

Scheduled and Unscheduled Hospital Readmissions Among Patients With Diabetes

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Objectives: To describe rates of scheduled and unscheduled readmissions among midlife and older patients with diabetes and to examine associated socioeconomic and clinical factors.

Study Design: Population-based data set study.

Methods: Using the 2006 California State Inpatient Dataset, we identified 124,967 patients 50 years or older with diabetes who were discharged from acute care hospitals between April and September 2006 and examined readmissions in the 3 months following their index hospitalizations.

Results: About 26.3% of patients were readmitted within the 3-month period following their index hospitalizations, 87.2% of which were unscheduled readmissions. Patients with unscheduled readmissions were more likely to have a higher comorbidity burden, be members of racial/ethnic minority groups with public insurance, and live in lower-income neighborhoods. Having a history of hospitalization in the 3 months preceding the index hospitalization was also a strong predictor of unscheduled readmissions. Almost one-fifth of unscheduled readmissions (constituting approximately 27,500 inpatient days and costing almost \$72.7 million) were potentially preventable based on definitions of Prevention Quality Indicators by the Agency for Healthcare Research and Quality. Scheduled readmissions were less likely to occur among patients 80 years or older, the uninsured, and those with an unscheduled index hospitalization.

Conclusions: The predictors of scheduled and unscheduled readmissions are different. Transition care to prevent unscheduled readmissions in acutely ill patients with diabetes may help reduce rates, improving care. Further studies are needed on potential disparities in scheduled readmissions.

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Diabetes mellitus affects about 23.6 million individuals in the United States and is the seventh leading cause of death.¹ Because of the complexity of the disease and its management, patients with diabetes are more likely to use healthcare services than the general population,¹ with a total direct medical cost of about \$116 billion and a mean cost that is 2.3 times higher than that of individuals without diabetes.^{1,2} Moreover, almost 6.3 million hospital stays in 2004 were by patients with diabetes as a principal or coexisting condition, costing almost \$57.8 billion, or about 20% of total hospital costs, while hospitalizations principally for diabetes cost about \$3.9 billion.²

Many of these hospital stays included readmissions of the same patients, and hospital readmission has been a major quality concern in diabetes care. However, there are few population-based studies on readmission among patients with diabetes and its risk factors. Jiang et al³ reported that more than 30% of older patients with diabetes were readmitted during the same year as their index hospitalization in 5 states in 1999. Readmissions accounted for 55.2% of total hospital stays, and the mean total hospital cost for patients with readmissions was 2.5 times higher than that for patients without readmissions. They also reported a high risk of readmission among racial/ethnic minority groups and variations in readmission rates by insurance type.^{4,5} Robbins et al⁶ and Robbins and Webb^{7,8} observed racial/ethnic disparities among hospital readmissions in Pennsylvania hospitals between 1994 and 2001 and noted the positive effect of public health clinics in reducing hospital readmissions among low-income patients with diabetes.

A gap in the literature on hospital readmissions among patients with diabetes has been the lack of differentiation between scheduled and unscheduled readmissions.^{3,5} Readmissions are often assumed to be unscheduled, but this may not be true, especially for patients with existing complex conditions such as diabetes. The need for attention to the type of readmission has been raised,⁹ but few studies^{6,7} have explicitly focused on unscheduled readmissions only. No study seems to have assessed what the reasons for and the factors associated with scheduled readmissions are, and whether they are similar to those associated with unscheduled readmissions.

Another gap in the literature is that studies have often focused on readmissions within 1 month of hospital discharge^{6,7,10} or on

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readmissions among Medicare patients.^{10,11} This short observation window is because hospital readmission has been widely studied in terms of its relationship to hospital performance.^{7,12} However, this may be too narrow an approach to evaluate readmission risk from the perspective of patients, for whom avoiding a later readmission is as important as avoiding an early readmission. Investigations focusing on patient risk for readmission have often used a 3-month window following hospital discharge,⁵ which we adopted.

The objectives of this study were to examine and compare the demographic, socioeconomic, and clinical factors associated with scheduled and unscheduled readmissions in midlife and older patients with diabetes using a population-based data set from California. We also examined common reasons for scheduled and unscheduled readmissions and estimated the cost and extent of potentially preventable readmissions using Prevention Quality Indicators (PQIs) of the Agency for Healthcare Research and Quality (AHRQ).¹³

METHODS

We analyzed the 2006 California State Inpatient Dataset (SID), developed as part of the Healthcare Cost and Utilization Project (HCUP) sponsored by the AHRQ.¹⁴ The publicly available California SID includes hospital discharge abstract data (such as demographic characteristics, clinical information, resource use, and payers) from short-term, nonfederal, general, and specialty hospitals. California was selected for the analysis because it has a large and ethnically/racially diverse population¹⁵ and provides in its SID an encrypted unique patient identifier (UPI) that is used to link hospital readmissions to a distinct patient. The California Office of Statewide Health Planning and Development (OSHPD)¹⁶ routinely monitors the quality of hospital inpatient data and corrects or edits the data if necessary. They also ask reporting institutions to make corrections when their reports do not meet the error tolerance level (now 2%) that the state has established.

Our sample included patients 50 years or older with diabetes as the principal or a secondary diagnosis, identified using the AHRQ's Clinical Classifications Software (CCS 45 [diabetes mellitus without complications] and CCS 50 [diabetes mellitus with complications]),¹⁷ all of whom were admitted to California hospitals at least once between April and September 2006. We defined the first admission as the index hospitalization and identified readmissions within 3 months of the

Take-Away Points

This study used a population-based data set to examine socioeconomic and clinical factors associated with scheduled and unscheduled readmissions after hospital discharge among older patients with diabetes.

- A substantial percentage (12.8%) of readmissions were scheduled at least 24 hours in advance.
- The causes and predictors of scheduled and unscheduled readmissions were distinct, suggesting that scheduled readmissions should be separated from unscheduled readmissions in studies of readmission.
- The lower likelihood of scheduled readmissions among older and uninsured patients implies less access to advanced coordinated healthcare services for these groups.

index hospitalization using the encrypted UPI. As did Jencks et al,¹⁰ we counted no more than 1 readmission for each patient and focused on the characteristics of the first readmission (ie, scheduled or unscheduled) in the analysis. Similar to the approach by Jiang et al,³ we excluded patients with a missing UPI, patients with the same UPI but with an inconsistent age (differing by >1 year) or sex, and patients with a missing admission or discharge month.

The outcome variables of this study were scheduled and unscheduled readmissions. We used the SCHED variable in the California SID,¹⁸ which refers to whether an admission is scheduled at least 24 hours in advance. Therefore, we defined unscheduled readmissions as readmissions that were not scheduled at least 24 hours in advance and scheduled readmissions as those that were scheduled at least 24 hours in advance. The SCHED variable is derived from the type of admission in the California hospital inpatient data report collected by the California OSHPD, from which the California SID is developed for the HCUP. The California OSHPD¹⁶ provides detailed guidelines for each variable in the report, including the type of admission, and conducts multistep validation checks and edits.

We examined patient sociodemographic and clinical characteristics that were potentially associated with readmission variables, representing the 3 major categories of the Behavioral Model of Health Services Use.¹⁹ This model posits that potential and realized health services use is determined by interactions among predisposing, enabling, and need characteristics of individuals and the healthcare systems in the communities where they reside. Predisposing factors are individual characteristics existing before illness that determine the likelihood of seeking care and are measured by age, sex, and race/ethnicity. Enabling factors provide the means to use health services and include individual-level and community-level factors measured by primary payer type, resident location, and neighborhood median income. The California SID does not provide the patient's exact income level, so we used as a proxy variable the median household income for the patient's zip code in 2006. Perceived health status and evaluated

health status determine the need for health services measured by comorbidities, prior hospitalization history, and variables related to index hospitalizations. The severity of conditions was measured by the number of chronic conditions in the 18 body systems using the Chronic Condition Indicator developed by the AHRQ.²⁰ We counted only 1 chronic condition per body system, as did Wolff et al,²¹ although some patients might have had more than 1.

For data analysis, we first computed unadjusted rates of scheduled and unscheduled readmissions within 3 months of the index hospitalization by patient demographic, socioeconomic, and clinical characteristics. Second, logistic regression models were developed to examine the predictors of scheduled and unscheduled hospital readmissions. The reference group for odds ratios was patients with no readmissions in the 0 to 3 months following their index hospitalizations. Third, we compared common clinical conditions between the scheduled and unscheduled readmission groups using the CCS for the *International Classification of Diseases, Ninth Revision, Clinical Modification* developed by the AHRQ.¹⁷ The CCS is a uniform and standardized coding system for aggregating more than 14,000 diagnosis codes into smaller, mutually exclusive, clinically meaningful categories. We ran a single-level CCS algorithm against our data, which categorized all the diagnoses into about 300 clinical conditions, among which we selected and compared the top 15 conditions for the scheduled and unscheduled readmission groups.

Fourth, the effects of potentially preventable unscheduled readmissions were examined using the length of stay and hospital cost. *Potentially preventable readmissions* refers to hospital readmissions for ambulatory care–sensitive conditions that should not require in-hospital treatment if better discharge planning, care coordination, and timely appropriate outpatient care are provided.^{5,22} We defined potentially preventable readmissions based on the following 8 PQIs of the AHRQ that are applicable to readmissions among older individuals²²: bacterial pneumonia, chronic obstructive pulmonary disease, dehydration, congestive heart failure, hypertension, short-term diabetic complications, uncontrolled diabetes, and urinary tract infection. Length of stay was obtained from the California SID, and hospital cost per readmission was computed by multiplying hospital charges per readmission from the California SID by the ratio of cost to charge provided by the HCUP.¹⁴ Total hospital cost for a certain PQI condition was obtained by summing hospital costs for all unscheduled readmissions for the PQI condition. The mean hospital cost was computed by dividing the total hospital cost by the total number of potentially preventable unscheduled readmissions. The grand total cost of potentially preventable unscheduled readmissions was the sum of the total hospital costs for un-

scheduled readmissions for all 8 PQI conditions observed in this study.

RESULTS

Our sample included 124,967 patients 50 years or older with diabetes who were discharged alive from California hospitals between April and September 2006. Most were aged between 65 and 79 years, female, of white race/ethnicity, and Medicare beneficiaries (Table 1). The patients had on average 3.8 chronic conditions each (data not shown); about 16.2% had a hospitalization history in the 3 months before the index hospitalization; and only about one-fifth (18.4%) of their index hospitalizations were scheduled at least 24 hours in advance. The most common reason for the index hospitalization was congestive heart failure (7.9%), followed by diabetes mellitus with complications (7.5%), coronary atherosclerosis (4.9%), and pneumonia (4.1%).

Approximately 26.3% (n = 32,857) of patients were readmitted within 0 to 3 months of their index hospitalizations, and most readmissions (87.2%) were unscheduled (Table 1). The risks for unscheduled and scheduled readmissions varied by patients' demographic, socioeconomic, and clinical characteristics. Adjusting for other factors, patients 80 years or older were slightly more likely than those aged 50 to 64 years to have an unscheduled readmission. Blacks and Hispanics were also more likely to have an unscheduled readmission than whites. Patients with public insurance had a higher risk for an unscheduled readmission than patients with private insurance. Patients residing in urban areas versus rural areas and those residing in lower-income neighborhoods versus higher-income neighborhoods had higher risks for an unscheduled readmission. The risk for an unscheduled readmission consistently increased as the number of chronic conditions that a patient had increased: patients with 7 or more chronic conditions were almost 3 times more likely to have an unscheduled readmission than those with diabetes only. An unscheduled readmission was more likely to occur among patients who had had 1 or more hospitalizations in the 3 months preceding the index hospitalization. Also, the risk for an unscheduled readmission increased when the index hospitalization was an unscheduled admission or when it ended with a transfer to another postacute or long-term institution. As length of stay rose, the likelihood of an unscheduled readmission increased.

Some factors predicting unscheduled readmissions also predicted scheduled readmissions in the same way: compared with men, women were less likely to have a scheduled readmission, but individuals with Medicare as the primary payer were more likely to have a scheduled readmission (Table 1). The number of chronic conditions and length of stay also

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Table 1. Descriptive Statistics, Readmission Rates, and Risk Factors for Unscheduled and Scheduled Readmissions

Variable	Overall (n = 124,967)	Unscheduled Readmissions (n = 28,649)		Scheduled Readmissions (n = 4208)	
	No. (%)	Rate	OR (95% CI) ^a	Rate	OR (95% CI) ^a
Age, y					
50-64	43,049 (34.4)	20.16	1.00	3.37	1.00
65-79	53,523 (42.8)	23.11	1.01 (0.97-1.05)	3.86	1.03 (0.94-1.13)
≥80	28,395 (22.7)	26.77	1.07 (1.02-1.12) ^b	2.44	0.71 (0.63-0.79) ^c
Sex					
Male	59,066 (47.3)	22.76	1.00	3.91	1.00
Female	65,901 (52.7)	23.07	0.96 (0.94-0.99) ^b	2.88	0.75 (0.70-0.80) ^c
Race/ethnicity					
White	68,447 (54.8)	21.94	1.00	3.45	1.00
Black	11,415 (9.1)	26.97	1.17 (1.11-1.23) ^c	3.50	1.11 (0.99-1.24)
Hispanic	30,874 (24.7)	23.85	1.10 (1.07-1.14) ^c	3.09	0.97 (0.90-1.05)
Other	14,231 (11.4)	22.42	1.02 (0.97-1.07)	3.46	1.07 (0.97-1.19)
Primary payer					
Medicare	81,637 (65.3)	25.05	1.39 (1.33-1.46) ^c	3.46	1.15 (1.04-1.26) ^b
Medicaid	12,786 (10.2)	27.03	1.53 (1.45-1.62) ^c	2.82	0.99 (0.87-1.13)
Private	24,895 (19.9)	15.54	1.00	3.68	1.00
Uninsured ^d	5649 (4.5)	15.47	0.99 (0.91-1.08)	1.93	0.58 (0.47-0.71) ^c
Resident location					
Rural	8647 (6.9)	19.76	1.00	3.99	1.00
Urban	116,320 (93.1)	23.16	1.16 ^c (1.09-1.22)	3.32	0.89 (0.79-1.00)
Median income of neighborhood					
High	25,499 (20.4)	21.31	1.00	3.60	1.00
Medium	63,653 (50.9)	22.66	1.03 (1.00-1.07)	3.23	0.94 (0.87-1.02)
Low	35,815 (28.7)	24.55	1.11 (1.07-1.16) ^c	3.45	1.04 (0.94-1.14)
No. of chronic conditions					
1	2036 (1.6)	10.81	1.00	1.67	1.00
2	22,479 (18.0)	15.20	1.36 (1.17-1.57) ^c	3.35	1.89 (1.33-2.68) ^c
3	32,986 (26.4)	19.00	1.68 (1.45-1.94) ^c	3.28	1.94 (1.37-2.75) ^c
4	29,553 (23.6)	24.00	2.07 (1.79-2.39) ^c	3.46	2.21 (1.56-3.13) ^c
5	20,091 (16.1)	28.05	2.36 (2.04-2.74) ^c	3.42	2.30 (1.62-3.27) ^c
6	10,902 (8.7)	32.33	2.72 (2.34-3.16) ^c	3.74	2.66 (1.86-3.81) ^c
≥7	6920 (5.5)	35.97	2.93 (2.52-3.41) ^c	3.22	2.33 (1.61-3.38) ^c
Admission history in 3 mo before index hospitalization					
Yes	20,290 (16.2)	38.75	2.17 (2.10-2.25) ^c	3.89	1.55 (1.43-1.68) ^c
No	104,677 (83.8)	19.86	1.00	3.27	1.00
Planned admission ≥24 h in advance					
Yes	22,942 (18.4)	12.90	1.00	5.72	1.00
No	102,025 (81.6)	25.18	1.72 (1.64-1.80) ^c	2.84	0.58 (0.53-0.62) ^c
Disposition destination					
Home	82,674 (66.2)	19.94	1.00	3.44	1.00
Other	42,293 (33.8)	28.77	1.28 (1.24-1.32) ^c	3.23	1.03 (0.95-1.11)
Length of stay, d					
	Mean (SD)				
	4.96 (6.41)		1.02 ^c (1.02-1.02)		1.01 ^c (1.00-1.01)

CI indicates confidence interval; OR, odds ratio.

^aThe reference group is patients without readmissions within 0 to 3 months (n = 92,110); 17 dummies for 18 clinical condition groups in the logistic model were omitted from the table because of space limitations. All statistics in the table were drawn from the index hospitalization records. The mean (SD) length of stay overall was 5.0 (6.4) days. The OR for unscheduled admissions was 1.02 (95% CI, 1.02-1.02); the OR for scheduled admissions was 1.01 (95% CI, 1.00-1.01) (P < .001 for both).

^bP < .01.

^cP < .001.

^dIncludes no charge, self-pay, and charity or indigent programs.

■ HOSPITALIZATIONS ■

Table 2. Common Clinical Conditions for Unscheduled and Scheduled Readmissions^a

Rank	Unscheduled Readmissions (n = 28,649)		Scheduled Readmissions (n = 4208)	
		No. (%)		No. (%)
1	Congestive heart failure	2507 (8.8)	Coronary atherosclerosis	479 (11.4)
2	Diabetes mellitus with complications	2067 (7.2)	Complications of device, implant, or graft	309 (7.3)
3	Septicemia	1646 (5.7)	Diabetes mellitus with complications	299 (7.1)
4	Pneumonia	1104 (3.9)	Osteoarthritis	192 (4.6)
5	Complications of device, implant, or graft	1022 (3.6)	Occlusion or stenosis of precerebral arteries	167 (4.0)
6	Complications of surgical procedures or medical care	987 (3.4)	Complications of surgical procedures or medical care	165 (3.9)
7	Acute and unspecified renal failure	967 (3.4)	Peripheral and visceral atherosclerosis	126 (3.0)
8	Urinary tract infections	920 (3.2)	Spondylosis	112 (2.7)
9	Coronary atherosclerosis	798 (2.8)	Congestive heart failure	106 (2.5)
10	Fluid and electrolyte disorders	782 (2.7)	Hyperplasia of prostate	79 (1.9)
11	Nonspecific chest pain	781 (2.7)	Biliary tract disease	79 (1.9)
12	Acute cerebrovascular disease	694 (2.4)	Heart valve disorders	79 (1.9)
13	Skin and subcutaneous tissue infections	671 (2.3)	Cardiac dysrhythmias	77 (1.8)
14	Cardiac dysrhythmias	667 (2.3)	Maintenance chemotherapy, radiation therapy	70 (1.7)
15	Acute myocardial infarction	621 (2.2)	Gangrene	65 (1.5)
Total		16,234 (56.7)		2404 (57.1)

^aClassified using Clinical Classifications Software (Rockville, MD: Agency for Healthcare Research and Quality).¹⁷

positively predicted the odds for both unscheduled and scheduled readmissions. Two other factors predicted both scheduled and unscheduled readmissions, but the directions were opposite: individuals 80 years or older versus those aged 50 to 64 years and individuals with unscheduled index hospitalizations versus scheduled index hospitalizations were more likely to have an unscheduled readmission but were less likely to have a scheduled readmission. In contrast, factors that positively predicted an unscheduled readmission but not a scheduled readmission were racial/ethnic minority group status (vs white), Medicaid as the primary payer (vs private insurance), resident location, median income of the neighborhood, and disposition destination. Uninsured status negatively predicted a scheduled readmission only compared with individuals having private insurance.

The most common 15 diagnoses for unscheduled and scheduled readmissions, covering more than 50% of all readmissions, are listed in **Table 2**. The most frequent condition among patients with an unscheduled readmission was congestive heart failure (8.8%), followed by diabetes mellitus with complications (7.2%), septicemia (5.7%), and pneumonia (3.9%). Among patients with scheduled readmissions, diabe-

tes mellitus with complications was the third most common diagnosis (7.1%), following coronary atherosclerosis (11.4%) and complications of device, implant, or graft (7.3%). Only 6 of 15 conditions (congestive heart failure, diabetes mellitus with complications, complications of surgical procedures or medical care, coronary atherosclerosis, cardiac dysrhythmias, and complications of device, implant, or graft) were common to both unscheduled and scheduled readmissions. In addition, 3 of those 6 conditions (congestive heart failure, coronary atherosclerosis, and complications of device, implant, or graft) were in very different ranks between unscheduled and scheduled readmissions.

Last, about 19.0% of unscheduled readmissions (n = 5432) were potentially preventable (**Table 3**). Among 8 conditions that can be managed in the ambulatory setting according to the AHRQ's PQI definitions, congestive heart failure, bacterial pneumonia, and urinary tract infection were the 3 most frequent among our sample of hospitalized midlife and older patients with diabetes. These potentially preventable unscheduled readmissions constituted approximately 27,500 inpatient days and cost almost \$72.7 million. Among 4208 patients with scheduled readmissions, only 140 (3.3%) were

Table 3. Prevalence of and Service Use for Potentially Preventable Unscheduled Readmissions (PPURs)

PQI	No.	PPURs per 1000 Unscheduled Readmissions ^a	Length of Stay, d		Hospital Cost, \$	
			Total for PPURs for Each PQI	Mean per PPUR ^b	Total for PPURs for Each PQI	Mean per PPUR ^c
A	B	C	D	E	F	
TAPQ01 Short-term diabetes complications	218	7.6	1002.8	4.6	2,876,880.60	13,196.70
TAPQ05 Chronic obstructive pulmonary disease	412	14.4	2018.8	4.9	5,406,264.00	13,122.00
TAPQ07 Hypertension	64	2.2	256.0	4.0	653,644.80	10,213.20
TAPQ08 Congestive heart failure	2618	91.4	13,613.6	5.2	37,432,425.80	14,298.10
TAPQ10 Dehydration	376	13.1	1616.8	4.3	3,436,038.40	9138.40
TAPQ11 Bacterial pneumonia	947	33.1	5303.2	5.6	14,432,469.40	15,240.20
TAPQ12 Urinary tract infection	704	24.6	3238.4	4.6	7,445,715.20	10,576.30
TAPQ14 Uncontrolled diabetes	93	3.2	427.8	4.6	998,475.90	10,736.30
Total	5432	189.6	27,477.4	—	72,681,914.10	—

PQI indicates Prevention Quality Indicator.
^aThe number of unscheduled readmissions in our sample was 28,649.
^bD was calculated by dividing C by A.
^cF was calculated by dividing E by A.

categorized as potentially preventable using the same PQI definitions; these comprised about 862 inpatient days and \$1.9 million (data not shown).

DISCUSSION

In this population-based study using the 2006 California SID, more than 1 in every 4 (26.3%) hospitalized midlife and older patients with diabetes were readmitted within 3 months of their index hospitalization, and most readmissions (87.2%) were unscheduled, which implies potential issues in quality and coordination of care for this vulnerable population.²³ Unscheduled readmissions were disproportionately higher for low-income, high-comorbid, racial/ethnic minority patients with diabetes having public insurance and living in urban areas. Disparities in diabetes care have been reported due to lower access to preventive and primary care and a higher rate of hospitalization among socioeconomically disadvantaged groups.^{6,24} Our study confirms that such disparities result in discrepancies in unscheduled readmissions. Disparities in hospital readmissions among patients with diabetes were reported in studies^{2,3,7} analyzing data from the 1990s, and our study demonstrates that such disparities continue.

We found that about one-fifth of unscheduled readmissions were potentially preventable, for which approximately 27,500 inpatient days and \$72.7 million were spent. Those readmissions might have been avoided if good inpatient and

transition care and outpatient follow-up had been provided.^{5,6} Considering the large variations among states in readmission rates, lengths of stay, and costs for inpatient care, it would be difficult to determine national estimates based on our data. Nevertheless, the economic burden of caring for individuals with diabetes, along with patient-level safety concerns related to unscheduled readmissions, reinforces the need for continuing efforts to innovate transition and chronic care models and the policies necessary to support them.

Our study is the first population-based study to date reporting that the predictors of scheduled and unscheduled hospital readmissions among patients with diabetes are dissimilar. Several patient demographic and socioeconomic factors (such as race/ethnicity, living in an urban area, and residing in a lower-income neighborhood) predicted unscheduled readmissions, but none predicted scheduled readmissions. Having no insurance, experiencing an unscheduled index hospitalization, and being among the older elderly (≥ 80 years) decreased the odds of a scheduled readmission. A study by Kossovsky et al²⁵ seems to be the only published article to date on scheduled and unscheduled readmissions. Examining 31-day readmissions among patients discharged from medical units in a single hospital in Geneva, Switzerland, over 1 year between 1995 and 1996, the authors reported findings consistent with ours: individuals 75 years or older and those admitted through the emergency department for an index hospitalization in their study were less likely to have a scheduled readmission.

This is important because scheduled readmissions may be an indicator of better access to advanced procedures or treatments (eg, elective chemotherapy, radiation therapy, or inpatient diagnostic procedures) and to better care coordination (ie, the patient has a relationship with a provider who arranges a scheduled admission, avoiding an emergency admission). If so, controlling for all other factors (including comorbidities), the lower rates of scheduled readmissions among the older elderly (≥ 80 years), the uninsured, and patients with unscheduled index hospitalizations suggest adverse disparity in care for these groups. Therefore, more empirical studies are needed on the extent and characteristics of scheduled readmissions and on potential disparities in receiving scheduled readmissions.

Limitations of this study should be mentioned. We analyzed publicly available hospital discharge data sets; as in any secondary data analysis, inaccurate or missing codes may exist, limiting the reliability of reports of scheduled and unscheduled readmissions (the type of admission variable) and of comorbidities. We counted all-cause readmissions and could not determine whether and to what extent a readmission was related to an index admission, which would be an important topic for future research. The validity of PQIs as the readmission quality indicators should be evaluated further. Because the data set does not allow the linking of patient data across years, we examined 1 year of data. We had data on discharge and admission months, but exact dates were unavailable. No detailed data were available on the type and severity of diabetes or on the availability of primary care physicians and discharge planning services. Last, we analyzed California data only.

Despite these limitations, this study addressed several gaps in the literature on hospital readmissions of patients with diabetes. Using a recent large population-based data set that included midlife and older patients with diabetes having all types of insurance, we reported several socioeconomic and clinical factors associated with scheduled and unscheduled readmissions and showed that predictors of the 2 types of readmissions were not parallel. The lower rates of scheduled readmissions in the older and uninsured groups imply potential lower access to advanced coordinated follow-up services for these groups. The consistently prevalent unscheduled readmissions among midlife and older patients with diabetes provide a rationale for continuing efforts to improve the organization and process of acute and chronic diabetes care and to promote quality and timely primary care, thereby ultimately saving unnecessary social costs and ensuring patient safety.

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