Original Article

Association Between Prescription Drug Benefit and Hospital Readmission Rates

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Abstract

Purpose: To determine whether primary care medicine clinic (PCMC) patients with a prescription drug benefit were associated with a lower rate of hospital readmissions.

Methods: This study was a retrospective, single-center, cohort study of PCMC patients who had at least 1 hospital readmission in 2011. Eligible patients were divided into 2 groups: patients without prescription drug benefits and patients with prescription drug benefits.

Results: Three hundred fifty-two patients met our inclusion criteria. The number of hospital readmissions for patients with a prescription drug benefit was higher than those with no prescription drug benefit (2.453 ± 2.49 vs 1.88 ± 1.91 ; $P = .052$). The length of index admission and the length of hospital readmission in days were higher in patients with no prescription drug benefits (index admission, 5.29 ± 6.38 vs 4.59 ± 4.50 ; $P = .428$) (readmission, 5.31 ± 5.90 vs 4.48 ± 4.33 , $P = .166$). The number of days to readmission was higher in those with drug benefits (58.12 ± 63.54 vs 53.39 ± 53.47 ; $P = .316$). When patient data were separated by CCI scores, it was noted that patients with pharmacy benefits had significantly more hospital readmissions in each CCI score category except for patients with a CCI of 6.

Conclusion: Although not statistically significant, patients with prescription drug benefits had more hospital readmissions but shorter hospital lengths of stay. Significant data linking hospital readmissions and prescription insurance benefits, if found in future studies, would provide helpful guidance to health care systems.

Key Words—hospital readmission, prescription drug benefit

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Readmissions, or hospitalizations that occur shortly after a previous hospital discharge, are extremely costly to the US health care system and are increasingly recognized as a marker of quality patient care. Approximately 90% of readmissions within 30 days appear to be unplanned and are the result of clinical deterioration.¹ It is also estimated that approximately 75% of readmissions are preventable.¹ Readmissions result in decreased reimbursement rates from Medicare for diagnoses of heart failure, myocardial infarction, and pneumonia.² Identifying patients who are at a higher risk for

readmissions overall is important to all members of the health care team. Previous studies have reported several reasons for common readmissions. Readmissions can be caused by deterioration in a patient's health after discharge due to inadequate management of their condition, a misunderstanding of how to manage it, or a lack of access to appropriate services.^{1–6} Another key step in the process to reduce readmissions is ensuring a safe and timely transition between settings. Coordinated transitions of care in an increasingly specialized health care environment have been shown to reduce readmission rates.⁷

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Studies have shown that hospital readmissions can be reduced not only by improving care in the hospital, but also by improving primary care services.⁸ Simple, low-cost interventions by primary care practices, such as education of patients about their conditions or how to use their medications correctly, have been shown to reduce hospitalizations and readmissions among patients with chronic disease states.⁸ A crucial element to preventative care is the accessibility of medications that have been proven to reduce morbidity and mortality.

Many types of prescription insurance plans help patients afford their medications. Prescription insurance plans can be employment based, direct purchase based, or government funded (Medicare, Medicaid, military). Despite these options, many patients are without health or prescription insurance.⁹ A lack of insurance can hinder patients from receiving necessary medications and preventive care, which may lead to an increase in hospital readmissions. To our knowledge, no studies have focused on whether prescription drug benefits influence hospital readmission rates.

The objective of our retrospective electronic record review was to determine whether primary care medicine clinic (PCMC) patients with a prescription drug benefit were associated with a lower rate of hospital readmissions during 2011 compared to PCMC patients who did not have prescription insurance.

METHODS

Setting

This retrospective, cohort study was conducted at the PCMC in the Barnes-Jewish Hospital Center for Outpatient Health. Barnes-Jewish Hospital is located in the center of St. Louis city and is the largest hospital in Missouri with 1,100 licensed beds. The PCMC provides approximately 2,500 patient visits per month. All medical care provided at PCMC is under the supervision of Washington University School of Medicine faculty, most of whom are on the medical staff of Barnes-Jewish Hospital. Professional personnel in nursing, diagnostic laboratories, social services, pharmacy, radiology, and nutrition are also active members of the health care team. PCMC currently has 5 residency-trained clinical pharmacists (clinical pharmacy team) who are responsible for drug information, consult, patient/staff education, and precepting pharmacy students and residents.

Patients of PCMC are eligible to receive 340B medication pricing at the hospital's retail pharmacy.

Study Design

This was a retrospective, single-center, cohort study. Patients included in the study were 18 years or older at the time of index admission, saw a PCMC physician at least 1 time during the year 2011, and were admitted and discharged more than 1 time to Barnes-Jewish Hospital during the year 2011. Patients were excluded if their hospital readmission was planned or if there was evidence of death in the study period. Hospital encounters for day surgery, transfusions, dialysis, or other ambulatory services were excluded. Patients admitted and discharged on the same day, patients whose admission data lacked a diagnosis, patients transferred to other hospitals, or patients receiving hospice services were also excluded. Data collected from a qualifying patient's electronic medical record included date of birth, race (defined as Caucasian, Black, Hispanic, Asian, or other), sex, hospital admission dates, hospital discharge dates, and medical insurance benefit (defined as Medicare only, Medicare and Medicaid, Medicaid, private, or no insurance). Charlson Comorbidity Index (CCI) scores, Deyo et al version, were calculated based on primary and secondary ICD-9 diagnosis codes from index admissions.¹⁰

Initially, a report containing 9,892 patients who were admitted more than 1 time to our hospital in 2011 was received. Due to difficulty obtaining a generated list of patient prescription drug benefits or PCMC visit dates, the clinical pharmacy team assigned a number to each patient and randomly performed 2,362 chart reviews in both the electronic medical record and the outpatient pharmacy system to verify patient eligibility. Current prescription drug benefit status was obtained by accessing admission billing documents. Chart reviews continued until 400 PCMC patients were identified; however, 48 patients were later excluded due to admission time lasting less than 24 hours. Eligible patients were then divided into 2 groups: patients without prescription drug benefits and patients with prescription drug benefits (Figure 1).

The primary outcome was the number of hospital admissions within 1 year following a previous hospital discharge. Secondary outcomes included length of index admission, length of hospital readmission, number of days to readmission, and patient 30-, 60-, and 90-day readmission rates.

Figure 1. Association between prescription drug benefit and hospital readmission rates. PCMC = primary care medicine clinic; Rx = prescription.

Statistical Analysis

Our primary and most of the secondary endpoints were analyzed using a Student *t* test. Patient 30-, 60-, and 90-day readmission rates were analyzed using McNemar's chi-square test or Fisher's exact test as appropriate. All tests were 2-tailed, and *P* values <.05 were considered statistically significant.

RESULTS

Patient Characteristics

A total of 352 patients met the study inclusion criteria. The majority were African American females. The mean age of patients was 56.5 years (Table 1). When further separating patients into the 2 groups of those with or without prescription drug benefits, it was noted that more men did not have a prescription drug benefits. To account for baseline comorbid conditions for each patient, a CCI score was calculated based on index admission data.¹⁰ Higher CCI scores indicate a greater comorbidity burden, and higher scores have been linked to higher readmission rates.¹¹ It was noted that study patients with a pharmacy benefit group had a higher CCI score (Table 2).

Table 1. Patient characteristics (*N* = 352)

Mean age $\pm$ SD, years	56.5 $\pm$ 14.92
Gender, <i>n</i> (%)	
Male	133 (37.78)
Female	219 (62.22)
Race, <i>n</i> (%)	
White, non-Hispanic	78 (22.16)
Black, non-Hispanic	255 (72.44)
Asian	4 (1.14)
Other	4 (1.14)
Unknown	11 (3.13)
Charlson Comorbidity Index score (%)	0/1 (17)
	2/3 (18)
	4/5 (19)
	6+ (46)

Table 2. Baseline characteristics per group

Characteristic	Pharmacy benefit group (<i>n</i> = 295)	No pharmacy benefit group (<i>n</i> = 57)
Mean age $\pm$ SD, years	57.5 $\pm$ 14.34	51.6 $\pm$ 16.8
Race (%)		
White, non-Hispanic	59 (20)	19 (33.3)
Black, non-Hispanic	218 (73.9)	37 (64.9)
Asian	4 (1.3)	0
Other	4 (1.3)	0
Unknown	10 (3.5)	1(1.8)
Male, <i>n</i> (%)	99 (33.5)	34 (59.6)
Mean ($\pm$ SD) CCI score	5.76 $\pm$ 3.59	3.66 $\pm$ 3.42

Note: CCI = Charlson Comorbidity Index (Deyo et al version).

Readmissions and Benefits

The number of hospital readmissions for patients with a prescription drug benefit was higher in comparison to those with no prescription drug benefit (2.453 ± 2.49 vs 1.88 ± 1.91 ; $P = .052$) (Table 3). The length of index admission and the length of hospital readmission in days were higher in those with no prescription drug benefits (index, 5.29 ± 6.38 vs 4.59 ± 4.50 ; $P = .428$) (readmission, 5.31 ± 5.90 vs 4.48 ± 4.33 ; $P = .166$). The number of days to readmission was higher in those with a prescription drug benefit (58.12 ± 63.54 vs 53.39 ± 53.47 ; $P = .316$). When looking at readmission rates, those with a prescription drug benefit had higher 30- and 90-day readmission rates (Table 3).

We further separated our data to more closely analyze patients with the same CCI scores to help minimize confounding comorbid conditions. It was noted that patients with pharmacy benefits had significantly more hospital readmissions in each CCI score category, except for patients with a CCI score of 6. Patients with a pharmacy benefit and a CCI score of 2 or 3 had significantly longer lengths of index admissions (4.82 ± 4.28 vs 2.56 ± 2.14 ; $P = .009$) and lengths of hospital readmissions (4.19 ± 4.17 vs 2.35 ± 1.63 ; $P = .001$). Although not statistically significant, it was noted that patients without pharmacy benefits and a CCI score of 6 or more had a fewer number of days until readmission (41.74 ± 44.28 vs 53.40 ± 60.21 ; $P = .063$) (Table 4).

DISCUSSION

Hospital readmissions are costly and can increase burdens to patients and health care systems. Finding possible trends in preventable readmissions may be a

way to target select patients who are at an increased risk of readmissions. The overall findings of this study indicate that patients with prescription drug benefits had more hospital readmissions, but they tended to have a shorter hospital length of stay. When comparing groups with similar baseline comorbid conditions and eliminating outliers, we found that patients with a CCI score of 6 or more had the same number of hospital admissions in both groups. This overall trend may be attributed to a lower perceived cost of care to those with benefits, or it may be possible that having a benefit plan may lead to higher health care utilization overall, including hospitalizations. Perhaps individuals without prescription benefits delay care due to financial reasons and in turn present to the hospital later and more acutely ill than those with benefits. A delay in care can lead to disease state progression and can explain the longer length of hospital stay seen in patients without prescription drug benefits.

It is important to explore whether the lack of prescription benefits is preventable. Prescription benefits are typically included as part of a larger medical benefit package; therefore, increasing the public's access to affordable medical insurance would theoretically increase access to prescription benefits. However, many patients currently covered by a medical plan are unable to afford additional monthly premiums and deductibles for prescription benefits and may elect not to choose the prescription benefits. For example, in 2010, the Centers for Medicare and Medicaid Services estimated that 10% of the Medicare population, almost 5 million patients, did not have Medicare Part D coverage even though they were eligible to select a plan.¹² This may be because the patients are unaware of their eligibility

Table 3. Comparison of outcomes of primary care medicine clinic patients in 2011: Pharmacy benefit vs no pharmacy benefit

Variable	Pharmacy benefit group (<i>n</i> = 295)	No pharmacy benefit group (<i>n</i> = 57)	<i>P</i> ^a
No. of hospital readmissions	2.453 ± 2.49	1.88 ± 1.91	.052
Length of index admission, days	4.59 ± 4.50	5.29 ± 6.38	.428
Length of hospital readmission, days	4.48 ± 4.33	5.31 ± 5.90	.166
No. of days to readmission	58.12 ± 63.54	53.39 ± 53.47	.316
30 day readmission rate, %	32.3	30.01	.5286
60 day readmission rate, %	13.9	14.7	.8074
90 day readmission rate, %	9.0	6.7	.4530

Note: Values are given as mean ± SD or percent. ^aAll *P* values < .05 were considered statistically significant using the *t* test for continuous variables and chi-square for categorical values.

Table 4. Comparison of outcomes of primary care medicine clinic patients in 2011 per Charlson Comorbidity Index score: Pharmacy benefit vs no pharmacy benefit

Variable	Pharmacy benefit group (<i>n</i> = 295)	No pharmacy benefit group (<i>n</i> = 57)	<i>P</i> ^a
No. of hospital readmissions			
0-1	2.33 ± 2.36	1.46 ± 0.85	.034*
2-3	2.14 ± 1.92	1.31 ± 0.63	.008*
4-5	2.373 ± 2.07	1.44 ± 0.72	.013*
6+	2.79 ± 2.91	3.37 ± 4.47 ^b	.590
Length of index admission, days			
0-1	4.79 ± 5.15	5.36 ± 5.25	.66
2-3	4.82 ± 4.28	2.56 ± 2.14	.009*
4-5	3.61 ± 5.31	6.24 ± 10.9	.496
6+	4.14 ± 3.89	4.00 ± 5.47	.916
Length of hospital readmission, days			
0-1	3.88 ± 3.89	4.47 ± 4.34	.465
2-3	4.19 ± 4.17	2.35 ± 1.63	.001*
4-5	4.22 ± 3.71	7.12 ± 11.65	.389
6+	3.92 ± 4.50	4.69 ± 5.07	.249
No. of days to readmission			
0-1	56.27 ± 68.6	40.79 ± 40.07	.106
2-3	55.62 ± 59.71	67.29 ± 64.31	.475
4-5	58.29 ± 60.24	89.42 ± 86.85	.227
6+	53.40 ± 60.21	41.74 ± 44.28	.063

Note: Values given as mean ± SD.

^a All *P* values < .05 were considered statistically significant using the *t* test for continuous variables and chi-square for categorical values.

^bWhen removing 1 outlying patient with 21 re-admissions, results = 2.79 ± 1.38.

for prescription benefits or because they would incur additional monthly expenses simply to have the coverage. The only avenues to prevent this phenomenon would be to increase education for patients regarding their eligibility and ability to partake in programs such as the Social Security “Extra Help” subsidy program and to keep premiums and deductibles for those not eligible for subsidies as low as possible.

Limitations

The findings of this study are promising; however, there were several limitations. Our sample size was small, especially in our uninsured population. Admissions to other hospitals were also not known, meaning that the actual readmission rates of the patients

in our study could have been higher than what was determined in our single-center study. Also, our study duration may not have been sufficient to capture the time needed for medication therapies to reach maximum effectiveness.

Medicare does not currently penalize institutions for observation admissions. Patients who were admitted under observation status only and stayed less than 1 full day were excluded from this study. Although observation admissions are not penalized, they still strain our health care system and may serve as an important endpoint for future studies.

Because we were unable to determine the prescription drug coverage status for all of our patients in 2011, some patients were assumed to have the same coverage in 2011 as they had in 2012. Prescription coverage can change frequently, as seen in several patients who had varying coverage types within the same 1-year study period. It is therefore possible that patients who we identified as having prescription insurance in 2012 had none in 2011, and vice versa.

Prescription drug benefits vary in coverage and formulary status of medications. Medications are often prescribed based on affordability and may differ in therapeutic outcomes. Frequent changes to therapeutic regimens based on formulary coverage can be cumbersome and confusing for patients, making them less likely to sustain high adherence rates. Finally, it is important to note that prescription coverage does not ensure that patients will fill prescriptions and take medications appropriately. We did not investigate refill histories for any of the patients in our study, due to the fact that patients may utilize numerous retail and mail-order pharmacies to obtain prescriptions.

Conclusion

We found no significant association between having prescription drug benefits and hospital readmission rates overall. When accounting for similar comorbid conditions upon index admission, patients with prescription benefits tended to have more hospital readmissions. Future studies with larger sample sizes, verification of prescription refill rates, and a longer duration may provide more information regarding this link. Significant data linking hospital readmissions and prescription insurance benefits, if found in future studies, would provide helpful guidance to health care systems regarding another way to reduce readmissions by widening access to prescription medications.

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