Prevalence and Outcomes of Same-Day Discharge After Elective Percutaneous Coronary Intervention Among Older Patients

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Percutaneous coronary intervention (PCI) is one of the most commonly performed cardiac procedures with more than 1 million episodes of care annually among Medicare recipients. Risks associated with PCI are highest within the first 24 to 48 hours after the procedure and include periprocedural myocardial infarction (MI), acute stent thrombosis, bleeding, or renal failure.1 Previous studies of Medicare beneficiaries show that up to 9.5% of patients experience at least 1 PCI-related complication.2

However, short- and long-term outcomes after PCI have improved because of the evolution in device technology and pharmacotherapy.3 Despite this improvement, patients are usually observed overnight in the hospital after elective PCI to monitor for PCI-related complications.2

Small single-center observational studies and single-center randomized studies performed outside the United States have demonstrated the safety of discharging patients home after PCI without overnight observation.3 Potential advantages of this strategy include obviating an overnight hospital stay for the patient, increased bed availability for the hospital, and cost savings.6 There are no multicenter data on how often US patients are discharged home the same day as their PCI. Additionally, the safety of same-day discharge for selected low-risk Medicare patients undergoing elective PCI was studied in this multicenter cohort study.

Context Patients undergoing elective percutaneous coronary intervention (PCI) are generally observed overnight in the hospital. The association between same-day discharge of older patients and death or readmission is unclear.

Objective To evaluate the prevalence and outcomes of same-day discharge among older patients undergoing elective PCI in the United States.

Design, Setting, and Participants Multicenter cohort study. Data were from 107,018 patients 65 years or older undergoing elective PCI procedures at 903 sites participating in the CathPCI Registry between November 2004 and December 2008 and were linked with Medicare Part A claims. Patients were divided into 2 groups based on their length of stay after PCI: same-day discharge or overnight stay.

Main Outcome Measures Death or rehospitalization occurring within 2 days and by 30 days after PCI.

Results The prevalence of same-day discharge was 1.25% (95% CI, 1.19%-1.32%; n = 1339 patients) with significant variation across facilities. Patient characteristics were similar between the 2 groups, although same-day discharge patients underwent shorter procedures with less multivessel intervention. There were no significant differences in the rates of death or rehospitalization at 2 days (same-day discharge, 0.37% [95% CI, 0.16%-0.87%]; overnight stay, 0.50% [95% CI, 0.46%-0.54%]; P = .51) or at 30 days (same-day discharge, 9.63% [95% CI, 8.17%-11.33%]; overnight stay, 9.70% [95% CI, 9.52%-9.88%]; P = .94). Among patients with adverse outcomes, the median time to death or rehospitalization did not differ significantly between the groups (same-day discharge, 13 days [interquartile range, 7.0-21.0] vs overnight stay, 14 days [interquartile range, 7.0-21.0]; P = .96). After adjustment for patient and procedure characteristics, same-day discharge was not significantly associated with 30-day death or rehospitalization (adjusted odds ratio, 0.95 [95% CI, 0.78-1.16]).

Conclusion Among selected low-risk Medicare patients undergoing elective PCI, same-day discharge is rarely implemented but is not associated with death or rehospitalization compared with overnight observation.

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among older individuals is not known. Accordingly, we used data from the multicenter National Cardiovascular Data Registry (NCDR) CathPCI Registry linked with administrative data from the Centers for Medicare & Medicaid Services (CMS) to (1) examine the prevalence of same-day discharge among older individuals following PCI, (2) compare the risk profiles of patients discharged the same day with those observed overnight, and (3) examine unadjusted and risk-adjusted rates of death or rehospitalization among these patient groups.

**METHODS**

**Study Sample**

The CathPCI Registry is an initiative of the American College of Cardiology (ACC) and the Society for Cardiovascular Angiography and Interventions and has been previously described.7 This registry catalogs data on patient and hospital characteristics, clinical presentation, hospital length of stay, treatments, and in-hospital outcomes for PCI procedures from more than 1000 sites across the United States. Data are entered into NCDR-certified software at participating institutions and exported in a standard format to the ACC. There is a comprehensive data quality program, including both data quality report specifications for data capture and transmission, as well as an auditing program. An ACC committee prospectively defined the variables, which are available at http://www.ncdr.com.

For the purpose of this analysis, we included the first diagnostic or PCI procedure performed in any individual patient 65 years or older during a qualifying hospitalization between November 29, 2000, and December 31, 2008 (FIGURE 1). We then excluded patients who did not undergo PCI. The CathPCI Registry contains data pertaining to in-hospital outcomes; therefore, to determine postdischarge outcomes, we linked the remaining CathPCI Registry patients with the Medicare 100% Part A claims file. Percutaneous coronary intervention procedure codes (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] 00.66, 36.0x, 37.22, 37.23, and 88.5x except 88.59) were used to identify index procedures in the Medicare files, which were then linked to the NCDR using indirect identifiers (nonunique fields that, when used in combination, may identify unique hospitalizations).

Linking rules used a hierarchy of evidence approach such that rules with the greatest specificity were applied first. Once a match was achieved for a patient, then no further rules were applied. The linking rules contained combinations of information denoting the index PCI procedure hospital, patient date of birth or age, admission, discharge date, and sex. If a single CathPCI Registry record matched with multiple Medicare records using the same rules, then no linking occurred. Sites that did not match to Medicare records and patients whose index PCI procedure did not occur during a period of fee-for-service enrollment were excluded.

After matching linkage with administrative data, the resulting data set contained 715 617 patients from 983 sites. From this, we applied several exclusion criteria (Figure 1). We excluded patients whose data were not collected with version 3.04 of the CathPCI Registry data collection form; patients whose procedures were performed for unstable angina, non–ST-segment elevation MI, or ST-segment elevation MI; patients who underwent emergency, urgent, or salvage procedures, defined as procedures performed for ongoing myocardial ischemia or infarction, pulmonary edema requiring intubation, or shock; and patients for whom cardiopulmonary resuscitation was being performed en route to the catheterization laboratory. Patients with shock and those who did not receive stents were excluded as well. Additionally, we excluded patients who were transferred to the PCI center from another hospital or transferred out to another hospital after PCI, underwent coronary artery bypass graft procedures, or died during hospitalization or any patient who was hospitalized for more than 1 night after PCI.

Once the exclusion criteria were applied, the study sample was divided into

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**Figure 1. Study Sample Selection Flow Diagram**

<table>
<thead>
<tr>
<th>2216786 Patients in ACC-NCDR catheterization registry aged ≥65 years (1047 sites)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1501169 Excluded</td>
</tr>
<tr>
<td>1209810 Diagnostic catheterization only</td>
</tr>
<tr>
<td>291359 Not linked with Medicare Part A claims</td>
</tr>
<tr>
<td>715617 Patients who had PCI assessed for eligibility (883 sites)</td>
</tr>
<tr>
<td>608599 Excluded</td>
</tr>
<tr>
<td>518329 Unstable angina, ST-segment elevation MI, non–ST-segment elevation MI, or incorrect data form</td>
</tr>
<tr>
<td>21947 Transferred in from another hospital</td>
</tr>
<tr>
<td>32695 Underwent urgent, emergent, or salvage procedure</td>
</tr>
<tr>
<td>2375 Transferred out, died during hospitalization, or underwent CABG during hospitalization</td>
</tr>
<tr>
<td>27062 Cardiogenic shock, hospitalized for &gt;1 day, or did not receive a stent</td>
</tr>
<tr>
<td>6191 Not eligible for fee-for-service care or procedure data discrepancy</td>
</tr>
<tr>
<td>107018 Patients included in analysis (903 sites)</td>
</tr>
</tbody>
</table>

ACC indicates American College of Cardiology; NCDR, National Cardiovascular Data Registry; PCI, percutaneous coronary intervention; MI, myocardial infarction; and CABG, coronary artery bypass graft procedure.
patients who were discharged the same day as their PCI procedure and patients who stayed in the hospital overnight and were discharged the following day. Discharge dates were obtained from the registry. The study was approved by the institutional review board of Duke University Medical Center, who determined that the study met the definition of research not requiring informed consent.

End Points and Definitions
The primary end points evaluated for this analysis included death or rehospitalization for any cause occurring within 2 days of discharge and at 30 days. Both end points were identified using Medicare data. The 2-day time point was chosen to reflect early outcomes that might be influenced by overnight observation. Other end points included procedural outcomes, such as procedural success, bleeding, and vascular complications, which were obtained from the CathPCI Registry. Procedural success in the registry is defined as residual stenosis 50% or less with a TIMI (Thrombolysis in Myocardial Infarction) flow grade of 2 or greater and 20% or greater decrease in stenosis severity in all lesions attempted. Lesion risk was assessed by operators and defined according to the ACC/American Heart Association (AHA) lesion classification scheme.8 Lesions were classified as high risk if any of the following were present: a diffuse quality (length > 2 cm); excessive tortuosity of proximal segment; extremely angulated segments greater than 90°; total occlusions more than 3 months old, bridging collaterals, or both; inability to protect major side branches; or degenerated vein grafts with friable lesions.

Bleeding complications were defined as access site bleeding, retroperitoneal bleeding, gastrointestinal bleeding, genitourinary bleeding, or other. Vascular complications were defined as access site occlusion, peripheral embolization, arterial dissection, arterial pseudoaneurysm, or arteriovenous fistula. All bleeding end points were further defined as requiring transfusion, causing a drop in hemoglobin greater than 3.0 g/dL, or both. Hematomas larger than 10 cm for femoral access or 2 cm for radial access also qualified as access site bleeding. Race/ethnicity data were reported by patients or family, and the options included white, black, Hispanic, Asian, Native American, and other. Chronic kidney disease was defined as a history of serum creatinine levels greater than 2.0 mg/dL (to convert to µmol/L, multiply by 88.4).

Statistical Analysis
The prevalence of same-day discharge was calculated for the overall study sample, as well as for each hospital using data from the CathPCI Registry. Hospitals were then grouped by their proportion of patients discharged the same day as the PCI. To determine the temporal trend in the prevalence of same-day discharge, we calculated the rates of same-day discharge by quarter between 2005 and 2008. An unadjusted Poisson regression model was used to determine the significance of the trends over time. For descriptive analyses, we compared baseline characteristics, treatment profiles, and procedural outcomes between patients linked with Medicare claims who were discharged the same day and those who stayed overnight in the hospital. Continuous variables are presented as medians with interquartile ranges (IQRs); categorical variables are expressed as percentages. Mann-Whitney Wilcoxon nonparametric tests were used for continuous variables and Pearson χ² tests were used for categorical variables.

The rates of the 2-day and 30-day end points were compared between the 2 groups; the Kaplan-Meier method was used to plot the cumulative incidence of 30-day death or rehospitalization and the curves were compared using the log-rank test. To examine the proportions of low- and high-risk patients discharged the same day vs observed overnight, we used logistic regression to construct models for 2-day and 30-day death or rehospitalization on the overnight stay group. The overnight stay group was chosen because of its larger sample size. Covariates entered into the model included demographic, medical comorbidity, and procedural variables.

This model was then applied to the entire study sample to determine the predicted risk of 2-day and 30-day death or rehospitalization. Using this model, patients were divided into quintiles of risk and the proportions of same-day discharge and overnight stay patients in each quintile were compared. Logistic regression was then used to determine the association between same-day discharge and 30-day death or rehospitalization. The generalized estimating equations method was used with all logistic regression models to account for within-hospital clustering. All significance testing was 2-sided and P < .05 was considered significant. All analyses were performed by the Duke Clinical Research Institute using SAS version 9.2 (SAS Institute, Cary, North Carolina) and Stata release version 11 (StataCorp, College Station, Texas).

RESULTS
After we applied the exclusion criteria, 107,018 patients enrolled between November 2004 and December 2008 from 903 sites remained. Of these, 1339 (1.25%; 95% CI, 1.19%-1.32%) were discharged on the same day as their PCI. There were no significant differences between the same-day discharge and overnight stay patients with respect to median age, proportion of women, or nonwhite race (Table 1). There were also few differences between the groups regarding medical comorbidities, with the exception of hypertension and dyslipidemia (which were less common among same-day discharge patients) and prior PCI (which was more common among same-day discharge patients).

Procedural characteristics varied between the groups. Same-day discharge patients underwent shorter procedures using lower contrast volume. Most patients underwent procedures via the femoral approach, but a higher proportion of same-day discharge patients underwent transradial PCI. The use of vascular closure devices was significantly higher among same-day discharge pa-
patients. Procedural pharmacology differed significantly between the groups with fewer same-day discharge patients receiving glycoprotein IIb/IIIa inhibitors or bivalirudin compared with overnight stay patients. In addition, fewer same-day discharge patients underwent multivessel PCI, although there was no significant difference in the risk of the target lesions between the groups. The majority of patients in both groups were discharged home.

There were also differences in hospital characteristics. Same-day discharge patients were treated at smaller facilities with slightly lower annual PCI volumes compared with patients who stayed overnight. The practice of same-day discharge also varied significantly by region (Table 1).

There was a modest decrease in the rate of same-day discharge between 2005 and 2008 (P < .001) (eFigure 1, available at http://www.jama.com). The majority of hospitals discharged less than 3% of patients on the same day as the PCI (eFigure 2).

Evaluation of the proportion of patients in each group by predicted risk of 2-day and 30-day death or rehospitalization revealed that patients who stayed overnight were evenly distributed across quintiles of risk whereas the proportion of same-day discharge patients decreased as predicted risk increased. The difference between the groups was more pronounced when examining the predicted risk of 30-day death or rehospitalization (eFigure 3).

**Table 2** lists the rates of inhospital, 2-day, and 30-day outcomes between the groups. There was no significant difference in the rates of procedural success between the 2 groups. In addition, there were no significant differences between the groups with respect to any general complication or bleeding complication. The rates of vascular complications were low in both groups. Ten patients (0.75%; 95% CI, 0.41%-1.27%) discharged home the same day experienced a vascular complication compared with 260 patients (0.25%; 95% CI, 0.22%-0.28%) who stayed overnight.

There was no significant difference between the groups in the incidence of 2-day death or rehospitalization or 30-day death or rehospitalization. **Figure 2** displays the Kaplan-Meier rates of the 30-day end point by patient group. There was no significant difference between the groups with respect to the median time to death or rehospitalization (same-day discharge, 13.0 days [IQR, 7.0-21.0] vs overnight stay, 14.0 days [IQR, 7.0-21.0]; P = .96).

### Table 1. Baseline Characteristics of Patients, Procedures, and Hospitals

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Overall (N = 107 018)</th>
<th>Same-Day Discharge (n = 1339)</th>
<th>Overnight Stay (n = 105 679)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (IQR), y</td>
<td>73.0 (69.0-78.0)</td>
<td>73.0 (69.0-78.0)</td>
<td>73.00 (69.0-78.0)</td>
<td>.25</td>
</tr>
<tr>
<td>Female sex</td>
<td>39 626 (37.03)</td>
<td>476 (35.55)</td>
<td>39 150 (37.05)</td>
<td>.26</td>
</tr>
<tr>
<td>Nonwhite race</td>
<td>11 837 (11.06)</td>
<td>119 (8.88)</td>
<td>11 718 (11.09)</td>
<td>.15</td>
</tr>
<tr>
<td>Medical comorbidities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>35 627 (33.29)</td>
<td>443 (33.08)</td>
<td>35 184 (33.29)</td>
<td>.87</td>
</tr>
<tr>
<td>Hypertension</td>
<td>89 223 (83.37)</td>
<td>1075 (80.28)</td>
<td>88 148 (83.41)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Prior congestive heart failure</td>
<td>11 597 (10.84)</td>
<td>138 (10.31)</td>
<td>11 459 (10.84)</td>
<td>.53</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>5126 (4.79)</td>
<td>55 (4.11)</td>
<td>5071 (4.80)</td>
<td>.24</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>86 292 (80.63)</td>
<td>1051 (78.49)</td>
<td>85 241 (80.66)</td>
<td>.05</td>
</tr>
<tr>
<td>Prior PCI</td>
<td>42 988 (40.17)</td>
<td>578 (43.17)</td>
<td>42 410 (40.13)</td>
<td>.02</td>
</tr>
<tr>
<td>Prior CABG</td>
<td>25 119 (23.47)</td>
<td>303 (22.63)</td>
<td>24 816 (23.19)</td>
<td>.46</td>
</tr>
<tr>
<td>Procedure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Femoral</td>
<td>104 552 (97.70)</td>
<td>1290 (96.34)</td>
<td>103 262 (97.71)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Radial</td>
<td>1680 (1.57)</td>
<td>42 (3.14)</td>
<td>1638 (1.55)</td>
<td></td>
</tr>
<tr>
<td>Brachial</td>
<td>405 (0.38)</td>
<td>5 (0.37)</td>
<td>400 (0.38)</td>
<td></td>
</tr>
<tr>
<td>Vascular closure device used</td>
<td>53 834 (50.30)</td>
<td>871 (65.05)</td>
<td>52 963 (50.12)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Fluoroscopy time, median (IQR), min</td>
<td>11.30 (7.00-18.50)</td>
<td>10.00 (6.30-16.40)</td>
<td>11.40 (7.00-18.50)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Contrast volume, median (IQR), ml</td>
<td>185.00 (130.00-250.00)</td>
<td>170.00 (115.00-225.00)</td>
<td>185.00 (130.00-250.00)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Multivessel PCI</td>
<td>17 474 (16.33)</td>
<td>189 (14.12)</td>
<td>17 285 (16.36)</td>
<td>.03</td>
</tr>
<tr>
<td>Bifurcation lesion</td>
<td>12 916 (12.07)</td>
<td>194 (14.49)</td>
<td>12 722 (12.04)</td>
<td>.006</td>
</tr>
<tr>
<td>High-risk lesion</td>
<td>37 882 (35.40)</td>
<td>442 (33.01)</td>
<td>37 440 (35.43)</td>
<td>.07</td>
</tr>
<tr>
<td>Procedural anticoagulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any glycoprotein IIb/IIIa inhibitor</td>
<td>24 749 (23.14)</td>
<td>259 (19.34)</td>
<td>24 490 (23.19)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Unfractionated heparin</td>
<td>43 314 (40.53)</td>
<td>606 (45.26)</td>
<td>42 708 (40.47)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Bivalirudin</td>
<td>54 086 (50.55)</td>
<td>584 (43.61)</td>
<td>53 502 (50.64)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Discharge disposition</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Home</td>
<td>106 691 (99.69)</td>
<td>1330 (99.33)</td>
<td>105 361 (99.70)</td>
<td></td>
</tr>
<tr>
<td>Nursing home</td>
<td>229 (0.21)</td>
<td>4 (0.30)</td>
<td>225 (0.21)</td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of beds, median (IQR)</td>
<td>415.0 (289.0-572.0)</td>
<td>385.0 (286.0-531.0)</td>
<td>415.0 (289.0-576.0)</td>
<td>.01</td>
</tr>
<tr>
<td>University hospital</td>
<td>10 120 (9.46)</td>
<td>120 (9.86)</td>
<td>10 000 (9.46)</td>
<td>.04</td>
</tr>
<tr>
<td>No. of annual PCI cases, median (IQR)</td>
<td>903.95 (669.87-1596.80)</td>
<td>772.68 (502.27-1481.70)</td>
<td>906.51 (570.17-1596.80)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>West</td>
<td>15 792 (14.76)</td>
<td>225 (16.80)</td>
<td>15 567 (14.73)</td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>12 890 (12.04)</td>
<td>88 (6.57)</td>
<td>12 802 (12.11)</td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>39 982 (37.36)</td>
<td>521 (38.91)</td>
<td>39 461 (37.34)</td>
<td></td>
</tr>
<tr>
<td>South</td>
<td>38 163 (35.66)</td>
<td>505 (37.71)</td>
<td>37 658 (35.63)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: CABG, coronary artery bypass graft; IQR, interquartile range; PCI, percutaneous coronary intervention.
SAME-DAY DISCHARGE AFTER ELECTIVE PCI

TABLE 3 displays the association between same-day discharge and 30-day death or rehospitalization after multivariable adjustment. Same-day discharge was not significantly associated with 30-day death or rehospitalization. Factors associated with a lower risk of 30-day death or rehospitalization included radial access, use of a vascular closure device, prior PCI, increasing ejection fraction, better renal function, increasing body mass index, and male sex.

COMMENT

This study, which used data from a large contemporary national registry of PCI procedures, showed that same-day discharge among older patients undergoing elective PCI is rare and variable across PCI facilities in the United States. Patients who were discharged home the same day were more often categorized in the lowest quintile of predicted risk for death or rehospitalization, while there were approximately equal proportions of lower- and higher-risk patients observed overnight. Same-day discharge was not significantly associated with an increased risk for either 2-day or 30-day death or rehospitalization. In addition, the median time to experience death or rehospitalization in both patient groups was 13 to 14 days—a time frame that would likely not be affected by an overnight stay. These data suggest that a proportion of low-risk patients currently observed overnight may be eligible for same-day discharge without an increase in early or intermediate-term adverse events.

According to published guidelines, same-day discharge can be considered for patients undergoing PCI who have low-risk clinical features, successful procedures without prolonged post-procedure use of parenteral antithrombotic agents, and adequate social support. These guidelines were developed using the sparse published literature on outpatient PCI and relied largely on expert consensus.

To date, there have been small single-center studies examining the safety of same-day discharge in both the elective setting and in patients with acute coronary syndrome. Many of these studies were conducted outside the United States, were observational in nature, and did not specifically focus on older patients. Of the 3 randomized trials, 2 were conducted in Canada and the third was conducted in the Netherlands. All reached similar conclusions that support a strategy of same-day discharge in selected patients undergoing PCI. Our study adds to the published literature by evaluating the same-day discharge strategy in broadly representative older patients undergoing elective PCI at more than 900 centers in the United States and adds to the robustness of published guidelines on length of stay after PCI.

Despite the apparent safety of same-day discharge for selected patients, the present analysis demonstrates that this approach is rarely practiced among sites represented in the NCDR. This may reflect reluctance on the part of clinicians to discharge patients the same day as the PCI procedure because of concerns over early post-PCI complications. Although these concerns are well founded, the rates of vascular or bleeding complications were extremely low (<1%) among the patients in our analysis, with no clinically significant differences between groups.

Another concern with same-day discharge is that it may lead to higher rates of post-PCI hospital readmissions, and

Table 2. In-Hospital, 2-Day, and 30-Day Rates of Death or Rehospitalization in Same-Day Discharge and Overnight Stay Patient Groups

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Overall, No. (%)</th>
<th>Same-Day Discharge (n = 1339)</th>
<th>Overnight Stay (n = 105679)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-hospital Procedure success</td>
<td>102 220 (97.39)</td>
<td>1301 (97.16) [96.10-97.93]</td>
<td>102 919 (97.39) [97.29-97.48]</td>
<td>.83</td>
</tr>
<tr>
<td>Any bleeding complication</td>
<td>441 (0.41)</td>
<td>5 (0.37) [0.16-0.57]</td>
<td>436 (0.41) [0.36-0.45]</td>
<td>.82</td>
</tr>
<tr>
<td>Any vascular complication</td>
<td>270 (0.25)</td>
<td>10 (0.75) [0.41-1.37]</td>
<td>260 (0.25) [0.22-0.28]</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>2-day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death or rehospitalization</td>
<td>533 (0.50)</td>
<td>5 (0.37) [0.16-0.57]</td>
<td>528 (0.50) [0.46-0.54]</td>
<td>.51</td>
</tr>
<tr>
<td>Death</td>
<td>18 (0.02)</td>
<td>1 (0.07) [0.01-0.42]</td>
<td>17 (0.02) [0.01-0.03]</td>
<td>.10</td>
</tr>
<tr>
<td>Rehospitalization</td>
<td>516 (0.48)</td>
<td>4 (0.30) [0.12-0.77]</td>
<td>512 (0.48) [0.44-0.53]</td>
<td>.30</td>
</tr>
<tr>
<td>30-day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death or rehospitalization</td>
<td>10 378 (9.70)</td>
<td>129 (9.63) [8.17-11.33]</td>
<td>10 249 (9.70) [9.52-9.88]</td>
<td>.94</td>
</tr>
<tr>
<td>Death</td>
<td>234 (0.22)</td>
<td>4 (0.30) [0.12-0.77]</td>
<td>230 (0.22) [0.19-0.25]</td>
<td>.53</td>
</tr>
</tbody>
</table>

Figure 2. 30-Day Death or Rehospitalization Between Same-Day Discharge Patients and Overnight Stay Patients

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the low rates of same-day discharge may reflect these concerns as well. In the current environment in which readmission rates are used as a quality metric, implementing same-day discharge may be challenging. However, our data suggest that readmission rates may not be affected by same-day discharge among selected older patients. When categorized according to the predicted risk for 2-day or 30-day death or rehospitalization, there were more lower-risk patients represented in the same-day discharge group. In contrast, a similar proportion of lower- and higher-risk patients were observed overnight after PCI. This implies that the use of overnight observation is driven less by patient risk and more by either local practice patterns or other nonclinical reasons.

One nonclinical reason for low rates of same-day discharge may be related to reimbursement. “Inpatient PCI” (a procedure after which the patient is admitted to the hospital for more than 23 hours) in the United States is reimbursed at a higher rate than “outpatient PCI” (after which patients are discharged within 24 hours). As a result, there may be a financial incentive to avoid same-day discharge in favor of admitting a patient; however, in the United States, most outpatient PCI patients are observed in the hospital overnight for 23 hours or less and, in so doing, occupy a bed either in a short-stay unit or inpatient ward. Under this approach, discharging a patient home the same day as the procedure potentially leads to 2 advantages from the hospital perspective: increased bed availability and cost savings due to avoiding the marginal costs associated with an overnight observation stay. However, it is unclear whether these potential costs savings would be offset by the costs incurred by developing systems to support a same-day discharge strategy.

Several limitations to our study should be noted. First, we could not evaluate specific features mentioned in the practice guidelines defining length of stay after PCI. Specifically, we did not have information on patients’ social support structures or how far they lived from the PCI facility. In addition, our analysis was based on registry data linked with administrative data to determine outcomes beyond hospitalization. This necessarily excluded certain patients such as patients younger than 65 years; however, because older age is associated with adverse outcomes after PCI, it may be even more appropriate to discharge selected younger patients home on the same day as the PCI. Second, we did not have specific information on costs and therefore can only speculate on cost savings related to same-day discharge. Third, only a portion of the collected data in the NCDR are audited; therefore, as with any large registry, there is potential for inaccurate data collection. Fourth, our study was not a ran-
SAME-DAY DISCHARGE AFTER ELECTIVE PCI

domized trial; although we adjusted for a wide array of clinical and procedural factors, unmeasured confounders may be present. Our study should not be taken as evidence to widely imple-
ment same-day discharge. Such decisions should be individualized to the specific patient, and the present analy-
is provides contemporary data for US centers that are considering a same-day discharge program.

CONCLUSIONS

This study, which represents a large cross-section of contemporary PCI practice, demonstrates that older pa-
tients undergoing elective PCI are rarely discharged home the same day as the procedure. Compared with overnight observation, a same-day discharge strategy was not associated with an increased risk for death or readmission. These data suggest that selected low-risk patients may be considered for same-day discharge; however, these findings need to be confirmed in an ade-
quately powered multicenter random-
ized trial.

Author Contributions: Dr Rao had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Rao, Weintraub, Roe. Acquisition of data: Kaltenbach, Weintraub, Peterson. Analysis and interpretation of data: Rao, Kaltenbach, Weintraub, Roe, Brindis, Rumsfeld, Peterson. Drafting of the manuscript: Rao, Kaltenbach, Weintraub, Roe, Peterson. Critical revision of the manuscript for important in-

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