the 30-day readmission ratio for patients with HF. Second, we discuss the implications for preventing hospital

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readmissions in individuals with HF and the implications for nursing practice.

BACKGROUND

Readmission rates for patients with HF

Heart failure is a chronic condition without a cure and is one of the most costly diagnoses in the United States. The National Heart, Lung, and Blood Institute reported $167.4 billion in direct costs of cardiovascular disease and $119.2 billion in indirect costs of mortality.[7] Although the risk standardized mortality rates for pneumonia and acute myocardial infarction declined between 2008 and 2010, the mortality rates for patients with HF increased during this period by 0.4%.[8] One-fifth of Medicare beneficiaries are readmitted within 30 days and 90% of those readmissions are unplanned or preventable costing $17 billion.[9] In 2008, HF was responsible for $34 billion in rehospitalization costs and increased death rates in the United States.[3] There is wide variation among and within the states in readmission rates for HF.[10,11] Teaching hospitals have high degrees of variation in 30-day readmission rates ranging from less than 10% to greater than 20%.[12] Regional patterns of hospital care, in particular, the rate of medical admissions and discharges, have been found to explain 47% of the readmission rate.[12] Readmission rates for HF are higher in hospitals in the lowest quartile of nurse staffing,[13] and the odds for HF readmission is 7% higher for each additional patient per nurse in the average nurses' workload.[14]

CMS hospital readmissions reduction program

The Affordable Care Act established the Hospital Readmissions Reduction Program, which requires the CMS to reduce payments in the inpatient prospective payment system to hospitals with excess readmissions. As part of the Hospital Readmission Reduction Program, the CMS began tracking 30-day readmission rates for HF. The CMS established a goal to reduce hospital readmissions for HF by 20% in the year of 2013 by financially penalizing hospitals that have a higher than expected HF readmission ratio.[15-17] To facilitate comparisons among hospitals for readmissions, the CMS established a methodology to calculate the *excess readmission ratio.* The *excess readmission ratio* is a measure of a hospital's readmission performance compared with the national average for the hospital's set of patients with that applicable condition.[14] For 2013, if the HF readmission ratio is 0.99 or higher, there will be a 1% reduction in Medicare payment, and in 2014, if the HF readmission ratio is 0.98 or higher, there will be a 2% reduction in payment.[4] The CMS Readmission Reduction Program has created incentives for hospitals to develop programs aimed toward reducing readmissions especially for chronic conditions such as HF.

Hospital Consumer Assessment of Healthcare Providers and Systems

The AHA survey of hospitals has been used in combination with publicly available data to explore linkages between nurse staffing, nurse education, work environment, and patient outcomes.[18,19] While the AHA survey provides information about organizational structure, facility services, and utilization, the data set does not provide information about the process of care or patient outcomes. In 2002, the CMS and the Agency for Healthcare Research and Quality worked together to create and test a survey aimed at understanding the patient's perception of hospitalization. The HCAHPS survey is a 27-item survey that measures 8 key components: hospital cleanliness, quietness of the hospital environment, patient-physician communication, patient-nurse communication, staff responsiveness, pain management, and communication about discharge and medications.[6,20] The survey was implemented in 2006, and CMS began publicly releasing the findings in 2008.[20]

Since July 2007, hospitals that are subject to the inpatient prospective payment system must submit their HCAHPS data to collect their full fees and to avoid a 2% payment

reduction.[6] Following the implementation of the Affordable Care Act in 2010, the CMS began using the HCAHPS data as a value-based incentive program named the Hospital Value-Based Purchasing Program. This program has a total performance score that comprises 2 components: 70% is the clinical process of care domain and 30% is focused on the patient experience of care domain, the latter of which is captured by HCAHPS data.[6] The indicator that captures the clinical process of care domain for patients with HF is whether they received care instructions at the time of hospital discharge.[6] Discharge instructions are also captured in the HCAHPS data.[20,21]

Effects of nurse-patient communication and education on HF readmissions

While knowledge alone is not sufficient to produce effective behavior change for patients with HF,[22,23] knowledge is an important and foundational element to empower the performance of self-care behaviors after hospital discharge.[17,23,24] Patients with HF exposed to nurse-led education while hospitalized have shown longer times to hospital encounter and hospital readmission at 6 months and 1 year, with shorter hospital stays and decreased costs.[25,26] Several studies suggest that knowledge plus nurse-led education delivered over time has improved abilities of patients with HF to recognize and treat symptoms quickly and decrease the need for frequent rehospitalizations.[17,23,27,28] Collectively, these studies indicate that the nurse has a role in providing patient education and as a result, reducing hospital readmission for patients with HF.

While there is much attention paid to measuring quality of care, reducing costs, and tracking high-risk diagnoses, it is less clear how hospital type, number of admissions, nursing staffing, and nurse-patient communication intersect to effect HF readmissions. Examining factors known to be related to HF readmission from publicly available data (CMS and HCAHPS) as well as data from the AHA Annual Survey of hospitals may provide valuable insight as to how these variables interact to impact HF readmission rates.

PURPOSE

The purpose of this secondary data analysis was to explore data from the AHA survey of hospitals, HCAHPS, and CMS performance outcome measures to identify predictors for excess HF readmissions in California, Massachusetts, and New York nonfederal hospitals. Specifically, we evaluated how much of the variance in the mean excess HF readmission ratio could be explained by nurse-patient communication about HF self-care prior to discharge when compared with other factors known to be associated with HF readmissions.

METHODS

Study sample

To achieve a sample that would allow us to evaluate the relationship of nurse staffing on HF readmissions, we matched clusters (states) on the basis of the following criteria: California was a state with low HF readmission ratios, Massachusetts had moderate levels, and New York had high levels. These 3 states provided a wide range of variability on this key variable. Sampling was completed at the state level, that is, no sampling of hospitals within states. The sample of 577 nonfederal general hospitals in this study included California (n = 336), followed by New York (n = 179) and Massachusetts (n = 62).

Data sources

The data sources included the 2009 AHA Annual Survey of Hospitals, the CMS hospital performance measures from 2008 to 2011, and CMS and HCAHPS from 2011 to 2012. The CMS 30-day risk standardized excess readmission ratio for HF, process of care measures, hospital-acquired conditions, and the AHA data set by the CMS provider number were merged with the HCAHPS data. The data used to produce the CMS 30-day risk standardized excess readmission ratio and the publicly reported CMS measures available on

the *Hospital Compare* Web site are described elsewhere.[29]

Data analysis

IBM© SPSS version 21[30] was used to analyze the 2009 AHA Annual Survey of Hospitals. The data file was examined for random or systematic missing data and marked skewness. Dummy variables (0 = no and 1 = yes) were created for each of the 3 states, cardiac intensive care joint venture services, and for hospitals that were members of the Council of Teaching Hospitals of the Association of American Medical Colleges. Included in the linear regression analysis were the percentage of patients given information about what to do during their recovery at home; the percentage of patients reporting nurses "sometimes" or "never" communicated well with them; California, New York, teaching hospital, cardiac intensive care joint venture; adult intensive care unit (ICU) beds/total facility beds staffed; total facility admissions/total facility bed staffed; and total nursing staff full-time equivalent hours per patient day/total facility personnel full-time equivalent hours per patient day.[31,32] Total nursing staff hours per patient day was calculated by summing registered nurse, licensed practical nurse, and nursing assistant hours per patient day. Hours per patient day was calculated by multiplying full-time equivalents by 2080 (40 h/wk × 52 wk) and dividing by "adjusted patient days."[31] No systematic missing data were found in the variables included in the data analysis. Binary correlations were examined for significant association and scientific relevance with the dependent variable, HF 30-day excess readmission ratio.

Scatterplots of the candidate predictors and the response were examined to look for applicability of the linear model, outliers, or unusual distributional shapes. All terms were initially placed in the model and then eliminated by stepwise modeling if they remained associated at P value of .05 and were removed at P value of .10. This was determined by stepwise procedures and likelihood ratio tests. A likelihood ratio test shows that the 2-way interactions did not significantly improve the model once all the main effects were included.

RESULTS

HF readmissions and selection of model factors

The mean number of HF 30-day readmissions from California, New York, and Massachusetts's nonfederal hospitals from July 2008 to June 2011 was 97.53 (SD = 91.2). Hospitals in the 25th percentile had a lower mean number of HF readmissions ($\overline{X}$ = 34.0) than hospitals in the 75th percentile ($\overline{X}$ = 128.0). Five variables measuring hospital characteristics and 2 variables measuring patients' self-reports of the quality of nursing care were strongly correlated to the dependent variable excess HF readmission ratio (Table 1). Excess HF readmission ratios were positively associated with hospitals in New York, higher facility admissions per facility bed staffed, total adult ICU beds/total facility beds staffed, teaching hospitals, and the percentage of nurses who "sometimes" or "never" communicated well with the patient (Table 1). Excess HF readmission ratios were negatively associated with California, nursing staff hours per patient day/total facility personnel hours per patient day, and the percentage of patients reporting that they had been given information about what to do during their recovery at home.

HF readmissions

The 9 independent variables correlated with the dependent variable, excess HF readmission ratio, were included in the linear regression analysis. Six factors significantly predicted the excess HF readmission ratio (Table 2). The excess mean HF readmission ratio was lower in California than in the other states by 0.043. In addition, the HF readmission ratio decreased by 0.004 for each percentage increase in patients reporting that they were given information about what to do during their recovery at home, and by 0.093 for each increase in the ratio of nursing staff

Table 1. Factors Significantly Correlated With HF Excess 30-Day Readmission Ratio (N = 314)[a]

Independent Variables	Coefficient	*P* (1-Tailed)
California[b]	− 0.291	.000
New York[b]	0.289	.000
Total facility admissions/total facility beds staffed	0.160	.002
Total adult ICU beds/total facility beds staffed	0.167	.001
Nursing staff FTE HPPD[c]/total personnel FTE HPPD	− 0.233	.000
Teaching hospital[b]	0.283	.000
Cardiac intensive care joint venture[b]	− 0.118	.018
Nurses "sometimes" or "never" communicated well with patient (%)	0.319	.000
Patient's given information about what to do during their recovery at home (%)	− 0.272	.000

Abbreviations: FTE, full time equivalent; HPPD, hours per patient day; ICU, intensive care unit.
[a]American Hospital Association.[33]
[b]Dummy variables (0 = no, 1 = yes).
[c]Total nursing staff FTE HPPD = RN FTE HPPD + LPN FTE HPPD + NA FTE HPPD.

Table 2. Stepwise Linear Regression: HF Excess 30-Day Readmission Ratio With Predictors (N = 314)[a,b]

Predictors	B	SE (B)	*P*
California[c]	− 0.043	− 0.279	.000
Total facility admissions/total facility beds staffed	0.001	0.127	.011
Nursing staff FTE HPPD[d]/total personnel FTE HPPD	− 0.093	− 0.100	.049
Teaching hospital[c]	0.041	0.186	.000
Nurses "sometimes" or "never" communicated well with patient (%)	0.003	0.125	.067
Patient's given information about what to do during their recovery at home (%)	− 0.004	− 0.268	.000

Abbreviations: FTE, full time equivalent; HPPD, hours per patient day.
[a]Stepwise: $R^2 = 0.290$; adjusted $R^2 = 0.276$; standard error of estimate = 0.066; SS = 0.541; $P = .000$.
[b]American Hospital Association.[33]
[c]Dummy variables (0 = no, 1 = yes).
[d]Total Nursing Staff FTE HPPD = RN FTE HPPD + LPN FTE HPPD + NA FTE HPPD.

full-time equivalent hours per patient day to the total facility personnel full-time equivalent hours per patient day. Conversely, the mean HF excess readmission ratio increased by 0.041 if a patient was hospitalized at teaching hospital, by 0.001 for each increase in the total facility admissions per total facility beds staffed, and by 0.003 for each percentage increase in the number of patients reporting that the nurses "sometimes" or "never" communicated well with them.

To summarize, 3 factors increased the excess HF readmission ratio: (1) increased admissions per bed, (2) teaching hospitals, and (3) poor nurse communication with patients. Conversely, 3 other factors lowered the HF readmission ratio: (1) hospitals in California, (2) higher portions of total nursing staff full-time equivalent hours per patient day to total personnel full-time equivalent hours per patient day, and (3) greater percentages of patients reporting that they were given information about what to do during their recovery at home. Overall, these 6 factors explained 27.6% of the variance in excess HF readmission ratios ($R^2 = 0.261$) (Table 2).

Differences among California, Massachusetts, and New York hospitals

California hospitals differed significantly from hospitals in New York and Massachusetts on several independent variables included in the linear regression model (see Supplemental Digital Content Table, available at http://links.lww.com/JNCQ/A58). The excess HF readmission ratio in California was significantly lower than that in both Massachusetts ($P = .020$) and New York ($P = .000$). Total facility admissions to total facility beds staffed were lower in California than in Massachusetts ($P = .000$) and New York ($P = .002$) as were the number of teaching hospitals compared with Massachusetts ($P = .002$) and New York ($P = .000$). Total full-time nursing staff hours per patient day/total facility full-time personnel hours per patient day were significantly higher in California than in both Massachusetts and New York ($P = .000$). California had more participating hospitals in cardiac ICU joint ventures than Massachusetts and New York ($P = .037$) and fewer adult ICU beds than New York ($P = .021$) and Massachusetts ($P = .004$).

Massachusetts differed significantly from both California and New York on patients' self-reports regarding the quality of nursing care. A significantly smaller percentage of patients in Massachusetts reported that nurses "sometimes" or "never" communicated to them compared with California and New York ($P = .000$). Conversely, significantly higher percentages of patients from Massachusetts hospitals reported that they were given information about what to do during their recovery at home than patients in California and New York ($P = .000$).

DISCUSSION

This report is unique in that to date, no study has used the AHA Annual Surveys of Hospitals, CMS, and HCAHPS databases to examine the relationship between patients' perceptions of the quality of care with excess 30-readmission ratios in patients with HF. The findings from this secondary analysis suggest that 6 factors explain 27.6% of the variance in excess 30-day readmission. This is consistent with others who have found differences in the 30-day readmission ratio for patients with HF by geographic region,[10,11,34] and that RN staffing can have an impact on 30-day readmission ratios.[13,14,35]

The findings from this study support that higher number of admissions per bed and lower nurse staffing and the type of hospital (teaching vs nonteaching) increase the hospital readmission rate for patients with HF. In Massachusetts, patients reported receiving teaching at discharge more frequently than patients from California or New York ($P = .000$); however, the 30-day readmission ratio was significantly lower in California than in Massachusetts or New York. It is unclear whether the teaching reported by patients in Massachusetts' hospitals is a result of the commencement of a transitional care program or whether the teaching is a one time

isolated event. As a result, further exploration of what discharge education entails is warranted. It is not possible to discern from the databases which hospitals had transitional care programs. This suggests a need to better capture these types of programs and best practice models especially in light of the Affordable Care Act.

Massachusetts' hospitals reported more part-time RN staff and higher turnover per patient bed than California. This finding is congruent with prior literature and may suggest that a lack of continuity of care by RNs could be a factor in the high 30-day readmission ratios for patients with HF.[14] The databases did not provide information about the discharge plan of care (ie, home, home with transitional care support, or rehabilitation) for patients posthospitalization. Given the overall decreased length of stay over the last decade in hospitals across all conditions including HF, it is important to track what impact, if any, this reduced length of stay may have.[36] It is possible that with a shorter hospital stay, the patient with HF may experience greater fragmentation in care leading to an increased risk for readmission.

Hospital readmissions were higher in the state of New York and Massachusetts than in California. Possible reasons for this high readmission rate could be related to 3 controllable factors: (1) admissions per bed increased as nurse staffing stayed the same, (2) shorten length of stay, and (3) the increased number of teaching hospitals compared with New York and California. This suggests that poor nurse staffing ratios combined with high acuity and high patient turnover may have an impact on HF readmission rates.

Limitations

The sample in this study included nonfederal hospitals in California, Massachusetts, and New York, which are not representative of hospitals throughout the United States. Second, variables measuring the quality of nursing care were limited to patient self-reports from HCAHPS. Third, other aspects of nursing care associated with lowering rehospitalization rates, such as the availability of transitional care programs and perceptions of hospital safety climate by nurses and physicians, were not available to measure in this study.[13,37,38] Outcomes such as mortality and nursing issues related to caregiver support and provider relationship with the patient may have an impact on readmissions, but these were not captured in these findings.

CONCLUSION

In summary, California reported lower readmission rates for HF than Massachusetts and New York. This may be attributed to higher nurse staffing and lower admissions per bed within the California hospitals. This suggests that California hospitals have fewer turnovers per bed, but nurse staffing in relation to the level of patient acuity is not clear from the existing databases. Future work should focus on the interrelationship of nursing staffing ratios to patient admissions and patient acuity and how these impact readmission rates for patients with HF. Furthermore, given the discrepancy between the large amount of information being provided at discharge in Massachusetts' hospitals and the higher readmission rates for HF in this state, it is important to gain a better understanding of what patient teaching entails. The types of discharge materials, discharge planning, and transitional programs that exist should be captured within databases such as the AHA Survey, HCAHPS, and CMS to determine best practices or gaps in care. Future work should focus on how the adequacy of RN staffing by number of nurses and educational level, the quality of the discharge teaching, and the nurse-patient communication impacts the HF readmission rate.

The results of this study have implications for promoting and developing legislation that supports adequate nurse staffing in acute care facilities. The high patient acuity and increased admission rate in teaching hospitals may contribute to less time for nurse-patient interaction and as a result inadequate teaching and discharge planning, thereby increasing the risk for readmissions for patients with HF. Future work should focus on improving

nurse staffing and exploring how this impacts time and quality of nurse-patient interaction in relation to patient teaching and discharge planning.

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