Published in final edited form as:

J Nurs Adm. 2016 January ; 46(1): 25–29. doi:10.1097/NNA.0000000000000289.

The Relationship Between Nurse Staffing and 30-Day Readmission for Adults With Heart Failure

Dr. Karen K. Giuliano, PhD, RN, FAAN, Dr. Valerie Danesh, PhD, RN, CCRP, and Dr. Marjorie Funk, PhD, RN, FAAN

Postdoctoral Fellow (Dr Giuliano) and Helen Porter Jayne and Martha Prosser Jayne Professor of Nursing (Dr Funk), Yale School of Nursing, Orange, Connecticut; and Corporate Manager (Dr Danesh), Research and Clinical Grants, Orlando Health, Florida

Abstract

OBJECTIVE—The purpose of this study was to better understand the relationship between nurse staffing and 30-day excess readmission ratios for patients with heart failure in the top US adult cardiology and heart surgery hospitals.

BACKGROUND—Heart failure is the most common cause of hospitalization for patients older than 65 years and is the most frequent diagnosis associated with 30-day hospital readmission in the United States.

METHODS—A secondary data analysis was conducted using nurse staffing data from 661 cardiology and heart surgery hospitals from the 2013 *US News & World Report* “Best Hospitals” survey. These data were combined with excess readmission ratios from the Centers for Medicare & Medicaid Services Hospital Compare database from 2013. An independent-samples *t* test was used to compare staffing (low/high) and excess hospital readmissions rates.

RESULTS—A significant difference ($P = .021$) was found between the low nurse staffing group ($n = 358$) and the high nurse staffing group ($n = 303$). Hospitals with a lower nurse staffing index had a significantly higher excess readmission rate.

CONCLUSION—These data provide further support to the body of research showing a positive relationship between nurse staffing and positive outcomes.

More than 1 million adults in the United States are hospitalized for heart failure (HF) each year, and 27% of these patients are readmitted within 30 days of hospital discharge.¹ In the United States, HF is the most common cause of hospitalization for patients older than 65 years, resulting in 6.5 million hospital days each year, and is the most frequent diagnosis associated with 30-day hospital readmission.^{2,3} In addition, the readmission costs for HF account for more than \$17 billion in Medicare dollars annually, elevating this issue to a national priority.¹

Cost-effectiveness is increasingly important in today’s healthcare environment as administrators and clinicians continue to become more and more focused on reducing

readmission rates. The identification and implementation of strategies to improve the quality of care while simultaneously improving the utilization of diminishing healthcare resources are a high priority. Because of the high cost of hospital readmissions, prevention of 30-day readmission for patients with HF is an important metric for hospitals. Publicly available data published by the Centers for Medicare & Medicaid Services (CMS) are available that can be used by hospitals to better understand HF readmissions at a macro level.

Section 3025 of the Affordable Care Act includes the “Hospital Readmissions Reduction Program,” which reduces payments and reimbursements to hospitals with excess readmissions.⁴ In August 2013, the 1st CMS penalties were leveraged against more than 2000 US hospitals spanning 49 states, with 18 hospitals receiving the maximum penalty. The CMS payers withheld up to 1% of regular reimbursements for hospitals with excess hospital readmissions within 30 days of discharge. The maximum penalty was increased to 3% in 2015.⁴ As a result, hospitals must consider any and all strategies that can have a positive impact on both readmission reduction and overall cost. With the ever-increasing data connecting patient outcomes to nurse staffing, hospitals would benefit by becoming more analytical in their approach to balancing the cost of nurse staffing with avoidable direct and indirect costs of excess readmission.

Nurse Staffing and Readmissions

There is a large and ever-growing body of nursing research that supports the benefits of balanced nursing workloads and staffing as vital pieces to support optimal patient, nurse, and financial outcomes. Suboptimal nurse staffing and poor patient outcomes have been examined in various studies. One study found that the odds of readmission were 7% higher for patients with HF for each additional patient per nurse in the average nurse’s workload.⁵ Tourangeau et al⁶ studied interventions aimed at improving patient mortality rates and found that a 10% increase in nurse-reported adequacy of staffing and resources was associated with 17 fewer deaths for every 1000 discharged patients. Aiken et al⁷ found a 60% higher mortality rate in hospitals with poor staffing. Bobay et al⁸ investigated the relationship between nurse staffing and postdischarge utilization of services, which was defined in their study as both unplanned emergency department (ED) visits and readmission for HF. Researchers found that higher staffing resulted in lower postdischarge ED visits and hospital readmissions and estimated that 72 000 patients in their 4-hospital system with chronic HF could benefit from implementing higher nurse staffing. Furthermore, the decreased cost of fewer unplanned ED visits and readmissions offset the costs of increased staffing.⁸

A nurse’s primary goal is to provide safe and high-quality care to patients. Increased nurse staffing may provide more opportunity for hospital nurses to better engage in discharge activities that could prevent hospital readmissions. These activities include identifying changes in patient conditions that require interventions, delivering discharge education for both patients and families related to dietary changes and medications for disease management, and facilitating transitions to outpatient care.⁹

In too many cases, inadequate staffing levels make it difficult for nurses to provide optimal patient care, including missed care. Missed care is defined as standard nursing care that is

not completed. Data exist to support that 56% of the acute care nurse participants report patient teaching as missed care.^{10,11} While increased nurse staffing does not determine the actual delivery or competence of nursing care, it does allow for relative increases in availability for nurses to engage in all the various aspects of patient care, including preparation for hospital discharge. For patients with HF who are preparing for hospital discharge, it is certainly conceivable that missed care in the form of patient teaching could impact hospital readmission.

The purpose of this study was to better understand the relationship of nurse staffing and 30-day excess readmission ratios for HF in the top US adult cardiology and heart surgery hospitals.

Methods

This was a retrospective observational study using secondary data on cardiology and heart surgery hospitals as defined by the 2013 *US News & World Report* “Best Hospitals” survey.¹² Data from the Best Hospitals survey were combined with excess readmission ratios from the CMS Hospital Compare database from 2013. A hierarchical generalized linear model is used by CMS to create the metric of “Excess Readmission Ratio,” which is the final standard metric for comparing hospitals to one another and to the national average.⁴ All data used in these analyses were publicly available and compliant with patient privacy standards. Institutional review board review deemed this study exempt. All data were managed using Excel and SPSS version 22 (Armonk, New York).

Data Sources

The initial sample included data on 720 US cardiology and cardiac surgery hospitals as identified by the 2013 *US News & World Report* annual “Best Hospitals” survey.¹² *US News & World Report* began publishing hospital rankings in 1990 to identify the best medical centers for a variety of patients in 16 specialty areas, including cardiology and heart surgery. These rankings, originally named “America’s Best Hospitals,” are now known simply as “Best Hospitals.” In order to be considered as a cardiology and heart surgery hospital by the *US News & World Report* 2013 survey, hospitals had to treat a minimum of 1335 in-patients in each of the years 2009, 2010, and 2011. This report has been published annually since 1990 and uses an extensive combination of quality and reputation variables to calculate an overall score used to rank each hospital included in the survey.¹²

The source data used for the nurse staffing index by 2013 *US News & World Report* is the 2012 American Hospital Association survey of all US hospitals. The nurse staffing index is a hospital-level measure that includes both inpatient and outpatient nursing. The numerator is the total number of RNs expressed as full-time equivalents, and the denominator is the adjusted average daily patient census.¹² The nurse staffing index estimates the total amount of care for both inpatients and outpatients by reflecting the number of days of inpatient care with the estimated volume of outpatient services.¹²

The criteria used by CMS for readmission data are patients 65 years or older enrolled in Medicare for the entire 12 months prior to a hospital admission and 30 days after the

original admission. CMS readmission measures do not include patients transferring to another hospital or patients leaving the hospital against medical advice. The CMS 30-day readmissions metric is calculated to include risk adjustments based on patient characteristics such as patient's age, gender, medical history, and various comorbidities that may make readmission more likely.⁴

Statistical modeling techniques implemented by the CMS are used for calculating expected readmission rates for individual hospitals, and details are available on the Hospital Compare Web site. Hospital Compare is a quality initiative from the CMS, with the main purpose being to help patients better understand, assess, and compare the various aspects of quality between hospitals. Numerous quality measures are available on Hospital Compare, and in 2013, they began public reporting of readmission rates for HF.

Data for the 720 cardiology and heart surgery hospitals included in the 2013 *US News & World Report* Best Hospitals survey were matched with data from the CMS Hospital Compare database in December 2013. There were no missing data on nurse staffing index ($N = 720$), but hospital excess readmission ratios for 59 hospitals were missing from the CMS Hospital Compare database. These 59 hospitals were subsequently excluded from analysis, leaving a final sample of 661.

Statistical Analysis

The nurse staffing index was used to convert the 661 hospitals into 2 groups by using the median staffing index of 1.5 as the cutoff value. The low nurse staffing index group ($n = 358$) included any hospital with a staffing index less than or equal to 1.5 nurses per patient. The high nurse staffing index group ($n = 358$) included any hospital with a staffing index of more than 1.5 nurses per patient.

An independent-samples *t* test was used to determine if the mean excess readmission rate for HF was significantly different between the low and high nurse staffing groups. Levene test indicated that the variances across the 2 groups were equal ($P = .580$); thus the significance value for equal variance was used.

Results

This sample represented a wide variety of US hospitals in both size and geographic location. A significant ($P = .021$) difference was found between the 2 groups in the excess readmission ratio, with the low nurse staffing index group ($n = 358$) having a higher excess readmission ratio than the high nurse staffing index group. The mean excess readmission ratio for the low nurse staffing group was 0.992, with an SD of 0.09. The mean excess readmission ratio for the high nurse staffing group was lower at 0.976, with an SD of 0.09. These results are displayed in Table 1. Thus, the data support that hospitals with lower nurse staffing had a significantly higher excess readmission rate for patients with HF than hospitals with higher nurse staffing.

Discussion

The nurse staffing index data provided by the *US News & World Report* survey reflect a global index of the staffing for each hospital. It does not necessarily reflect any individual differences in the nursing staff who are specifically involved in either the inpatient or outpatient care of patients with HF. Nevertheless, it is reasonable to presume that in general hospitals with better staffing overall would be more likely to have better staffing in the clinical areas that care for patients with HF. While the discrete processes of nursing care cannot be determined from staffing ratios alone, the opportunities for care can likely be approximated, which was a basic assumption for this study.

Readmission rates are also influenced by other factors such as hospital size, location, severity of illness, and case mix. Because this study was conducted using secondary analysis, we did not have access to these types of data. However, the regression models used by the CMS to calculate the expected readmission rates for each individual hospital do include risk adjustments based on patient characteristics such as age, gender, medical history, and various comorbidities that may make readmission more likely. Thus, even though we did not have visibility to these variables for our study, they were inherently included in the expected HF readmission rates that were used in our study.

Numerous studies support the notion that improved nurse staffing is linked to improved patient outcomes, and the results of this study provide further support. One of the unique contributions of our secondary analysis is the way we combined 2 publicly available data sources in order to obtain the variables of interest for our study. Readmission for HF is an important quality, clinical, and economic issue. With the transparency now provided by public reporting, as well as the economic realities associated with reduced reimbursement for hospitals who are faced with high excess readmission rates, the use of existing empiric data that can help hospitals balance quality and cost is important. Our study provides an example of how to generate new knowledge from existing data.¹³

While the underlying reasons that improved nurse staffing is consistently linked to improved patient outcomes are an area of ongoing research, numerous factors might be considered. Improved nurse staffing can provide patients with added surveillance, thus allowing nurses to spend more time providing direct patient care and preparing patients for discharge.^{14,15} Nursing-driven care specific to HF discharge planning includes a significant amount of patient teaching, along with enhanced admission assessment, patient- and family-centered handoff communication, and post-acute care follow-up interventions.¹ Given this, it is conceivable that low nurse staffing could have a negative influence on the preparation for discharge and potentially increase the risk for unplanned readmission in patients with HF.

Conclusion

Research widely supports a relationship between higher nurse staffing and improved patient outcomes. Our analysis tested this assumption using the nurse staffing measure of nursing index and 30-day readmission rates for patients with HF in 661 of the top-rated cardiac care hospitals in the United States. The findings support that hospitals with higher nurse staffing

had a lower excess readmission rate than hospitals with lower nurse staffing, despite the inclusion of out-patient nursing care in the nurse staffing index. Thus, these data provide further support to the large body of research that demonstrates a positive relationship between higher nurse staffing and measureable improvements in patient outcomes.

In order to apply these findings to practice, more work needs to be done on improving our understanding of the economic balance of increased investments in nurse staffing with the associated cost reductions from decreased hospital readmissions. Future research should include the generation of new knowledge regarding the specific risks for readmission, potential strategies to mitigate those risks, and what nursing activities are the most important for preventing readmission.

Acknowledgments

The authors thank the following nurses for their assistance with the database construction for this project: Amanda Bedding, RN; Maddie Hans, RN; Adam Sanfilippo, RN; and Kaylee Thibodeau, RN.

References

1. Hines PA, Yu K, Randall M. Preventing heart failure readmissions: is your organization prepared? *Nurs Econ.* 2010; 28(2):74–85. [PubMed: 20446378]
2. Hunt SA, Abraham WT, Chin MH, et al. 2009 focused update incorporated into the ACC/AHA 2005 guidelines for the diagnosis and management of heart failure in adults a report of the American College of Cardiology Foundation/American Heart Association task force on practice guidelines developed in collaboration with the international society for heart and lung transplantation. *J Am Coll Cardiol.* 2009; 53(15):e1–e90. [PubMed: 19358937]
3. Dharmarajan K, Hsieh AF, Lin Z, et al. Diagnoses and timing of 30-day readmissions after hospitalization for heart failure, acute myocardial infarction, or pneumonia. *JAMA.* 2013; 309(4): 355–363. [PubMed: 23340637]
4. CMS. Medicare Readmissions Reduction Program. Centers for Medicare and Medicaid; 2013. Web site <http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html> [Accessed January 21, 2015]
5. McHugh MD, Ma C. Hospital nursing and 30-day readmissions among medicare patients with heart failure, acute myocardial infarction, and pneumonia. *Med Care.* 2013; 51(1):52–59. [PubMed: 23151591]
6. Tourangeau AE, Doran DM, McGillis Hall L, et al. Impact of hospital nursing care on 30-day mortality for acute medical patients. *J Adv Nurs.* 2007; 57(1):32–44. [PubMed: 17184372]
7. Aiken LH, Clarke SP, Sloane DM, Lake ET, Cheney T. Effects of hospital care environment on patient mortality and nurse outcomes. *J Nurs Adm.* 2008; 38(5):223–229. [PubMed: 18469615]
8. Bobay KL, Yakusheva O, Weiss ME. Outcomes and cost analysis of the impact of unit-level nurse staffing on post-discharge utilization. *Nurs Econ.* 2011; (2):69–78. 87. [PubMed: 21667673]
9. Tubbs-Cooley HL, Cimiotti JP, Silber JH, Sloane DM, Aiken LH. An observational study of nurse staffing ratios and hospital readmission among children admitted for common conditions. *BMJ Qual Saf.* 2013; 22(9):735–742.
10. Kalisch BJ, Landstrom G, Williams RA. Missed nursing care: errors of omission. *Nurs Outlook.* 2009; 57(1):3–9. [PubMed: 19150261]
11. Kalisch BJ, Tschannen D, Lee H, Friese CR. Hospital variation in missed nursing care. *Am J Med Qual.* 2011; 26(4):291–299. [PubMed: 21642601]
12. Olmsted MG, Murphy J, Geisen E, et al. Methodology: U.S. News & World Report Best Hospitals 2013–14. *US News & World Report.* Jul 12.2013

13. Magee T, Lee SM, Giuliano KK, Munro B. Generating new knowledge from existing data: the use of large data sets for nursing research. *Nurs Res.* 2006; 55(2 suppl):S50–S56. [PubMed: 16601635]
14. Zhu XW, You LM, Zheng J, et al. Nurse staffing levels make a difference on patient outcomes: a multisite study in Chinese hospitals. *J Nurs Scholarsh.* 2012; 44(3):266–273. [PubMed: 22732012]
15. Henneman EA, Gawlinski A, Giuliano KK. Surveillance: a strategy for improving patient safety in acute and critical care units. *Crit Care Nurse.* 2012; 32(2):e9–e18. [PubMed: 22467622]

Table 1

Comparison of Nurse Staffing and Excess Readmission Ratio Using Independent t test

RN Staffing Index	n	Excess Readmission Ratio,^a Mean (SD)	P
Low nurse staffing index: 0–1.5	358	0.992 (0.09)	.02
High nurse staffing index: >1.5	303	0.976 (0.09)	

Nurse staffing index is defined as the total number of registered staff nurses expressed as full-time equivalents/average daily patient census.

^aThe standard metric used by the CMS for comparing hospitals to one another on hospital readmissions.