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Physician characteristics correlate with hospital readmission rates

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Abstract

Hospital readmission rates are used as a metric to measure quality patient care. While several tools predict readmissions based on patient-specific characteristics, this study assesses if physician characteristics correlate with hospital readmission rates.

In a 5-year retrospective electronic record review at a single institution, 31 internal medicine attending physicians' discharges were tracked for a total of 70 physician years, and 15,933 hospital discharges. Each physician's yearly 7-day, 8 to 30-day, and 30-day readmission rates were compared. Each rate was also correlated with years of post-graduate clinical experience, discharge volume, physician sex, and fiscal year.

Individual physicians had significantly different 7-day, 8 to 30-day, and 30-day readmission rates from each other. The rates were not related to sex, years after post-graduate training, or fiscal year. However, physician patient volume correlated with 7-day readmission rates. Physicians who discharged ≤100 patients per year had a higher 7-day readmission rate than physicians who discharged >100 patients per year. This correlation with patient volume did not hold for the 8 to 30-day and 30-day readmission rates.

Individual physicians differ in their patient readmission rates in 7-day, 8 to 30-day, and 30-day categories. A critical level of a physician's hospital activity, as reflected by the number of patient discharges per year (>100), results in lower 7-day readmission rates. Sex, post-graduate years of clinical experience, and fiscal year did not play a role. The lack of correlation between each physicians' 7-day and 8 to 30-day readmission rates suggests that different physician factors are involved in these 2 rates.

Abbreviations: HOSPITAL = score includes Hemoglobin, Oncology, Sodium, Procedure, Index admission Type, number of Admissions in past year, Length of stay >5 days, LACE+ = index score that measures: length of hospitalization, acuity of admission, comorbidities, and emergency department visits in the past 6 months +age, sex, number of prior admissions, SAS 9.4 = statements on auditing standards.

Keywords: physician hospital readmission rates, characteristics, internal medicine

1. Introduction

1.1. Background

The 7-day and 30-day readmission rates are major criteria that hospitals track for both patient quality of care as well as

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insurance reimbursement.[1] Since the Hospital Readmissions Reduction Program through the Affordable Care Act now requires the Centers for Medicare & Medicaid Services to reduce payments to hospitals with excess readmissions, reducing hospital readmission rates has gained much attention.[2]

Several models currently predict patient readmission rates.[3] Two validated tools that incorporate patient and clinical characteristics as predictive measures of readmissions are: 1. length of hospitalization, acuity of admission, comorbidities, and emergency department visits in the past 6 months + age, sex, number of prior admissions (LACE+) index score and 2. hemoglobin, oncology, sodium, procedure, index admission type, number of admissions in past year, length of stay >5 days (HOSPITAL) index score.[4–6] Several other independent studies evaluated admissions based on specific disease states or surgeries such as heart failure, sepsis, chronic obstructive lung disease, heart valve surgery, and spine surgery.[7–11] However, relatively few studies have assessed whether or not traits of the physicians caring for the patients influence readmission rates as well. The current study attempts to address this literature gap.

Several studies have analyzed physician seniority and patient outcomes, specifically in the Emergency Department. For example, a research team found that senior emergency medicine physicians had the lowest mortality and fewest 72-hour patient returns compared with younger physicians.[12] Input from senior emergency medicine physicians regarding patient care resulted in more accurate patient dispositions and improved outcomes compared with the plans created by junior physicians.[13,14] Senior emergency medicine physicians also have improved

survival rates of their trauma patients.[15] These data suggest that emergency medicine physicians with more clinical experience can provide better quality patient care than their younger counterparts.

However, while the research consensus in the Emergency Department shows that experience matters, the research on general medicine inpatient services is conflicting. Some studies have shown that older internal medicine physicians have worse patient outcomes[16] especially in elderly patients.[17] In contrast, another study showed no association between physician age or experience and patient outcomes on general internal medicine teaching wards.[18] Yet another study showed that senior physicians had better outcomes on general medicine procedures and less experienced providers had higher adverse patient procedural events and iatrogenic injury.[19]

Some research suggests that female physicians provide higher quality care compared with men. For example, women followed clinical guidelines and incorporated patient-centered communication more often than male physicians.[20–24] One study showed that female internists had lower mortality and readmission rates compared with male physicians.[25] Perhaps provider sex also influences readmission rates.

1.2. Objectives

Given the limited studies and conflicting conclusions in the existing literature, this study aims to assess if physician characteristics correlate with patient readmission rates on a general internal medicine hospital service. Then, if a correlation does exist, which characteristics matter? Our study focused on post-graduate clinical experience, patient discharge volume, physician sex, and fiscal year as factors that could influence readmission rates. In addition, we evaluated the correlation between 7-day and 30-day readmission rates.

2. Methods

This study was approved by the Penn State Health Hershey Medical Center and Penn State College of Medicine institutional review board. In a 5-year retrospective electronic query at a single academic institution, 31 internal medicine attending physicians and their hospital discharge rates were tracked for a total of 70 physician years and 15,933 hospital discharges. Each physician's yearly 7-day, 8 to 30-day, and 30-day readmission rates were calculated. Eight to 30-day readmission rates were calculated in order to negate the effect of the short-term 7-day readmissions from the longer-term 30-day readmissions. Independent variables included years of post-graduate clinical experience, patient discharge volume, physician sex, and fiscal year.

We included fiscal year to account for any influence from annual care coordination, scheduling, or administrative changes. With nearly 16,000 discharges over 5 years, all from the same internal medicine ward at a single institution, any variation in patient characteristics would have equilibrated over the course of time and volume.

Other factors that we considered, but were unable to obtain, were individual physician's patient satisfaction scores, especially ratings on communication skills and patient satisfaction with timing of discharge. Another factor that we considered was each physician's length of hospital stay, but with the frequent shift changes we found those results fairly inaccurate.

3. Statistical methods

All variables were summarized prior to analysis using frequencies and percentages or means, medians, and standard deviations. Distributions of continuous variables such as the 7-day, 8 to 30-day, and 30-day readmission rates were assessed using histograms and normal probability plots. Because the data were comprised of repeated measures for multiple fiscal years per hospitalist physician (range 1–5 fiscal years), a linear mixed effects model that accounted for the correlation between observations made on the same physician was employed to make comparisons of mean 7-day, 8 to 30-day, and 30-day readmission rates in terms of several independent variables including post-graduate clinical experience, patient discharge volume, physician sex, and fiscal year. Years of post-graduate clinical experience was measured as a continuous variable and by category: 1 year, 2 years, 3 to 4 years, 5 to 10 years, and >10 years after residency graduation. Tukey method of adjusting for multiple comparisons was applied to any comparisons that involved >2 groups for the independent variable. The 7-day rate and 8 to 30-day rate were also used as predictors of 30-day rate in a similar repeated measures model. All analyses were performed using SAS 9.4 (SAS Institute, Cary, NC).

4. Results

Of the 31 hospitalist physicians, 14 were women and 17 were men with a total of 15,933 hospital discharges over a 5-year period. Years of post-graduate education ranged from 0 to 30 years with a mean of 6.6 ± 7.8 years (Fig. 1).

Yearly discharges ranged from 15 to 404 patients with a mean of 227 ± 95 discharges. There were 70 physician years, the majority of physicians (30) 42% discharged between 201 and 300 patients in a year, followed by (16) 23% discharging 301 to 400 patients, (15) 21% discharging 101 to 200 patients, and (8) 11% discharging <100 patients (Fig. 2).

Significant differences in mean readmission rates were found between physicians for all time periods: 7-day readmission rate ($P = .009$), 8 to 30-day readmission rate ($P = .011$), and 30-day
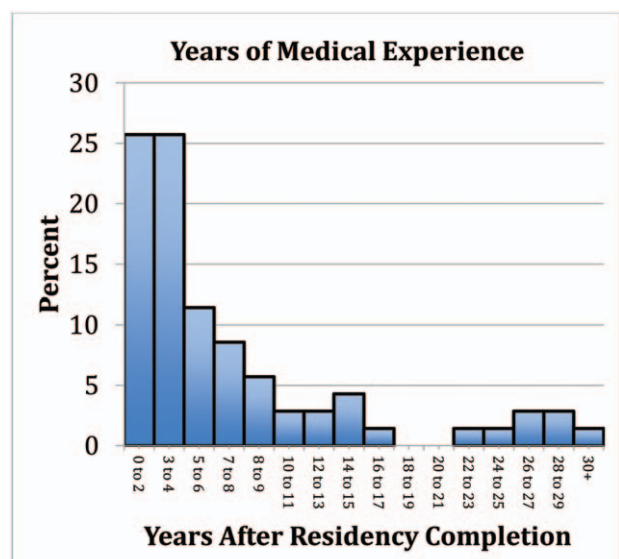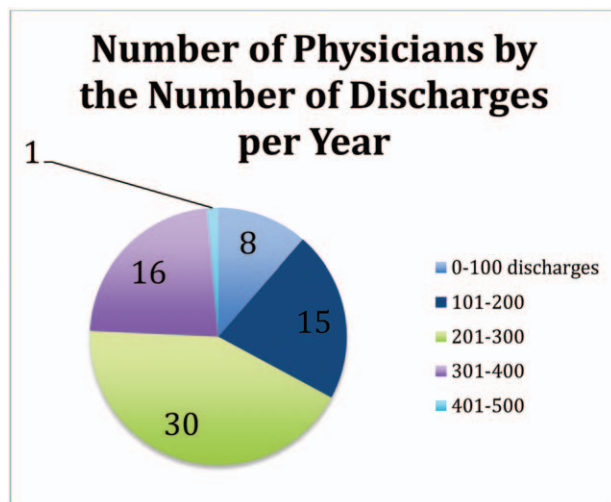
Figure 1. Physicians' years since graduate education.

Figure 2. Quantification of Physician Discharges.

Discharges per year	Mean 7-day Readmission rate	P-value
≤100	8.24 (6.76, 9.71)	–
101–200	5.75 (4.67, 6.84)	.047
201–300	5.83 (5.06, 6.61)	.033
≥300	5.49 (4.47, 6.51)	.024

readmission rate ($P = .002$). Physicians' 7-day readmission rates correlated with their 30-day readmission rates ($P < .001$). For every 1% increase in 7-day readmission rate, there is a 1.24% increase in 30-day readmission rate. However, the 7-day readmission rate did not correlate with the 8 to 30-day readmission rate ($P = .155$). Readmission rates did not correlate with fiscal year, sex, or years of post-graduate clinical experience (Table 1).

There was a significant difference in the mean 7-day readmission rate according to the volume of patients doctors discharge each year. The physicians who discharged ≤100 patients in a year had a significantly higher mean 7-day readmission rate, 8.24% compared with those who discharged 101 to 200 ($P = .047$), 201 to 300 ($P = .033$), or ≥301 ($P = .024$). The volume of patients was not a significant factor in the 8 to 30-day and 30-day readmission rates (Table 2).

5. Discussion

With nearly 16,000 discharges over 5 years, at a single rural institution, the patient mix and degree of illness were similar for all doctors. Comparing discharges per fiscal year enabled us to control for changes in care coordination that affected each physician. Yearly changes were made to care coordination and social service support. Changes included increasing the number of care coordinators, adding structured care coordination rounds, adding afternoon rounds to morning rounds, and restructuring to team based care coordinators. However, there were no differences in 7-day, 8 to 30-day, or 30-day readmission rates between the different fiscal years, suggesting that the

	Mean	Min	Max	P-value
7-day readmission rate	6.0 ± 2.1%	2.9	10.0	.009
8–30-day readmission rate	10.5 ± 2.8%	3.3	15.3	.011
30-day readmission rate	16.6 ± 3.0%	7.7	21.7	.002

changes implemented in care coordination did not reduce readmission rates.

When individual physician's readmission rates were compared with each of the other physician's, there were significant differences found between physicians. Significant differences were seen between physicians in all categories: 7-day, 8 to 30-day, and 30-day readmission rates. These differences indicate that individual physician characteristics play a role in hospital readmissions. Unlike the few studies that looked at age and sex, we did not find that years of post-graduate education nor sex contributed to the differences in physician readmission rates. Our physicians were fairly evenly split between man and woman, however, as in most hospitals the majority of our hospitalists were recent resident graduates. Fifty percent of our physicians were in practice <5 years post-graduation and <10% were practicing for >20 years post-graduation. The sample size of physicians may need to be increased with a larger range in post residency years to see an effect.

The piece of data that was statistically significant was physician patient discharge volume. According to the results, there is a threshold or critical number of patients a physician needs to discharge a year—greater than 100 patient annual discharges—in order to significantly lower their 7-day readmission rate. The likely explanation behind this finding is that being a hospitalist is a skillset, and as with any skill, maintaining proficiency requires a certain level of practice. The physicians who discharged <100 patients per year had other academic positions in administrative, research, education, or outpatient work.

The 8 to 30-day and 30-day readmission rates followed a similar trend that more discharges resulted in less readmission rates, but the trend was not statistically significant. Likely, the issues that result in 8 to 30-day or 30-day readmissions are different than the problems leading to a 7-day readmission. For example, a study postulated that readmissions after the 7-day mark are likely community or household related factors which are not related to the hospitalization.[26] In contrast, issues resulting in a 7-day readmission are likely linked to the recent hospitalization, for example, an improperly completed discharge medication reconciliation or discharging a patient prematurely, before appropriately treating their condition. However, individual physicians also had significantly different 8 to 30-day readmission rates, which suggest that certain undefined physician characteristics also influence this later rate. The physician characteristics that influence the longer 8 to 30-day readmissions may be different than the characteristics that influence the more acute 7-day readmissions.

Limitations to the study include the limited number of physician characteristics currently studied. While we analyzed 3 physician traits, there are possibly dozens of other traits that may also be implicated in patient readmissions. Future work should examine an expanded set of traits. Future studies should

also include collaboration across multiple academic institutions, but in so doing, patient and institutional variability will need to be accounted for. Ultimately, identifying and maximizing the positive physician traits that influence and lower patient readmissions should improve quality of patient care.

6. Conclusion

Individual physicians have significantly different 7-day, 8 to 30-day, and 30-day patient readmission rates. A critical level of hospital activity, as reflected by the number of patient discharges per year (>100), results in lower 7-day readmission rates. Sex, post-graduate years of clinical experience, and fiscal year did not play a role. The lack of correlation between physicians' 7-day and 8 to 30-day readmission rates suggests that different factors are involved in these 2 rates.

Author contributions

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