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## Incidence and Predictors of 30-Day Hospital Re-Admission Rate Following Percutaneous Coronary Intervention (From the National Heart, Lung, and Blood Institute Dynamic Registry)

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### Abstract

Post-discharge outcomes following percutaneous coronary intervention (PCI) are important measures of quality of care and complement in-hospital measures. We sought to assess in-hospital and post-discharge PCI outcomes to 1) better understand the relationship between acute and 30 day outcomes, 2) identify predictors of 30-day hospital re-admission, and 3) determine the prognostic significance of 30-day hospital readmission. We analyzed in-hospital death and length of stay (LOS) and non-elective cardiac-related re-hospitalization following discharge in 10,965 patients following PCI in the Dynamic Registry. From 1999–2006, in-hospital death rate and LOS declined. The 30-day cardiac re-admission rate was 4.6%, with considerable variability over time and among hospitals. The risk of re-hospitalization was greater in women, those with CHF, unstable angina, multiple lesions and emergency PCI. Conversely, a lower risk of re-hospitalization was associated with a higher number of treated lesions. Patients re-admitted within 30 days had higher one-year mortality than those free from hospital readmission. In conclusion, while in-hospital mortality and LOS following PCI have decreased over time, the observed 30 day cardiac re-admission rate was highly variable and the risk of re-admission was more closely associated with underlying patient characteristics than procedural characteristics.

### Keywords

percutaneous coronary intervention; outcomes; re-admission

### Introduction

Hospital length of stay (LOS) and in-hospital mortality following percutaneous coronary intervention (PCI) represent acute process and quality of care measures, respectively (1,2).

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Important and complementary measures of overall PCI quality are those that occur after hospital discharge (1,3). In fact, in-hospital and post-discharge metrics may be discordant as improvements in acute in-hospital process of care metrics may not translate to improvements in subsequent clinical events (2, 4–6). In addition, the introduction of new technologies may impact acute process and 30 day outcomes differently. As such, there has been a renewed focus not only on LOS (2) but post discharge mortality and re-admission rates following PCI. The latter was addressed in recently published data that suggested substantial and widely variable re-admission rates among hospitals (7). While the study of re-admission rates likely provides an avenue for improving care, this metric leaves much to be desired as the nature of re-admission is complex (8–10). Using a database designed specifically to prospectively assess PCI outcomes, we sought to assess in-hospital and post-discharge PCI outcomes, specifically the 30 day rate of hospital re-admission following PCI. In addition, we examined predictors of re-admission at 30 days and the impact of hospital readmission on one year mortality.

## Methods

Details of the purpose, structure, and function of the National Heart, Lung and Blood Institute (NHLBI) sponsored Dynamic Registry have been previously described (11). A total of 10,965 patients undergoing PCI were consecutively enrolled in five recruitment waves between 1997 and 2006: 2,524 patients were recruited from 1997 to 1998, 2,105 patients were recruited in 1999, 2,047 patients were recruited from 2001 to 2002, 2,112 patients were recruited in 2004, and 2,177 patients were recruited in 2006. Patient- and lesion-level data were collected and component and composite rates recorded. Outcomes considered for this analysis included LOS as an acute process measure, as well as rates of in-hospital major adverse cardiac events (MACE) including in hospital death, myocardial infarction (MI), and any repeat target vessel revascularization procedure (acute quality measures). For those patients discharged alive, 30 day cardiovascular re-admission rates, and 30 day and one year mortality were determined. Cardiovascular re-admission was defined as non-elective repeat hospitalization by 30 days in all patients alive at discharge for one or more of the following: angina, MI, coronary artery bypass graft surgery (CABG), non-staged/non-index artery PCI, heart failure or stroke.

Patients participating in the Dynamic Registry consented to the collection of in-hospital and post-discharge data after the index procedure. Study coordinators at each site contacted patients multiple times in the first year and at 1 year to obtain vital status and information regarding intercurrent hospitalizations, cardiovascular events, or procedures. Dates corresponding to all reported outcomes were recorded and confirmed by requesting relevant records. Whenever possible, angiographic data pertaining to repeat PCI were collected and reviewed to determine target-vessel revascularization. Post-discharge follow-up data was available for 97.5%, 94.9%, 90.2%, 99%, and 99% of patients for waves 1–5, respectively. The study protocol was approved by the Institutional Review Boards of the coordinating center (University of Pittsburgh) and all the clinical sites involved.

## Statistical analysis

Patients were stratified by 30 day re-admission status. Continuous data were summarized as means  $\pm$  1 standard deviation (SD). Categorical variables are summarized as counts or percentages. Overall differences between proportions were assessed by the chi-square test and continuous variables were compared by the Kruskal-Wallis test while the test for trend was assessed with the Mantel-Haenszel test for categorical variables and the ordered Jonckherre-Terpstra test for continuous variables. Similar methods were used for lesion-level analyses. Cumulative event rates at 30d and one year were calculated by the Kaplan–Meier method and compared using the log rank statistic. Patients who did not experience the

outcome of interest were censored at the last known date of contact or at thirty days or one-year if contact extended beyond that point. All rates are reported as point estimates. Rates were also adjusted for imbalances in important covariates among waves using general linear modeling methods. In order to examine risk factors associated with a cardiovascular re-admission within 30 days of PCI, a model was built using important clinical, demographic, and procedural factors via Cox proportional hazards methodology. Hazard ratios and their corresponding 95% confidence intervals are reported. All statistical analyses were performed with the use of SAS software, version 9.2, and a two-sided p-value of 0.05 or less was considered to indicate statistical significance.

## Results

Over successive periods between 1997 and 2006, there were significant increases in patient age, body mass index, prior revascularization, percent with concomitant non-cardiac disease, diabetes mellitus, hyperlipidemia, heart failure, and hypertension; and a decrease in percent with prior MI (Table 1). Overall stent use increased over time. No drug eluting stents were used prior to 2004 whereas a preponderance were used in the 2004 and 2006 recruitment periods. Procedural success remained unchanged (see Table 2). Radial artery access was used in 3.1% overall, with a trend toward increasing use that peaked at 6.6% in the final 2006 recruitment wave ( $p < 0.0001$ ).

Over time, in-hospital mortality improved significantly and LOS shortened. Over the same time period, there was considerable variability in 30 day cardiac re-admission rates (Figure 1). The cardiac-related re-admission rate among those discharged alive was 4.6% (95% CI 3.5–5.7) and ranged from 0 to 14.3% across the 27 sites. The cardiac re-admission rate for the period 2001–02 (where only 90.2% follow up was achieved compared to the 95–99% follow up rates for the rest of the recruitment periods), was estimated by imputation to be between 4.9% and 5.2%. Cardiac readmission rates for those < 65 years ( $n=5835$ ) and those 65 years ( $n=4985$ ) were similar (Figure 2). The distribution of cardiac-related reasons for re-admission is shown in Figure 3.

Tables 3 and 4 show demographic, angiographic, and procedural characteristics for those patients discharged alive according to 30 day re-admission status. Those characteristics independently associated with re-hospitalization by 30 days of discharge are shown in Table 5. As demonstrated, there were no procedural predictors, but several patient-related variables associated with the risk of re-hospitalization. While female sex, CHF, acute coronary syndromes, co-morbid conditions, a larger number of significant lesions, and emergent PCI were associated with a greater risk of re-hospitalization, increasing numbers of lesions treated by PCI was associated with a lower risk of readmission.

After adjusting for baseline differences between groups, the risk for mortality by 1 year for the non re-hospitalized group compared to those hospitalized at least once in the first 30 days after index PCI is shown in Figure 4 and suggests that re-admitted patients are at higher risk for death at one year. Even after accounting for baseline differences, 30-day cardiac hospitalization was an independent predictor for mortality at one year (Table 6).

## Discussion

In this analysis of PCI outcomes over time, we observed stable and high procedural success rates, decreasing in-hospital mortality, and decreasing LOS. Notwithstanding these improvements in acute care outcomes and processes of care, there was discordance with, and variability in, the 30 day cardiac re-hospitalization rate over time. There was increased mortality risk at one year for re-admitted patients. While several patient-level characteristics

were associated with a greater risk of re-hospitalization at 30 days, there was no such association with any procedure-related variables. These findings highlight the complex nature of assessing PCI quality and provide further insight into cardiac readmission rate following PCI and its clinical significance.

In the current era of public reporting and linking of payment to patient outcomes (12–16), it behooves us to critically assess PCI quality metrics such as rates of repeat hospitalization following PCI. With procedures like PCI, where low event rates may coexist with inconsistent data collection mechanisms, the link between specific outcomes and operator or hospital performance is problematic (17, 18), even with adjudication (19). In addition, there may be poor correlation between risk-adjusted outcomes and preventable outcomes (20). The present analysis corroborates others that suggest that PCI outcomes may not be directly related to the procedure itself but to patient-specific and/or health care system factors (21–23).

Metrics such as 30 day re-admission rate do not lend themselves to explicit implications and are the product of a complex set of incentives and external regulatory forces (24). Two recent retrospective analyses, one from a Medicare database (7) and the other from 22 Massachusetts hospitals (25), reported *all cause* post-PCI re-admission rates of 1 in 7 (14%) and 1 in 8 (12.5%) following PCI, respectively. Our prospective analysis revealed a *cardiac* re-admission rate of 1 in 22 PCI procedures (4.6%) and no significant difference between those 65 or older and those under 65 years of age. A third retrospective analysis from a single center reported a 9.4% all cause (and 6.5% cardiac) re-admission rate following PCI (26).

The complex nature of readmission following PCI is further demonstrated in this analysis by the potential way in which new technology and new innovation with device therapy may confound attempts to measure post-procedural quality. As noted in Figure 1, re-admission rates increased during the 2004 recruitment period despite contemporaneous decreases in mortality and LOS. This recruitment period spanned the time of the FDA public health notification of adverse events associated with the Cordis CYPHER™ Coronary Stent (27). Secular changes in PCI practice may also confound interpretation of re-admission rates via temporal changes in procedural and patient selection criteria and may explain, in part, the apparent increase in PCI in the “asymptomatic” subgroup in the registry. Many of the latter patients were previously symptomatic but were asymptomatic at the time of PCI. In addition, a substantial fraction of patients were undergoing the second of a planned staged PCI for multivessel revascularization.

Our detailed prospective analysis suggests that patient characteristics (namely female gender, heart failure, acute coronary syndromes, multiple significant lesions, emergent procedures and the presence of non-cardiac co-morbid conditions) more strongly predict 30 day cardiac re-admission than procedural characteristics. Further evidence for this is supported by our observation that more extensive PCI (greater number of lesions treated) was associated with a lower 30 day re-admission rate. Importantly, we note lower one year survival for those readmitted within 30 days after index PCI. Increased efforts to target this group of patients at discharge are warranted and are an important part of the “transition of care” process. (28–30)

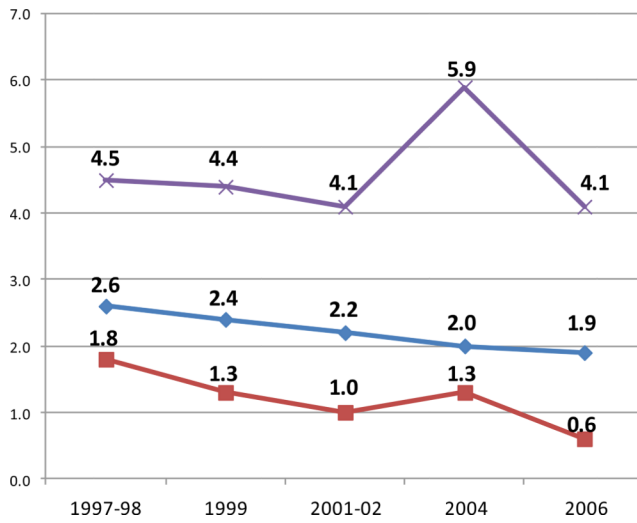
This analysis is limited by the fact that there have been many secular changes in reimbursement and hospital discharge policies over the time period studied. Because of this, it is difficult to draw convincing conclusions regarding cause and effect relationships. The Dynamic Registry collected all data prospectively. Follow-up rates consistently exceeded 90% and were carefully documented and substantiated.

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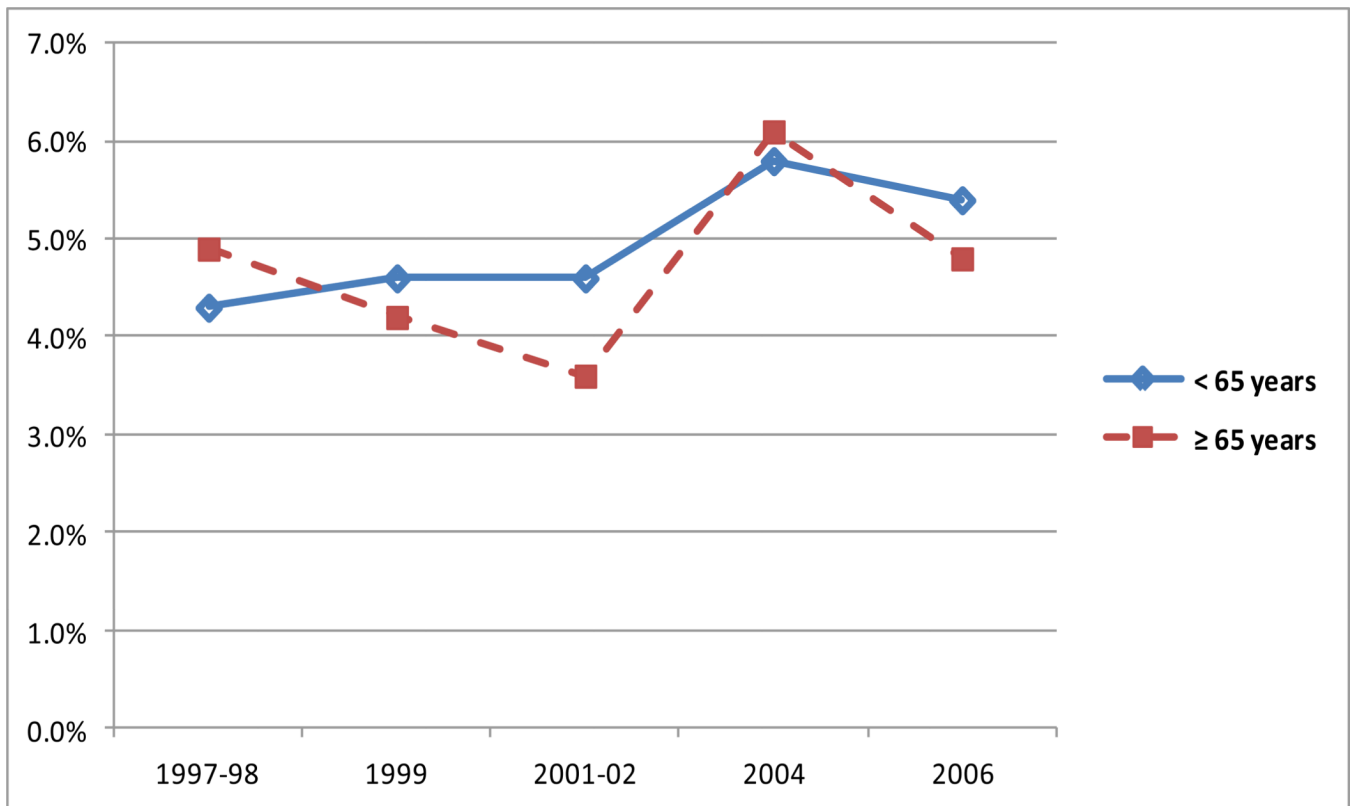




	p-value overall	p-value trend
X 30d Rpt Hosp(%)	0.001	0.09
◆ Length of Stay(d)	<0.001	<0.001
■ In-Hosp Mort(%)	0.01	0.006

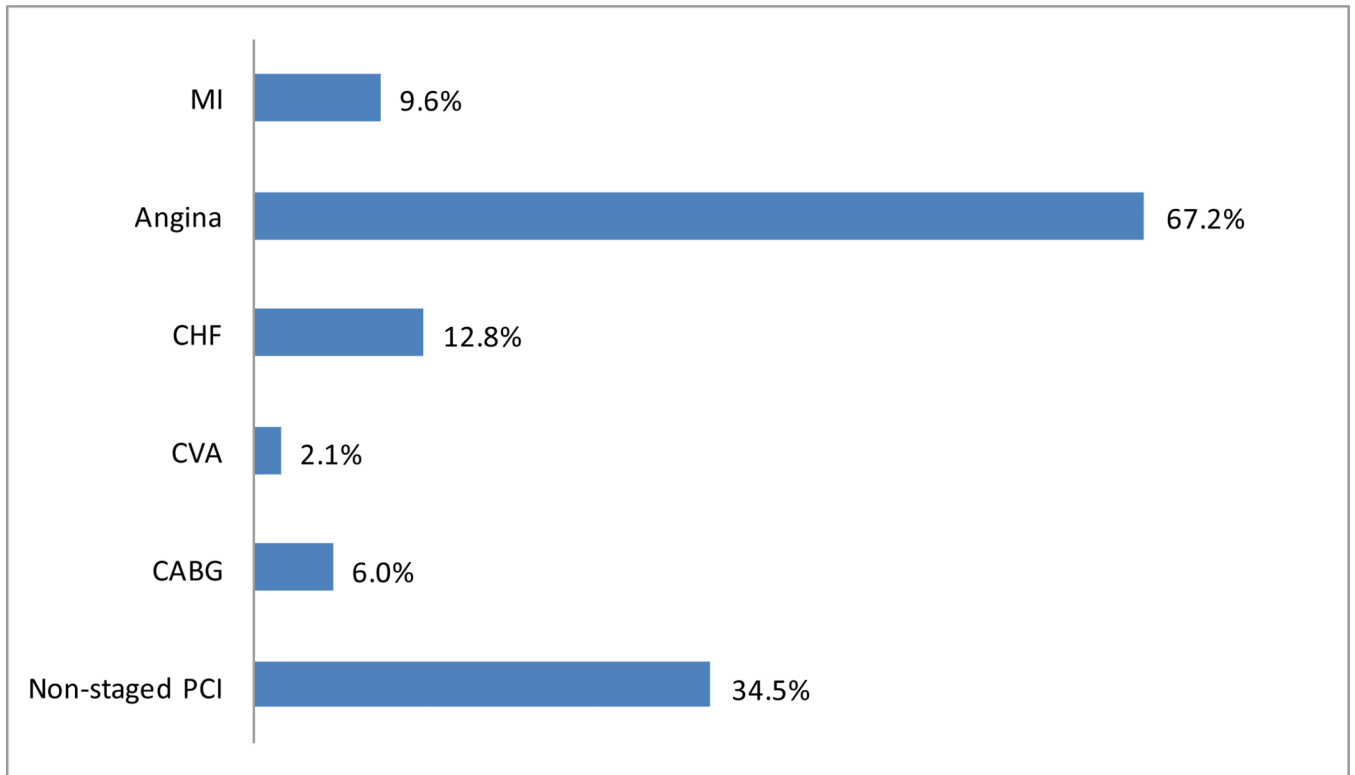
**Figure 1. Trends in In-Hospital and 30 Day Outcomes Following PCI**

X shows the 30-day repeat hospitalization rates; ◆ shows the length of hospital stay in days; ■ shows the in-hospital mortality rate.



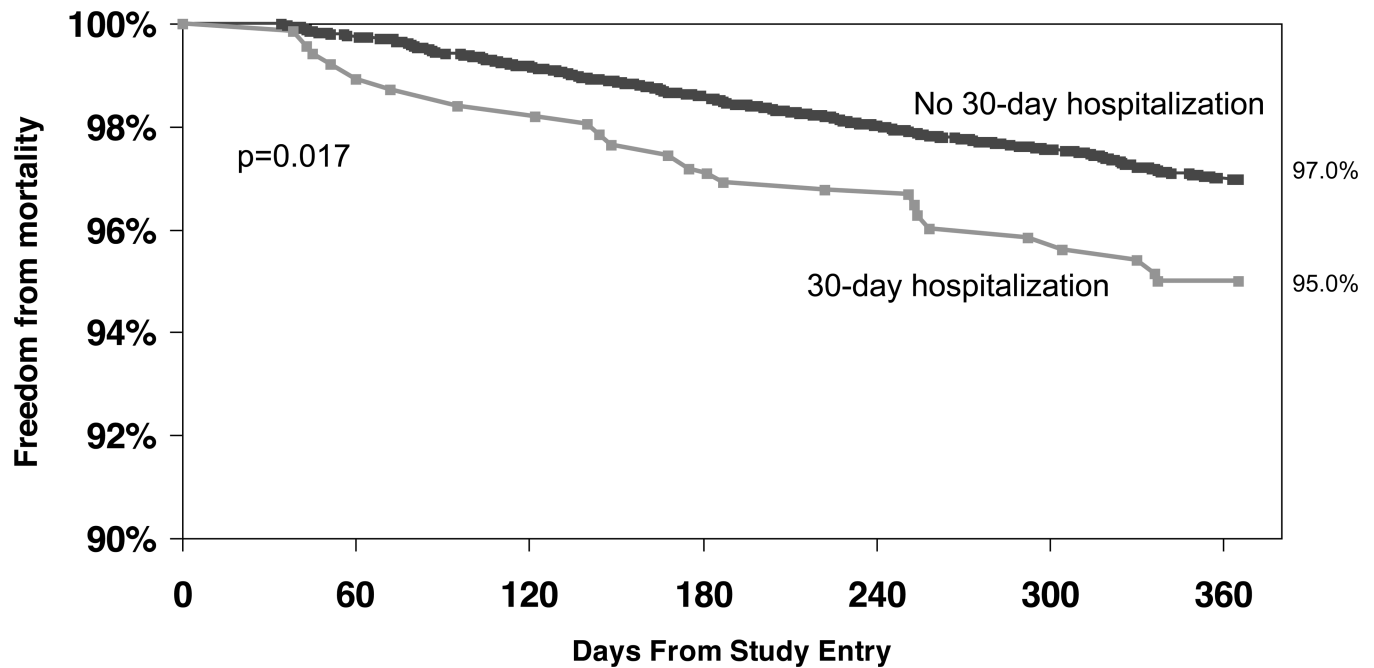
**Figure 2. Re-Hospitalization Rate by Age**  
Cardiac Readmission Rates Over Successive Periods For Patient Age Less Than 65 And 65 Years And Older. The average readmission rate for the entire cohort less than 65 years was 4.9% and 4.7% for those 65 years or older.





**Figure 3. Cardiovascular-Related Reasons For Readmission**

For those discharged alive and re-hospitalized within 30 days of discharge. Hospitalization can be for more than one reason. MI = myocardial infarction, CHF = congestive heart failure, CVA = cerebrovascular accident, CABG = coronary artery bypass graft surgery.



**Figure 4. Adjusted Freedom From Mortality By 30-Day Cardiac Re-Hospitalization Status**

Adjusted one year survival curves using the inverse probability weight method for those who experienced a 30-day re-hospitalization compared to those who did not are shown. Those who died in the 30-day period from discharge were excluded. The solid line represents the non-hospitalized group (n=10328), the dashed line represents the group that had been hospitalized at least once in the first 30-days (n=455).

Table 1

## Demographic Characteristics

Characteristic	1997-98 (N=2483)	1999 (N=2077)	2001-02 (N=2026)	2004 (N=2083)	2006 (N=2161)	P value*
Age, mean, median (years)	62.5, 63	62.9, 63	64.3, 65	63.6, 64	63.9, 64	<0.001
Age over 65	44.1%	45.2%	48.8%	46.3%	46.5%	0.066
Women	35.2%	36.1%	36.0%	32.6%	32.9%	0.013
Race						
White	80.0%	78.1%	79.1%	76.9%	75.1%	0.982
Black	7.8%	12.1%	12.9%	14.7%	16.2%	
Asian	4.8%	3.9%	3.8%	3.0%	2.1%	
Hispanic	7.2%	5.7%	4.1%	5.3%	5.8%	
Other	0.2%	0.2%	0.1%	0.0%	0.7%	
Body Mass Index (kg/m <sup>2</sup> ) mean, median	28.2, 28	28.8, 28	29.3, 28	29.2, 28	29.7, 29	<0.001
Prior Percutaneous Coronary Intervention	28.2%	30.7%	33.2%	31.9%	35.4%	<0.001
Prior Coronary Artery Bypass Surgery	16.4%	17.0%	19.6%	19.9%	17.8%	0.147
Prior Myocardial Infarction Severe Non-Cardiac	39.1%	32.5%	27.6%	26.2%	22.6%	<0.001
Concomitant Disease	29.4%	33.6%	38.4%	36.7%	36.0%	<0.001
Cerebrovascular	6.0%	6.4%	6.8%	8.0%	6.8%	0.042
Renal	3.3%	4.8%	7.1%	8.3%	8.7%	<0.001
Peripheral Vascular	7.1%	7.1%	9.0%	8.7%	7.4%	0.176
Pulmonary	6.8%	8.8%	8.2%	7.6%	7.7%	0.613
Cancer	5.6%	6.7%	7.6%	7.7%	7.4%	0.006
Other	8.4%	10.6%	15.4%	14.5%	11.2%	<0.001
Diabetes Mellitus	27.5%	28.5%	30.2%	33.2%	34.2%	<0.001
Congestive Heart Failure	9.7%	9.3%	12.4%	9.2%	10.1%	0.694
Hypertension	59.2%	64.4%	74.7%	77.1%	78.2%	<0.001
Hyperlipidemia	61.3%	63.6%	71.7%	75.2%	79.2%	<0.001
Smoking						
Never	34.4%	32.1%	33.3%	37.5%	36.0%	0.041

Characteristic	1997-98 (N=2483)	1999 (N=2077)	2001-02 (N=2026)	2004 (N=2083)	2006 (N=2161)	P value*
Current	25.4%	27.1%	24.0%	22.6%	25.6%	
Former	40.1%	40.8%	42.7%	39.9%	38.4%	

\* Test for trend patients from successive recruitment periods discharged alive.

Table 2

## Angiographic / Procedural Characteristics

Characteristic	1997-98 (N=2483)	1999 (N=2077)	2001-02 (N=2026)	2004 (N=2083)	2006 (N=2161)	P value*
Abnormal Left Ventricular Ejection Fraction	26.8%	27.1%	31.1%	30.7%	28.7%	0.044
Left Ventricular Ejection Fraction, mean, median	55.2, 56	53.3, 55	51.6, 55	51.8, 55	52.7, 55	<0.001
Number Significant Lesions, mean, median	2.9, 2	2.9, 2	3.1, 3	3.1, 3	3.1, 3	<0.001
Amenable to Complete Coronary Artery Bypass Surgery Revascularization	87.4%	85.4%	82.6%	76.0%	72.1%	<0.001
Amenable to Complete Percutaneous Coronary Intervention Revascularization	81.4%	81.2%	81.8%	87.0%	90.2%	<0.001
Revascularization reason						
Asymptomatic	2.2%	4.7%	8.5%	10.1%	14.5%	<0.001
Stable Angina Pectoris	25.1%	20.6%	20.0%	23.0%	18.8%	<0.001
Unstable Angina Pectoris	47.3%	45.8%	41.9%	34.9%	32.7%	<0.001
Acute Myocardial Infarction	18.5%	25.7%	27.8%	27.8%	28.8%	<0.001
Other	6.9%	2.7%	1.4%	1.7%	1.8%	<0.001
Cardiogenic shock	1.1%	1.4%	1.6%	0.7%	1.1%	0.282
Circumstances of Procedure						
Elective	66.7%	51.7%	51.9%	77.8%	65.9%	0.001
Urgent	16.2%	41.7%	27.8%	15.9%	25.9%	
Emergent	17.2%	6.7%	20.4%	6.3%	8.2%	
Lesion ACC/AHA Classification						
A	10.0%	13.1%	16.2%	10.6%	11.6%	0.013
B1	29.3%	32.8%	34.2%	35.9%	29.7%	
B2	39.8%	38.2%	30.3%	32.3%	29.5%	
C	20.9%	15.9%	19.3%	21.1%	29.2%	
Treatment strategy						
Stent use (overall)	67.6%	79.2%	86.1%	93.3%	95.6%	<0.001
Eluting Stent use (overall)	0%	0%	0%	65.2%	82.8%	<0.001
In hospital Myocardial Infarction	2.6%	2.7%	1.8%	2.4%	1.7%	0.0919
In hospital Q-wave MI/Emergency Coronary Artery Bypass Surgery	0.7%	0.5%	0.2%	0.2%	0.1%	<0.001

Characteristic	1997-98 (N=2483)	1999 (N=2077)	2001-02 (N=2026)	2004 (N=2083)	2006 (N=2161)	P value*
Overall Angiographic Success						
None	3.3%	2.7%	2.2%	2.2%	2.1%	<0.001
Partial	4.2%	4.2%	3.2%	2.3%	1.6%	
Total	92.5%	93.1%	94.7%	95.5%	96.3%	
Procedure Success (angiographic, without death /Q wave Myocardial Infarctions/ Emergent Coronary Artery Bypass Surgery)						
	96.3%	97.0%	97.6%	97.6%	97.8%	0.0069

\* Test for trend in patients from successive recruitment periods discharged alive

Table 3

## Demographic Characteristics Stratified by Re-hospitalization Status

Characteristic	Rehospitalization			P value*
	Total (n=10,829)	No (n=10,345)	Yes (n=484)	
Age, mean, median (years)	63.4, 64	63.4, 64	63.2, 63	0.9147
Age over 65	46.1%	46.1%	45.5%	0.7803
Women	34.6%	34.2%	41.5%	0.0010
Race				
White	77.9%	78.0%	77.1%	0.8037
Black	12.6%	12.6%	12.0%	
Asian	3.5%	3.5%	4.3%	
Hispanic	5.7%	5.6%	6.4%	
Other	0.2%	0.3%	0.2%	
Body Mass Index (kg/m <sup>2</sup> ), mean, median	29.0, 28	29.0, 28	28.7, 28	0.1814
Prior Percutaneous Coronary Intervention	31.7%	31.6%	35.2%	0.1218
Prior Coronary Artery Bypass Surgery	17.9%	17.7%	20.9%	0.1299
Prior Myocardial Infarction	29.9%	29.9%	30.5%	0.7865
Severe Non-Cardiac				
Concomitant Disease	34.6%	34.2%	42.3%	0.0003
Cerebrovascular	6.8%	6.7%	9.1%	
Renal	6.4%	6.4%	6.2%	0.8750
Peripheral Vascular	7.8%	7.8%	9.5%	0.1525
Pulmonary	7.9%	7.8%	10.0%	0.0892
Cancer	7.0%	7.0%	6.4%	0.6461
Other	11.8%	11.6%	17.0%	0.0003
Diabetes Mellitus	30.6%	30.5%	34.0%	0.1039
Congestive Heart Failure	10.1%	9.9%	14.3%	0.0019
Hypertension	70.3%	70.2%	73.5%	0.1222
Hypertlipidemia	70.1%	70.0%	71.2%	0.5830
Smoking				
Never	34.7%	34.5%	38.2%	0.0518



Characteristic	Rehospitalization			P value*
	Total (n=10,829)	No (n=10,345)	Yes (n=484)	
Current	25.0%	24.9%	27.0%	
Former	40.3%	40.6%	34.9%	

Stratification variable is re-hospitalizations for cardiac reasons within 30 days of discharge from index PCI

\* For patients discharged alive

**Table 4**

## Angiographic / Procedural Characteristics Stratified by Re-hospitalization Status

Characteristic	Total (n=10,829)	Re-hospitalization		P value <sup>*</sup>
		No (n=10,345)	Yes (n=484)	
Abnormal Left Ventricular Ejection Fraction	28.9%	28.7%	33.5%	0.0479
Left Ventricular Ejection Fraction, mean, median	52.9, 55%	52.9%, 55%	52.0%, 55%	0.1985
Number Significant Lesions, mean, median Amenable to Complete Coronary Artery	3.0, 2	3.0, 2	3.4, 3	<.0001
Bypass Surgery Revascularization Revascularization	80.6%	80.7%	79.5%	0.5443
Amenable to Complete Percutaneous Coronary Intervention Revascularization	84.4%	84.5%	81.7%	0.1103
Revascularization reason				
Asymptomatic	8.0%	8.1%	6.0%	0.1011
Stable Angina Pectoris	21.6%	21.9%	15.3%	0.0005
Unstable Angina Pectoris	40.7%	40.5%	45.0%	0.0480
Acute Myocardial Infarction	25.5%	25.2%	31.6%	0.0017
Other	2.8%	2.9%	1.7%	0.1131
Cardiogenic shock	1.2%	1.1%	2.7%	0.0017
Circumstances of Procedure				
Elective	58.3%	58.8%	49.6%	<.0001
Urgent	31.0%	30.9%	34.5%	
Emergent	10.6%	10.4%	15.9%	
Lesion ACC/AHA Classification				
A	12.2%	12.2%	13.4%	0.2813
B1	32.2%	32.4%	29.1%	
B2	34.2%	34.1%	36.3%	
C	21.3%	21.3%	21.2%	
Treatment strategy				
Stent use (overall)	77.8%	77.8%	78.3%	0.7552
Eluting Stent use (overall)	28.2%	28.0%	32.5%	0.0123
In hospital Myocardial Infarction	2.3%	2.2%	3.3%	0.1106
In hospital Q-wave MI/Emergency				
Coronary Artery Bypass Surgery	0.4%	0.4%	0.4%	0.8991
Overall Angiographic Success				
None	2.5%	2.4%	3.9%	0.0733
Partial	3.1%	3.1%	2.3%	
Total	94.4%	94.4%	93.8%	
Procedure Success (angiographic, without death/Q wave MI / Emergent CABG), %	97.2%	97.3%	95.7%	0.0289

Stratification variable is re-hospitalizations for cardiac reasons within 30 days of discharge from index PCI.

\* For patients discharged alive

**Table 5**

Predictors of Rehospitalization Within 30 Days Of Discharge From Index PCI

	<b>Hazard Ratio</b>	<b>95% CI</b>	<b>p-value</b>
Age	0.99	0.98–1.00	0.02
Women	1.39	1.14–1.68	<0.001
Body Mass Index	0.98	0.96–1.00	0.03
Congestive Heart Failure	1.41	1.07–1.87	0.02
Co-morbid condition	1.31	1.08–1.59	0.006
Reason for revascularization (versus other)			
Stable Angina Pectoris	1.12	0.75–1.67	0.57
Unstable Angina Pectoris	1.66	1.16–2.37	0.006
Acute Myocardial Infarction	1.52	1.02–2.26	0.04
Number significant lesions	1.15	1.08–1.22	<0.001
Number lesions treated	0.84	0.73–0.98	0.03
Acuity (versus elective)			
Urgent	1.15	0.92–1.44	0.21
Emergent	1.53	1.11–2.12	0.01

**Table 6**

Adjusted Hazard Ratios and 95% CIs for Mortality From Day 31-365

	Cox Proportional Hazards		
	Hazard Ratio	95% CI	p-value
30-day hospitalization	1.56	1.03–2.36	0.035
Age	1.03	1.02–1.05	<0.001
Race			
Black	1.32	0.97–1.81	0.08
Asian	1.42	0.79–2.56	0.205
Hispanic	1.25	0.75–2.10	0.40
Body mass index (versus <25)			
25.0–29.9	0.55	0.42–0.72	<0.001
30	0.54	0.40–0.73	<0.001
Diabetes Mellitus	1.67	1.30–2.14	<0.001
Congestive Heart Failure	2.14	1.64–2.79	<0.001
Double Vessel Coronary Disease	1.13	0.82–1.56	0.46
Triple Vessel Coronary Disease	1.34	0.96–1.87	0.09
Cardiogenic shock	2.05	0.96–4.36	0.06
Co-morbid conditions			
Chronic Kidney Disease	2.34	1.75–3.13	<0.001
Peripheral Vascular Disease	1.37	1.01–1.85	0.04
Chronic Lung Disease	1.66	1.23–2.25	<0.001
Cancer	1.67	1.22–2.28	0.001