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CME

Readmission in the 30 Days After Percutaneous Coronary Intervention

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CME Objective for This Article: At the completion of this article, the learner should be able to discuss: 1) reasons why it is important to prevent readmissions after PCI procedures; 2) factors that are associated with readmission after PCI procedures; and 3) reasons why readmission after PCI is a poor measure of PCI procedural quality.

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Readmission in the 30 Days After Percutaneous Coronary Intervention

Objectives This study sought to identify the frequency and etiology of readmission within 30 days of percutaneous coronary intervention (PCI) in a large integrated healthcare system.

Background One-fifth of Medicare patients are readmitted within 30 days of hospitalization. Identifying the causes of readmission may help identify strategies to prevent readmission.

Methods All patients undergoing PCI (elective, urgent, and emergent) at our center between January 1, 2007, and April 12, 2010, were prospectively entered into the American College of Cardiology National Cardiovascular Data Registry. Patients readmitted to any hospital within 30 days of the index procedure were identified using an administrative database and telephone follow-up. Individual charts were reviewed independently by 2 investigators; disagreements regarding the cause for readmission were resolved by a third investigator.

Results During the study period, 3,255 PCI were performed, and 262 patients (8.0%) were readmitted within 30 days. Of these, 261 (99.6%) had medical records available for review. Reasons for readmission included: complications related to the PCI (n = 31, 11.9%); non-PCI cardiac causes related to index admission (n = 93, 35.6%); noncardiac causes related to index admission (n = 34, 13%); causes unrelated to the index admission (n = 103, 39.5%). Multivariable logistic regression modeling revealed that female sex, advanced age, peripheral arterial disease, prior valvular surgery, and PCI complications during the index procedure were associated with 30-day readmission.

Conclusions Readmissions within 30 days due to complications related to PCI performed on index admission are rare (0.9% of all PCI) and are an infrequent cause of readmission (<12% of readmissions). Thirty-day readmission after PCI should not be used as a quality metric of PCI performance.
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Readmission after an initial hospitalization is expensive and is associated with poor long-term outcome. One of 5 Medicare patients is readmitted within 30 days of a hospitalization; readmissions account for approximately one-fifth of all Medicare payments (1). After percutaneous coronary intervention (PCI), 30-day mortality in patients requiring readmission following PCI is significantly higher than in those not readmitted (2). High-

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quality care in the hospital before, during, and after a PCI may reduce the frequency of readmission (3,4). Reducing readmission rates may cut healthcare costs and improve patient outcomes (5,6). Previous studies of readmission following a PCI have used administrative databases, which provide incomplete data (7). Individual case reviews may yield additional data regarding causes of readmission.

We reviewed the medical records of patients readmitted in the 30 days following a PCI at our medical center to identify causes of readmission and factors that may increase risk of readmission following PCI.

Methods

PCI center. The PCI center in this study is a 437-bed tertiary care hospital in rural central Pennsylvania, serving 44 counties with a population of 2.6 million (8). The PCI center is part of a health system, including 2 hospitals and more than 40 outpatient clinics using the same integrated electronic medical record for all inpatient and outpatient care. Coronary intervention at the PCI center during the study period was performed by 4 interventional cardiologists employed by the healthcare system. All operators performed >200 PCIs per year.

Interventional procedure. PCI were typically performed with 6-F guide catheters via the radial or femoral approach. Bivalirudin was used for anticoagulation in most cases, and vascular closure for femoral cases was performed using an intra-arterial collagen plug or suture device. In-hospital care of the patient after the procedure was provided by cardiol-

ogy fellows, internal medicine residents, and advanced practitioners under the supervision of cardiologists. A minority of patients (~10%) were discharged 5 to 6 h after the procedure (without an overnight stay) if they were identified as being very low risk based on clinical presentation, coronary anatomy, procedural details, laboratory values, and social factors.

Patients. The study population included all patients undergoing PCI at our medical center from January 1, 2007, to April 12, 2010.

Data collection. The study was approved by the institution's Investigational Review Board. Data on all PCI patients were entered prospectively into the ACC NCDR (American College of Cardiology National Cardiovascular Data Registry) at the time of the PCI by the operator and catheterization laboratory staff. Data through hospital discharge were captured by nurses and advanced practitioners.

Patients readmitted to any hospital in the health system after PCI were identified using the system's electronic health records. Their data were captured by chart review. Additional follow-up was obtained using the Social Security Death Index and telephone calls to all patients 1 year after PCI. Contact was successful in 83% and identified an additional 4 patients readmitted to hospitals outside of the PCI center health system. Data on the reason for readmission were available for 3 of these patients.

Medical records were reviewed independently by 2 independent investigators (S.P., G.Y.). Disagreements on the cause of readmission were adjudicated by a third investigator (J.B.). In cases where several factors contributed to readmission, the principle cause was recorded. Readmissions were determined to be "related" versus "unrelated" by reviewing index and readmission history, physical exam, progress notes, discharge summary, and medication administration reconciliation; and outpatient encounters (office visits, telephone encounters). Any link between the index admission and readmission was classified as "related." If no link was found, the readmission was classified as "unrelated."

Categories of readmission. Causes of readmission were categorized into 4 groups: 1) PCI complications related to the PCI procedure; 2) cardiac causes related to the index admission; 3) noncardiac causes related to the index admission; and 4) any cause not related to the PCI or index admission.

DEFINITIONS OF CAUSES OF READMISSION.

1. "Gastrointestinal bleeding *related* to index admission" included upper or lower gastrointestinal bleeding with any of the following during the initial admission: melena; hematochezia; or guaiac positive testing from known etiologies, including peptic ulcer disease, diverticulosis, angiodysplasias, hemorrhoids, or malignancy.
2. "Gastrointestinal bleeding *unrelated* to index admission" included upper or lower gastrointestinal bleeding after discharge, with no evidence of bleeding during the initial admission.
3. "Atrial fibrillation/flutter *related* to index admission" included atrial fibrillation/flutter present before index admission or occurring during the initial admission.
4. "Atrial fibrillation/flutter *unrelated* to index admission" included new onset of atrial fibrillation/flutter after discharge with no past history of arrhythmia.
5. "Infections *related* to the index admission" included any infections attributable to the PCI vascular access site, Foley catheter or central venous catheter placed during the index hospitalization, relapse of infection acquired during the index hospitalization, exacerbation of a previously identified chronic infection, or gangrene.
6. "Infections *unrelated* to the index admission" included community-acquired infections (e.g., pneumonia, cholecystitis) in patients without evidence of infection at any time during the index hospitalization.
7. "Neurological problems *unrelated* to the index admission" included seizures, syncope, transient ischemic attack or stroke, subarachnoid hemorrhage, or autonomic dysfunction in patients without neurologic problems at any time during the index hospitalization.
8. "Renal insufficiency or complications of end-stage renal disease *unrelated* to index admission" included readmissions for acute kidney injury starting >20 days after PCI, glomerulonephropathy, or complications of end-stage renal disease (e.g., hyperkalemia, missed dialysis session, arteriovenous fistula malfunction).
9. "Psychiatric disorder *unrelated* to index admission" included exacerbations of previous psychiatric problems that had been quiescent during the index admission, or those newly diagnosed after the initial admission.

Abbreviations and Acronyms

CI = confidence intervals
ICD-9-CM = International Classification of Diseases-Ninth Revision-Clinical Modification
OR = odds ratio
PCI = percutaneous coronary intervention

Complications of PCI (using NCDR definitions) (8) included significant dissection, perforation, periprocedural myocardial infarction, post-cardiogenic shock, congestive heart failure, stroke, tamponade, significant bleeding, need for transfusion, and acute renal failure requiring dialysis.

Data analysis. Demographic and procedural data for all PCI are reported as means ± SD. Logistic regression was used to compare variables between readmission and nonreadmission groups, and p values were obtained based on empirical standard error estimates from generalized estimating equations with exchangeable covariance structure to account for repeated measures per patient. Variables with p value <0.10

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Table 1. Demographic and Procedural Characteristics

	All (n = 3,255)	Readmitted (n = 258)	Not Readmitted (n = 2,997)	p Value
Male	2,172 (66.7)	155 (60.1)	2,017 (67.3)	0.03
Age at procedure, yrs	64.0 ± 12.1	65.7 ± 12.9	63.9 ± 12.0	0.03
White	3,210 (98.6)	254 (98.5)	2,956 (98.6)	0.85
BMI kg/m^2; 5.3% unknown	30.8 ± 11.0	30.5 ± 6.7	30.6 ± 6.6	0.37
PCI year				0.60
2007	931 (28.6)	70 (27.1)	861 (28.7)	
2008	1,003 (30.8)	74 (28.7)	929 (31.0)	
2009	1,016 (31.2)	90 (34.9)	926 (30.9)	
2010	305 (9.4)	24 (9.3)	281 (9.4)	
Smoker	1,797 (55.2)	131 (50.8)	1,666 (55.6)	0.13
Hypertension	2,326 (71.4)	193 (74.8)	2,133 (71.2)	0.18
Dyslipidemia	2,502 (76.9)	205 (79.5)	2,297 (76.6)	0.22
Family history of coronary artery disease	882 (27.1)	67 (26.0)	815 (27.2)	0.66
Prior myocardial infarction	840 (25.8)	71 (27.5)	769 (25.7)	0.42
Prior heart failure	276 (8.5)	37 (14.3)	239 (8.0)	0.004
Prior valve surgery	58 (1.8)	14 (5.4)	44 (1.5)	0.004
Prior PCI	903 (27.7)	76 (29.5)	827 (27.6)	0.31
Prior coronary artery bypass graft	489 (15.0)	50 (19.4)	439 (14.7)	0.06
Cerebrovascular disease	360 (11.1)	40 (15.5)	320 (10.7)	0.03
Peripheral artery disease	417 (12.8)	55 (21.3)	362 (12.1)	0.0004
Chronic lung disease	406 (12.5)	37 (14.3)	369 (12.3)	0.36
Diabetes mellitus	1,046 (32.1)	109 (42.3)	937 (31.3)	0.0005
Type of presentation				<0.0001
STEMI presentation	816 (25.1)	61 (23.6)	755 (25.2)	
Non-STEMI presentation	654 (20.1)	60 (23.3)	594 (19.8)	
Unstable angina presentation	854 (26.2)	91 (35.3)	763 (25.5)	
Stable angina presentation	650 (20.0)	35 (13.6)	615 (20.5)	
Other presentation	281 (8.6)	11 (4.3)	270 (9.0)	
Cardiogenic shock	67 (2.1)	3 (1.2)	64 (2.1)	0.17
Intra-aortic balloon pump	113 (3.5)	9 (3.5)	104 (3.5)	0.96
Fluoroscopy time, min	17.4 (11.3–25.5)	19.9 (12.3–28.6)	17.2 (11.2–25.4)	0.07
Contrast volume, ml; 6.1% unknown	225 (180–280)	230 (175–290)	225 (180–280)	0.60
Left ventricular ejection fraction, %; 29.9% unknown	55 (45–65)	55 (40–60)	55 (45–65)	0.002
Femoral arterial access	2,801 (86.1)	227 (88.0)	2,574 (85.9)	0.33
Positive stress test	582 (17.9)	30 (11.6)	552 (18.4)	0.001
PCI status				0.017
Urgent PCI status	1,385 (42.6)	128 (49.6)	1,257 (41.9)	
Emergent PCI status	834 (25.6)	65 (25.2)	769 (25.7)	
Elective PCI status	918 (28.2)	54 (20.9)	864 (28.8)	
Other PCI status	118 (3.6)	11 (4.3)	107 (3.6)	
Any procedural complication	407 (12.5)	40 (15.5)	367 (12.3)	0.16
Perforation/dissection complication	164 (5.0)	13 (5.0)	151 (5.0)	0.99
Myocardial infarction/stroke complication	108 (3.3)	14 (5.4)	94 (3.1)	0.10
Shock/heart failure/tamponade/bleeding/dialysis/ transfusion complication	176 (5.4)	18 (7.0)	158 (5.3)	0.25
>1 lesion treated	873 (26.8)	69 (26.7)	904 (26.8)	0.94
Worst lesion pre-stenosis, %	90 (80–99)	90 (80–99)	90 (80–99)	0.08
"High" lesion complexity	1,651 (50.7)	139 (53.9)	1,512 (50.5)	0.30

Continued on the next page

Table 1. Continued

	All (n = 3,255)	Readmitted (n = 258)	Not Readmitted (n = 2,997)	p Value
Post-stenosis >0%	245 (7.5)	22 (8.5)	223 (7.4)	0.52
Medications				
Bivalirudin	1,642 (50.5)	137 (53.1)	1,505 (50.2)	0.32
Clopidogrel	2,946 (90.5)	240 (93.0)	2,706 (90.3)	0.09
Eptifibatide	149 (4.6)	14 (5.4)	135 (4.5)	0.53
Glycoprotein IIb/IIIa	73 (2.2)	7 (2.7)	66 (2.2)	0.63
Heparin, unfractionated	1,763 (54.2)	153 (59.3)	1,610 (53.7)	0.08

Values are n (%), mean ± SD, or median (interquartile range).
BMI = body mass index; PCI = percutaneous coronary intervention; STEMI = ST-segment elevation myocardial infarction.

Table 2. Causes of Readmission

Readmission Diagnosis	Patients Readmitted, n (%) (n = 261)
PCI complications	31 (11.9)
In-stent thrombosis	12 (4.6)
Vascular access	8 (3.1)
Coronary dissection	2 (0.8)
Other	9 (3.5)
Cardiac, related to index admission	93 (35.6)
Unstable angina	28 (10.7)
Congestive heart failure	22 (8.4)
Staged PCI	13 (5.0)
Non-STEMI	9 (3.4)
Atrial fibrillation/flutter	5 (1.9)
Staged coronary artery bypass graft	4 (1.5)
Stable angina	4 (1.5)
Pericarditis	2 (0.8)
Hypertension crisis	2 (0.8)
Other	4 (1.5)
Noncardiac, related to index admission	32 (12.2)
Infection/sepsis	6 (2.3)
Peripheral artery disease	5 (1.9)
Carotid artery stenosis	3 (1.1)
Gastrointestinal bleed	2 (0.7)
Other	16 (6.1)
Unrelated to index admission	105 (40.2)
Noncardiac chest pain	27 (10.3)
Gastrointestinal (reflux, bleed, bowel obstruction)	20 (7.7)
Infection/sepsis	9 (3.4)
Neurologic	8 (3.1)
Psychiatric (anxiety, depression)	8 (3.1)
Atrial fibrillation/flutter (new onset)	5 (1.9)
Kidney disease (end-stage complication, missed dialysis, acute renal insufficiency weeks after index admission)	5 (1.9)
Pulmonary embolus	3 (1.1)
Orthostatic hypotension/dehydration	2 (0.7)
Chronic obstructive pulmonary disease	2 (0.7)
Other	16 (6.1)

Values are n(%). Categories listed as "other" include diagnoses with only 1 readmission.
Abbreviations as in Table 1.

between the 2 groups were considered for inclusion in a multivariable logistic regression model predicting 30-day readmission as a function of those risk factors. Using backward stepwise elimination, a final model was obtained, retaining variables significant at $p < 0.15$. Results of the logistic regression models are presented in terms of p values and odds ratios (OR) where the OR represents the amount by which presence of each risk factor multiplies the odds of 30-day readmission.

Results

During the study period, 3,255 PCI were performed on 2,807 patients, and 262 (8.0%) patients were readmitted within 30 days. Data for 1 patient who had been readmitted to an unaffiliated hospital were not available for review; this patient was excluded from further analyses. Characteristics of all patients who underwent PCI, and the 261 who were readmitted, are listed in Table 1.

The reasons that patients were admitted, and their frequencies, are listed in Table 2. Only 31 readmissions (11.9%) were due to a complication that occurred during or after the PCI, 93 (35.6%) were not related to the PCI but of cardiac etiology related to the index admission, 34 (13%) were noncardiac but related to index admission, and 103 (39.5%) were not related to the index admission (Table 2).

Table 3. Elective Readmissions

Cause of Elective Readmission	Readmissions (n = 27)
Staged percutaneous coronary intervention	13
Elective coronary artery bypass graft	4
Elective carotid stenting	3
Elective peripheral artery angioplasty/stenting	3
Elective cystoscopy	1
Elective abdominal aortic aneurysm endovascular repair	1
Elective cholecystectomy	1
Scheduled bone biopsy	1

Values are n.

Table 4. Summary of Significant Correlates of Readmission From Unadjusted and Multivariate Models

Characteristic	Comparator	Unadjusted OR (95% CI)	p Value	Adjusted OR From Multivariate Model (95% CI)	p Value
Sex	Female vs. male	1.34 (1.04–1.73)	0.03	1.11 (0.98–1.27)	0.12
Prior valve surgery		3.94 (2.26–6.89)	0.004	3.72 (2.16–6.40)	0.004
Peripheral artery disease	Vs. none	1.45 (1.97–2.69)	0.0004	1.60 (1.16–2.21)	0.01
Diabetes mellitus	Vs. none	1.61 (1.25–2.08)	0.0005	1.51 (1.16–1.97)	0.004
Pre-PCI left ventricular ejection fraction	Per 10% increase	0.99 (0.99–0.99)	0.002	0.94 (0.90–0.99)	0.02
Myocardial infarction or stroke complication	Vs. none	1.80 (1.03–3.14)	0.10	1.94 (1.11–3.41)	0.07
Presentation	Other vs. stable angina	0.72 (0.37–1.41)	0.34	0.68 (0.35–1.34)	0.27
	STEMI vs. stable angina	1.39 (0.91–2.10)	0.13	1.67 (1.06–2.65)	0.03
	Non-STEMI vs. stable angina	1.75 (1.15–2.67)	0.01	1.80 (1.15–2.81)	0.01
	Unstable angina vs. stable angina	2.11 (1.42–4.11)	0.0002	1.99 (1.33–3.00)	0.0009
Worst lesion pre-stenosis	Per 10% increase	0.99 (0.98–1.00)	0.08	0.85 (0.76–0.98)	0.04

CI = confidence interval; OR = odds ratio; other abbreviations as in Table 1.

Among readmitted patients, the most common PCI complications leading to readmission were in-stent thrombosis (n = 12; 5% of readmissions, 0.4% of all PCI procedures) and vascular access complications (n = 8; 4 pseudoaneurysms and 4 hematomas without pseudoaneurysm). The most common cardiac causes for readmission related to the index admission (Table 3) were unstable angina (n = 28), congestive heart failure (n = 22), and planned readmission for a staged revascularization (n = 17; 13 staged PCI, 4 staged coronary bypass surgery). The most common noncardiac problems related to the index admission were infection (n = 6), peripheral artery disease (n = 5), carotid artery stenosis (n = 3), and gastrointestinal bleeding (n = 2). The most common causes of readmission unrelated to the initial admission were noncardiac chest pain (n = 27), new gastrointestinal problems (n = 20), new infections (n = 9), exacerbations of previously known anxiety/depression (n = 8), new onset atrial fibrillation or flutter (n = 5), and complications of end-stage renal disease (n = 5). Of the 261 readmitted patients with follow-up data available, 27 (10%) were elective readmissions (Table 3).

Univariate analysis. Variables associated with readmission on univariate analysis included female sex (OR: 1.34, 95% confidence intervals [CI]: 1.04 to 1.73, p = 0.03), diabetes mellitus (OR: 1.61, 95% CI: 1.25 to 2.08, p = 0.0005), peripheral arterial disease (OR: 1.45, 95% CI: 1.97 to 2.69, p = 0.0004), and prior valve surgery (OR 3.94, CI: 2.26 to 6.89, p = 0.004).

Multivariate analysis. In the multivariate analysis, prior valve surgery was the strongest risk factor for readmission (OR: 3.72, 95% CI: 2.16 to 6.40, p = 0.004) (Table 4). Patients whose indication for PCI was unstable angina had almost 2 times greater likelihood of readmission than those with stable coronary disease (OR: 1.99, 95% CI: 1.33 to 3.00, p = 0.0009) and those with a non–ST-segment elevation myocardial infarction also had a much greater likelihood of readmission (OR: 1.80, 95% CI: 1.15 to 2.81, p = 0.01). Each 10% increase in left ventricular ejection fraction was associated with a slightly lower likelihood of readmission (OR: 0.94, 95% CI: 0.90 to 0.99, p = 0.02), and each 10% increase in the pre-stenosis of the worst lesion before PCI was associated with a lower likelihood of readmission (OR: 0.85, 95% CI: 0.76 to 0.98, p = 0.04).

Discussion

This is the first study of PCI readmission to use individual chart review to identify causes of readmission and to determine whether readmissions were related or unrelated to the index admission. Prior studies have categorized causes for readmission using the principle diagnosis International Classification of Diseases-Ninth Revision-Clinical Modification (ICD-9-CM) codes (2,3,9) or unspecified methods (10). In contrast, we used reviews of the medical record by 2 reviewers, with a third to resolve disputes, to categorize reason for readmission. We believe this may be a more reliable technique, as principle diagnosis ICD-9 codes are usually assigned by administrative rather than clinical personnel and are often inaccurate (7).

Several important findings emerged. First, readmission to treat complications of the initial PCI was rare (0.9% of all PCI, 11.9% of readmissions). Stent thrombosis and vascular access complications account for the majority of these. The relative rarity of these events may be because stent thrombosis has decreased substantially with newer generation stents (11), and vascular complications decreased after the adoption of radial access techniques at our medical center (12). Although PCI complications have not been eliminated, even their complete eradication would minimally decrease the overall PCI readmission rate.

A second important finding of this study is the low readmission rate of 8.0% within 30 days of PCI. Two small single-center studies, with readmission rates of 8.5% and 9.4%, were reported in 1995 and 1998 (3,10). More re-

cently, 2 large studies (representing all Medicare patients in 1 study and all PCI performed in New York state in the other) reported higher readmission rates (14.6% and 15.6%) (2,9). These studies included a large number of operators and catheterization laboratories, some with lower volumes and less experience, which may translate to inconsistent quality. In contrast to these recent large studies, ours is the only single center PCI readmission study from the modern stent era, and it has documented much lower readmission rates. Our lower readmission rate may be in part due to characteristics of our health system, an integrated multispecialty group practice that uses electronic medical records for all inpatient and outpatient care, allows "read-only" access to patients and to unaffiliated physicians, and automatically sends reports to referring and primary care physicians. In addition, the health system has a pharmacist-led initiative aimed at optimizing adherence to dual antiplatelet therapy. The lower readmission rate is not likely to be related to differences in baseline characteristics of our population compared with those in other studies; the incidence of comorbidities in our patients was similar or higher than those in prior studies. For example, 25% of our patients presented with ST-segment elevation myocardial infarction and 68% of PCI were urgent/emergent, which is higher than reported in prior studies.

A third key finding of this study is that 39% of readmissions were seemingly unrelated to the index admission and were caused by illnesses not apparent during the index admission. Whereas closer follow-up might have identified some of these problems at an earlier stage and prevented readmission, in the vast majority there were no obvious lapses in care or clear-cut opportunities for improvement.

Finally, only one other study has examined the frequency with which elective "staged" PCI procedures contributed to readmissions after an initial PCI. In New York state, 3.4% of all PCI patients were readmitted for a staged PCI (20% of readmissions) (9). In contrast, only 13 patients in our study (0.4% of all PCI and 5% of readmissions) were readmitted for PCI. This reflects a high rate of ad hoc multivessel PCI performed in a single setting at our hospital (13) and, in some cases, may also reflect the performance of elective PCI as an outpatient procedure that does not qualify as an inpatient admission.

Thirty-day readmission rates have become a "quality indicator" for acute myocardial infarction and congestive heart failure, and are a National Quality Foundation proposed quality indicator for PCI. The Patient Protection and Affordable Care Act will use "quality indicators" to adjust payment to hospitals, with decreased reimbursements directly linked to readmission rates as part of value-based purchasing (14). In this milieu, health systems will focus resources on preventing readmission. Analyses such as ours may offer insight into prevention of readmission.

Future efforts to prevent readmissions after PCI should include a comprehensive interventional quality program to decrease the rate of procedural and post-procedural complications (15). Rapid follow-up after PCI may prevent readmissions (as has been observed for heart failure patients) (16) by monitoring compliance with medications that prevent stent thrombosis, reinfarction, and bleeding (17). Scoring systems to predict heart failure readmissions have been proposed (18). Data such as that included in this study might allow development of a similar scoring system for PCI readmissions, focusing more attention on patients at high risk for readmission.

Study limitations. This is a single-center retrospective analysis of prospectively collected data, with all the limitations inherent in this type of study. Not all patients could be tracked in the system's electronic medical record or contacted at 1 year after their PCI procedure; if patients lost to follow-up were sicker or were engaged in more unhealthy behaviors, the readmission rate might have been higher than we identified. Case-by-case review of complications is work intensive, although it is associated with more accurate data than can be gleaned from administrative databases (2,9,10). Our categorization of readmissions as related or not related to the index admission is subject to misclassification error because, in some cases, it is difficult to determine the root cause of the illness requiring readmission. Our study did not identify patients returning for acute problems that visited an emergency department or underwent "observation status" in a hospital who in the past might have been formally admitted.

Conclusions

Only 8.0% of patients who underwent a PCI were readmitted in the 30 days after a PCI. Most factors correlating with readmission after PCI are not modifiable (e.g., age, sex). Readmissions within 30 days due to PCI complications are rare (0.9% of all PCI), so eliminating all complications would have a small effect on the overall readmission rate. Cardiac problems related to the index admission are responsible for only one-third of readmissions, and two-fifths of readmissions appear to be unrelated to the index hospitalization. Our data do not support use of readmission after PCI as an indicator of the quality of care during the index admission.

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Key Words: complication ■ percutaneous coronary intervention ■ readmission.

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