# **Same day discharge after elective percutaneous coronary intervention: insights from the British Cardiovascular Intervention Society**

**Short running title:**  Same day discharge after elective PCI

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## **Abstract**

## **Objectives**

We aimed to evaluate national temporal trends of same day discharge (SDD) and compare clinical outcomes to patients admitted for overnight stay (ON) undergoing elective PCI for stable angina.

**Background**

ON observation has been the standard of care following PCI, with no previous national analyses around changes in practice or clinical outcomes from healthcare systems in which SDD is the predominant practice for elective PCI

**Methods**

Data from 169,623 patients undergoing elective PCI between 2007-2014 were obtained from the British Cardiovascular Intervention Society registry. Multiple logistic regressions and the BCIS risk model were used to study association between SDD and 30-day mortality.

**Results**

SDD rates increased from 23.5% in 2007 to 57.2% in 2014, with centre SDD median prevalence varying from 17% (IQR 6% –39%) in 2007 to 66% (IQR 45% –77%) in 2014. The largest independent association with SDD was observed for radial access, OR=1.69 (95% CI 1.65 to 1.74, P<0.001). An increase in 30-day mortality rates over time for the SDD cases was observed, without exceeding the predicted mortality risk. According to the difference-in-differences analysis, observed 30-day mortality temporal changes did not differ between SDD and ON (OR=1.15, 95% CI 0.294 to 4.475, P=0.884).

**Conclusions**

SDD has become the predominant model of care amongst elective PCI cases in the UK, in increasingly complex patients. SDD appears to be safe with 30-day mortality rates in line with those calculated using the national risk prediction score used for public reporting. Changes towards SDD practice have important health economic implications for healthcare systems worldwide.

**Keywords:** Elective Percutaneous coronary intervention, Same day discharge, Mortality, Outcomes

**Condensed Abstract:**

There are limited data around national trends and comparative outcomes same-day discharge (SDD) versus overnight (ON) observation in elective PCI setting. In this study, we a significant increase in SDD from 23.5% in 2007 to 57.2% in 2014 accompanied by a significant shift in patient risk profile towards a higher risk such as increasing age, comorbidity burden, complex coronary disease and increasing complexity of the procedure. More importantly, despite these changes, SDD practice has almost doubled over the study period with 30-day mortality rates staying in line with those calculated using national risk prediction score.

**Clinical Perspectives:**

**What is known?** There are limited of data in contemporary practice showing national trends in same-day discharge (SDD) practice and comparing clinical outcomes to patients admitted for overnight (ON) observation following elective PCI.

**What is New?** In a national cohort of over 169,000 elective procedures undertaken in United Kingdom, SDD practice was associated with similar risk of 30-day mortality compared to ON stay despite an increase complexity of procedure.

**What is next?** SDD is safe and feasible in majority of the patient requiring elective PCI and may provide significant cost savings for the healthcare systems worldwide.

**Abbreviations**

BCIS = British Cardiovascular Intervention Society

CABG = Coronary Artery Bypass Graft

MI = Myocardial Infraction

ON = OverNight stay

OR = Odds Ratio

PCI = Percutaneous Coronary Intervention

SDD= Same Day Discharge

## **Introduction**

 Percutaneous coronary intervention (PCI) is the most commonly performed cardiovascular procedure in the United States, with over 480,000 PCI procedures undertaken annually, at an estimated mean hospital charge of $84813 (1). Hospitals are increasingly challenged to deliver higher quality care at lower costs, with hospital length of stay an important determinant of total hospital healthcare costs, particularly in procedures such as PCI(2). Historically, overnight observation has been the standard of care following PCI, to detect and manage potential complications, such as major bleeding, vascular access complications, stent thrombosis and recurrent ischemic events(3). Advances in stent technology, pharmacotherapy and changes in access site practice have reduced these early peri-procedural events(4-6), meaning that early complications following PCI are relatively rare. Most of the early complications following PCI, occur either within 6 hours or after 24 hours, and are relatively rare between 6-24 hours (7, 8) meaning that they would not be impacted on by routine overnight observation. Both randomised controlled trials (RCTs) (9-11)and observational studies (12, 13) have found same day discharge (SDD) to be safe, preferred by patients (10) and associated with significant healthcare cost savings(14, 15). Nevertheless, SDD has not been widely adopted in many healthcare systems, with contemporary data from the US suggesting that only 5% of patients eligible for SDD are discharged on the same day(14). A recent survey of interventional cardiologists suggests that only 32% of Canadian and 14% of US interventional cardiologists practice SDD(16).

 Although RCTs have shown the safety of SDD, these have recruited low risk patients and excluded many patients groups such as those with impaired left ventricular function(9-11), PCI in vein grafts(15) or using multiple stents(10), large bore catheter use(9), glycoprotein IIb/IIIa use(9-11), impaired renal function(10, 15), or those aged >80(15). To date there have been no real world analyses from healthcare systems in which SDD is the predominant practice for elective PCI, describing how it has evolved nationally and the changes in case mix that have occurred. Moreover, whilst previous analyses have shown that SDD is safe(12), these have been derived from lower risk cohorts that may not reflect contemporary SDD Practices. The United Kingdom is well placed to study outcomes associated with SDD: it has transitioned to predominantly transradial access site practice that is associated with reduced risk of access site complications, earlier mobilisation that favours SDD (2, 4, 17) and SDD is the most common standard of practice in elective PCI.

 Our aims are: (i) to study regional and temporal trends in the adoption of SDD practice over time in England and Wales using the national British Cardiovascular Interventional Society (BCIS) database, (ii) study temporal trends in clinical, procedural and patient characteristics of SDD cases and how these have compared to changes in the profile of overnight (ON) cases, (iii) to quantify temporal changes in the patient risk profile using the BCIS risk model (18), and study mortality outcomes and how they compared to those predicted by case mix (iv) study independent predictors of early (3-day) and late (30-day) mortality in SDD cases.

**Methods**

**BCIS dataset and exclusion criteria**

 Data were derived from the BCIS – National Institute for Cardiovascular Outcomes Research (BCIS-NICOR) database that captures > 95% of PCI procedures performed from 1st January 2007 until 31st December 2014 in the UK. The dataset contains 123 variables covering demographic characteristics, clinical information, periprocedural and outcome variables, as previously described(18-20). All-cause 30-day mortality was derived from the Office for National Statistics (ONS) data for English and Welsh patients. Mortality records for the patients in Scotland and Ireland are not available from the ONS, so these cases were excluded.

 This analysis included patients aged between 18 and 100 years who underwent elective PCI for stable angina in England and Wales. We excluded duplicate cases, which were identified based on patient identifier, hospital identifier, date of the procedure, age, sex and date of discharge. Cases where age, sex or centre information was not recorded were excluded, as were private centres and centres with fewer than 100 elective PCI procedures within a year (for that year only). Cases where SDD or the outcome (30-day mortality) was missing were also excluded. Additionally, cases recorded with procedural and arterial complications, bleeding up to discharge and an adverse hospital outcome (Supplementary Table 1), as by necessity these cases would be required to remain in hospital for overnight stay and so bias outcomes towards more favourable outcomes in the SDD cohort.

***Statistical analysis***

 We performed descriptive analyses to compare same day discharge practice amongst 11 Strategic Health Authorities (SHAs) in England and Wales and over time, from 2007 to 2014. We produced line graphs and spatial maps including regional same day discharge prevalence. We also described temporal changes in patient characteristics separately for SDD and uncomplicated ON cases (cases in which there were no peri-procedural complications). The variables included in the analysis are described in Supplementary Table 2. For each covariate of interest, a univariate model was fitted to evaluate whether the distribution of each characteristic differed over time for the two cohorts. A linear regression model was used for age and centre sum of elective cases, logistic regression models for each binary variable and a binary generalised logistic regression model for the prevalence of elective cases in each centre variable, multinomial logistic regression models for each nominal variable and ordinal logistic regression for the LVEF. This analysis was performed using the raw data.

 For all subsequent analyses, missing data were imputed using multiple imputation by chained equations, generating 10 imputed datasets. All aforementioned variables were included in the imputation model as well as same day discharge, 30-day mortality, age, sex, centre volume, year and SHA. Within every iteration, each incomplete variable was regressed against the others and missing values were replaced by predictions plus random errors from the model; logistic regression was used for binary variables, multinomial regression for nominal variables and ordinal logistic regression for LVEF. In the substantive modelling, the results from each imputed dataset were aggregated to a single result using Rubin’s rules(21). Summary statistics were produced for each imputed dataset to ensure consistency with the original dataset. Information on data missingness for each variable was also collected.

 To assess which procedural characteristics were independently associated with same day discharge, a multivariable logistic regression analysis was performed; here, the outcome was SDD, and the predictors included in the model were all of the aforementioned variables (apart from 30-day mortality), year of the procedure and a categorical variable for the SHAs. Odds ratios (OR) were reported, with each representing higher (lower) odds of SDD, if higher (less) than 1. Multicollinearity between the variables was assessed using Variance Inflation Factors.

Moreover, we used logistic regression models to compare 30-day mortality between SDD and uncomplicated ON stay cases, adjusting for patient’s characteristics. This was undertaken for all cases and for higher risk cases, defined as cases: (i) older than 75 years old, (ii) diabetic, (iii) left main stem attempted or (iv) chronic total occlusion vessels attempted (CTO). We also performed logistic regression analyses to assess the independent predictors of 30-day mortality only for the SDD cohort and used the previously published BCIS risk model (which had good discrimination and calibration, and is used for national reporting)(22), to estimate the 30-day mortality risk of each patient in the two cohorts (SDD and uncomplicated ON). This model can also be accessed as a calculator via <https://www.bcis.org.uk/resources/pci-risk-calculator/>. The expected risk was obtained within each imputed dataset, which in addition to the observed mortality risk, were aggregated to the mean over the imputed datasets to provide a single value. Finally, we performed a difference-in-differences analysis to compare the risk trends of the two groups. That is, we compared the difference between the two cohorts of the observed and expected 30-day mortality, separately, from 2007 to 2014. A sensitivity analysis was also performed including overnight stay cases with procedural and arterial complications, bleeding up to discharge and adverse hospital outcome (complicated cases; Supplementary Table 1) and changing the outcome to 3-days mortality.

 Stata statistical software version 15 was used for all analyses and an alpha level of 5% was used throughout.

**Results**

 Between 2007 and 2014, 537,425 PCI procedures were performed in England and Wales, of which 169,623 were for elective indications and met the inclusion criteria. Figure 1 displays the flow diagram for exclusions. Among patients who underwent PCI for stable angina, 41.6% were discharged on the same day and 58.4% had an overnight stay. SDD rates increased from 23.5% in 2007 to 57.2% in 2014.

 Supplementary Table 4 illustrates the temporal trends in clinical and procedural characteristics of patients stratified by SDD and uncomplicated ON stay (cases in which no procedural / arterial access site complications occurred). Females were less likely to be discharged the same day than males and average age was consistently lower for the SDD cases, though overall increased from an average of 63.3 (±10.1) in 2007 to 65.3 (±10.6) years old in 2014. Moreover, factors that indicate higher risk patients (e.g. previous myocardial infarction, diabetes, previous Coronary Artery Bypass Graft (CABG), renal impairment etc.) were observed more commonly in the uncomplicated ON cases. Current smoking was slightly higher for the SDD group at all timepoints. Multi-vessel disease prevalence was consistently higher for the uncomplicated ON cases, as was left main territory and the use of GPIIb/IIIa inhibitor. Radial access was more commonly observed in the SDD cohort, and the difference increased over time. Crude 30-day mortality was consistently lower for the SDD cases. Missing data information is presented in supplementary Table 3. Supplementary Tables 5 and 6 display temporal changes after multiple imputation and comparing SDD with ON, including complicated cases (cases where there were either procedural or arterial complications). The results of both the analyses were similar to those aforementioned.

 In most regions in England and Wales, SDD proportions increased over time (Figure 2, Supplementary Figure 1). North East England had the largest increase, from 4% in 2007 to 64% in 2014. Large increases were also found for the South East Coast (from 14% to 64%) and West Midlands (from 17% to 59%). In the South West there were no apparent increases (Supplementary Table 7). The highest proportion was observed for Wales in 2014: 87% of elective cases discharged on the same day. At the centre level, overall 79 centres performed at least 100 elective procedures in a year and same day discharge median prevalence varied from 17% (IQR 6% –39%) in 2007 to 66% (IQR 45% –77%) in 2014.

 Independent predictors of SDD are presented in Table 1. Female patients were significantly less likely to be SDD than males (OR 0.92, 95%CI 0.893-0.94, P<0.001) and similarly increasing age was independently associated with a lower rate of SDD (OR 0.99 per year, 95% CI 0.987-0.99, P<0.001), whilst receipt of GPIIb/IIIa inhibitor had the largest independent association with overnight stay, with OR=0.27 (95% CI 0.257 to 0.285, P<0.001) for SDD. Significant independent association with uncomplicated ON was also observed with the prevalence of elective cases within centres, renal history (high creatinine level and dialysis use), left main stem attempted, chronic total occlusions attempted, valvular heart disease and peripheral vascular disease. Centre prevalence of elective cases was also independently associated with overnight stay, with OR=0.59 (95% CI 0.531 to 0.666, P<0.001). The largest independent association with SDD was observed for radial access site, with OR=1.69 (95% CI 1.653 to 1.738, P<0.001). The coefficient estimate for calendar time was 1.25 per calendar year (95% CI 1.241 to 1.257, P<0.001), after adjusting for case-mix. This indicates that SDD became more prevalent over time regardless of changes in patient characteristics. Similar results were observed when the analysis was repeated, but this time including the complicated ON cases (cases with periprocedural complications; Supplementary Table 8).

 SDD was independently associated with reduced odds for 30-day mortality both for all cases and for the higher risk cases (with OR=0.58, 95%CI 0.448-0.747, P<0.001 and OR=0.47, 95%CI 0.346-0.648, P<0.001 for SDD, respectively) (Table 2 and Supplementary Table 9). SDD was not associated with 3-day mortality after adjusting for patient’s characteristics for either the whole cohort or the higher risk group (OR=1.23, 95%CI 0.731-2.083, P=0.431 and OR=0.70, 95%CI 0.363-1.344, P=0.282, respectively) (Table 3 and Supplementary Table 10). Independent predictors of 30-day mortality in the SDD cohort were age, multivessel PCI, LMS PCI, dialysis, poor LV function, current smoking and GPIIb/IIIa inhibitor use (Table 4). Independent predictors for 3-day mortality in the SDD cases were age, current smoking and GPIIb/IIIa inhibitor use (Table 5). Calculated 30-day mortality rates from the BCIS model were compared to the observed mortality rates in Central Illustration. Here, we observed slow increases in both expected and observed mortality risk for SDD patients, with some variation in observed risk because of the small number of deaths. It can be seen that the calculated risk profile of SDD cases increased over time, but observed 30-day mortality rates did not exceed those predicted by the BCIS risk model. A similar slow increase in the calculated expected and observed 30-day mortality risk was observed for the uncomplicated ON cases. Within the sensitivity analysis, 3% of the overnight stay cases who demonstrated complications were excluded, which did not materially change the findings (Central Illustration). Finally, the changes of the observed mortality rates over time for the two cohorts do not differ significantly for both 30-days mortality (OR=1.15, 95% CI 0.294 to 4.475, P=0.884) and 3-days mortality (OR=0.69, 95% CI 0.080 to 5.944, P=0.735) (Table 6).

**Discussion**

 In this paper, we present the largest analysis to date of SDD, and how this has evolved from a national perspective in the United Kingdom to become the current dominant model of care in elective PCI cases. Secondly, we show significant heterogeneity in discharge practice nationally, with up to 5-fold differences in its adoption across different regions, after differences in patient and procedural characteristics have been adjusted for. Thirdly, our findings suggest that over time, PCI cases of increasing complexity are considered for SDD, with an increasing average age, a greater prevalence of comorbid conditions and more complex disease treated such as left main stem or multi-vessel disease. Finally, despite these changes towards a higher risk profile, SDD appears to be safe and is not associated with increased risk of either early (3 day) or 30-day mortality and observe that 30-day SDD mortality rates are in line with those calculated using the national risk prediction score that is used for public reporting. These findings provide robust reassurance that a change in SDD practice towards higher risk patients is safe, and that changes towards a predominant SDD model of care for elective PCI nationally is feasible, which may have important health economic implications internationally.

 Our data demonstrate that SDD has evolved from cases undertaken in younger patients to more complex cases in multi-morbid older patients as evidenced by the increasing average age of SDD patients, the greater prevalence of comorbid conditions such as diabetes, renal failure, valvular heart disease, patients requiring dialysis, and more complex disease treated such as LMS and multi-vessel disease. Our analysis suggests that clinical characteristics such as age, female sex, prior CABG, impaired left ventricular function, valvular heart disease and comorbid conditions such as diabetes, renal dysfunction, previous AMI and prior stroke are independently associated with ON stay. This is not surprising as many of these clinical and procedural characteristics contribute to contemporary risk scores for PCI and are independently associated with adverse procedural outcomes(22-26). Operators may therefore choose to monitor such patients with higher risk procedural and clinical characteristics overnight. Previous analyses have similarly identified comorbid burden and complexity of PCI as independent predictors of ON stay(27, 28), with patients with the highest rate of comorbid burden (as defined by a Charlson score >5) 30% less likely to be SDD compared to those with the lowest comorbid burden (Charlson score 0-2)(28).

 Anticipation of vascular complications related to access site bleeding has traditionally been an important driver for extending the hospital observation period overnight(3), although contemporary practices using vascular closure devices, ultrasound guided femoral access and smaller sheath sizes have improved the safety of femoral access. Over a similar period of time to the current study, transradial access (TRA) has grown to become the default access site used for PCI in the UK(2, 4, 17), driven by earlier patient mobilisation, decreases in major bleeding and vascular access site complications associated with TRA. Indeed, we observe that one of the strongest independent predictors of SDD was the use of TRA OR=1.69 (95% CI 1.653 to 1.738, P<0.001). Interestingly, and by contrast to the currently presented data, an analysis of the National Cardiovascular Data Registry CathPCI Registry linked to Medicare claims between 2009 and 2012 revealed that SDD was only used in 5.3% of elective PCI cases of which over 23% were undertaken through the TRA route (TRA prevalence 9% in the whole cohort)(14).

 Whilst previous literature has shown the safety of SDD, (3, 12, 13, 29)many of the studies have been derived from healthcare systems in which SDD is not commonplace, and are derived from low risk cohorts where complex PCI cases are excluded. For example, many of the randomised controlled studies have excluded elderly patients(10, 15), those with complex disease such as CTO, LMS or prior CABG(10, 15), or those with impaired left ventricular function(10, 11). Hence such data may not reflect outcomes of contemporary higher risk cohorts that are SDD cases. Furthermore whilst many observational studies have reported the safety of SDD(3, 13), safety endpoints are often compared to those observed in cases that are admitted for overnight stay, where outcomes may be less favourable as patients with complications or adverse events during their PCI are admitted for overnight monitoring, and it is well known that peri-procedural complications are associated with adverse post discharge outcomes(30-32). Furthermore, complex cases that are higher risk are more likely to be admitted for overnight monitoring and their post discharge outcomes will be worse by default compared to those observed for SDD. Therefore comparison of clinical outcomes between SDD and ON stay cases may not be an appropriate means to assess the safety of SDD; even when one adjusts for differences in clinical / procedural characteristics. Using a alternate approach, we have studied outcomes associated with SDD through analysis of observed mortality outcomes at 30 days in comparison to “expected” outcomes based on the patient / procedural risk profile using the BCIS risk score that is used for national reporting (22) in both SDD and ON groups, and excluded cases in which peri-procedural complications were sustained as the primary analysis, although these cases were included in the sensitivity analyses. This should overcome many of the limitations in directly comparing safety outcomes between SDD and ON as we have highlighted above. Our analysis shows that whilst both clinical characteristics and the complexity of cases undertaken in SDD has increased over time, 30 day clinical outcomes are in line with those predicted by the BCIS model, supporting the safety of this practice. We have also studied the safety of SDD at earlier time points (3 days) and show that SDD was not associated with increased risk of mortality at this timepoint compared to patients with ON, either in the whole cohort or in those patients defined as higher risk.

 Whilst previous studies have investigated national SDD practice(13), these have come from healthcare systems in which SDD is not common place, and represent highly selected cohorts from a small number of centres. For example, in the analysis of Rao et al (13) using the United States CathPCI Registry, they reported a SDD prevalence of only 1.25% comparing outcomes of 1339 SDD patients to 105,679 patients admitted to ON stay. In this analysis, no significant differences was observed in either 2- or 30-day mortality or a composite endpoint of mortality and hospitalisation between the two groups of patients, although this was a highly selective SDD cohort representing relatively uncommon practice at the time. Consequently, such data cannot inform health care policy makers with regard to the safety of transitioning towards SDD from ON stay nationally. Analysis of PCI data derived from the Florida and New York State Ambulatory Surgical Database (SASD) and State Inpatient Database (SID) between 2009-2013 showed that SDD increased from 2.5% in 2009 to 7.4% in 2013(28), although factors known to be important in guiding the decision for SDD, such as access site choice and pharmacology, were not available, and important safety outcomes such as post discharge mortality were not captured. Importantly there have been no previous studies reporting how the risk profile, the clinical and procedural characteristics of SDD cases has changed temporally from national healthcare systems that had transitioned to predominantly SDD, to provide an overview of experience and guidance to healthcare systems that are in the early phases of SDD adoption.

 For successful implementation of SDD practice, it is important to accurately assess patients for suitability for SDD after successful PCI. A recent expert consensus document update from the Society for Cardiovascular Angiography and Interventions (33) has provided a framework for SDD around the “three P’s”: Procedure, Patient, and Program, focussing on patient, procedural and institutional factors. Institutional factors identified include: (1) safe monitoring in the immediate post-PCI period, (2) appropriate guideline directed medical therapy including dual antiplatelet therapy and counselling on treatment duration, (3) compliance with PCI performance measures including secondary prevention and education on risk factor modification, and (4) timely follow-up, including a phone call within 24–72 hr and a scheduled clinic appointment within 2–4 weeks. Whilst our national analysis does not provide information on local institutional policies within the United Kingdom, this document consensus provides a framework that can be used in healthcare systems where SDD is less well established. Our analysis of predictors of both early (3-day) and 30-day mortality in SDD patients provides insight into patient groups at higher risk of adverse outcomes. At the 30 days timepoint independent predictors of mortality include age, GPIIb/IIIa use, poor LV function, multi-vessel or LMS PCI and renal dialysis. Many of the predictors of adverse outcomes for 30-day mortality for SDD patients are known to associate with poorer prognosis and it is unlikely that admitting such higher risk patients ON for observation would impact on 30-day mortality rates. Of interest at the earlier time point (3-days), the independent predictors of mortality include age, current smoking and GPIIb/IIIa use. Interestingly, Current smoking is independently associated with early and 30-day mortality for only SDD cases but not for the whole cohort. It is unclear why this may be the case, but smokers that remain overnight in a hospital facility would not be able to smoke, in contrast to those discharged on the same day. Smoking is known to increase platelet activation, aggregation and activates thrombotic cascades which may place individuals who smoke particularly in the early stages after PCI at greater risk of ischemic complications or death (34). Whilst our dataset does not capture post discharge complications such as stent thrombosis, our observedincrease risk of mortality particularly in early time points in smokers discharged on the same day may support such a hypothesis. Use of GPIIb/IIIa may act as a surrogate for higher risk cases, or cases where a suboptimal result occurred necessitating the use of GPIIb/IIIa that may contribute to the increased risk of mortality observed at this timepoint associated with their use. GPIIb/IIIa drugs also increase the risk of bleeding complications, although lack of data around causes of death does not allow us to differentiate whether the increased risk associated with GPIIb/IIIa use relates to bleeding complications.

 Our analysis is subject to a number of limitations. Firstly, our analysis is a comparison of cases that were discharged on the same day following elective PCI and patients that were admitted ON. It does not provide any information regarding patients that were planned as SDD cases but because of a complication or a more complex procedure, a decision was made to monitor them over night (intention to treat versus “actual treatment” received). Our study therefore does not provide insight into which cases can be safely discharged on the same day of the procedure upfront. Secondly, our analysis only includes 30-day mortality outcomes and not post discharge complications that are not captured by the BCIS dataset and so our data is unable to provide insight whether the risk of complications is greater amongst patients with SDD. Nevertheless RCTs have not shown any significant difference in major adverse events or complications up to 30 days post discharge between SDD or ON stay patient groups (11). Furthermore propensity score matched data from the states of New York and Florida, did not reveal any significant differences in 30 day myocardial infarction, complications or readmission rates between SDD and ON stay cohorts of patients, although even in the last year studied (2013), rates of SDD were less than 10% (28). Finally, a recent analysis from the Premier Healthcare Database suggests that SDD is not associated with increased rates of either major bleeding, myocardial infarction or acute kidney injury at 30 days (35). Thirdly, we do not have information around the timing of the PCI procedure which may impact on the decision to SDD. Infrastructure may not be in place at all institutions to monitor patients whose procedures undertaken in the late afternoon for 4-6 hours on a day case unit, and so such patients may be admitted for ON stay. Our analysis was limited to data up to 2014 and it possible that SDD discharge practices have evolved further in more contemporary practice. Finally, whilst we have included centre volume as an institutional characteristic in our models, the BCIS dataset does not capture infrastructural aspects to centres such as radial lounges that promote SDD practice(36, 37).

 In conclusion, SDD has become the predominant model of care amongst elective cases in the United Kingdom. We report that as adoption of SDD has increased over time, with patients undergoing elective PCI with SDD are increasingly complex, elderly, with a greater prevalence of comorbid conditions and more complex disease treated such as left main stem and multi-vessel disease. Despite these changes towards a higher risk profile, SDD appears to be safe with 30-day mortality rates in line with those calculated using the national risk prediction score used for public reporting. These findings provide reassurance that a change in SDD practice towards higher risk patients is safe, and that changes towards a predominant SDD model of care for elective PCI nationally is feasible, which has important health economic implications for healthcare systems worldwide.

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**Table 1: Multivariable logistic regression model (with adjusted ORs) for the SDD**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Odds Ratio** | **Std. Err.** | **p-value** | **[95% Confidence Interval]** |
| **Female** | 0.92 | 0.012 | <0.001 | [0.893, 0.940] |
| **Age** *(per year)* | 0.99 | 0.0001 | <0.001 | [0.987, 0.990] |
| **Ethnicity** |  |  |  |  |
| Caucasian | Ref |  |  |  |
| Black | 0.98 | 0.070 | 0.784 | [0.852, 1.128] |
| Asian | 0.86 | 0.023 | <0.001 | [0.814, 0.904] |
| Other | 1.75 | 0.039 | <0.001 | [1.679, 1.834] |
| **Medical history** |  |  |  |  |
| Previous MI | 0.95 | 0.013 | 0.001 | [0.929, 0.982] |
| Previous CABG | 0.81 | 0.020 | <0.001 | [0.770, 0.849] |
| Previous PCI | 0.96 | 0.013 | 0.004 | [0.938, 0.988] |
| High Cholesterol | 0.99 | 0.013 | 0.546 | [0.968, 1.017] |
| Hypertension | 0.96 | 0.012 | 0.003 | [0.942, 0.987] |
| Peripheral Vascular Disease | 0.77 | 0.021 | <0.001 | [0.734, 0.815] |
| Previous Stroke | 0.95 | 0.029 | 0.070 | [0.892, 1.004] |
| Diabetes | 0.99 | 0.014 | 0.523 | [0.966, 1.021] |
| **Renal history** |  |  |  |  |
| No renal | Ref |  |  |  |
| High Creatinine(>μmol/l – no dialysis) | 0.54 | 0.027 | <0.001 | [0.486, 0.594] |
| Dialysis | 0.66 | 0.043 | <0.001 | [0.585, 0.753] |
| **Smoking** |  |  |  |  |
| Never smoked | Ref |  |  |  |
| Ex smoker | 1.05 | 0.014 | <0.001 | [1.023, 1.076] |
| Current Smoker | 1.03 | 0.020 | 0.126 | [0.992, 1.070] |
| **LVEF** |  |  |  |  |
| Good | Ref |  |  |  |
| Moderate (LVEF 30-50%) | 0.92 | 0.019 | <0.001 | [0.882, 0.958] |
| Poor (LVEF < 30%) | 0.90 | 0.028 | 0.001 | [0.847, 0.958] |
| **Multi-vessel Disease** | 0.86 | 0.015 | <0.001 | [0.834, 0.896] |
| **Left Main** **Stem attempted** | 0.68 | 0.021 | <0.001 | [0.636, 0.719] |
| **Valvular Heart Disease** | 0.76 | 0.035 | <0.001 | [0.698, 0.834] |
| **CTO attempted** | 0.71 | 0.013 | <0.001 | [0.690, 0.742] |
| **Antiplatelet use** |  |  |  |  |
| Clopidogrel | Ref |  |  |  |
| Ticagrelor | 0.89 | 0.060 | 0.101 | [0.783, 1.022] |
| Prasugrel | 0.82 | 0.047 | 0.001 | [0.729, 0.915] |
| Ticlopidine | 1.11 | 0.132 | 0.398 | [0.873, 1.403] |
| **Warfarin** | 0.94 | 0.045 | 0.233 | [0.858, 1.036] |
| **Bivalirudin** | 0.97 | 0.109 | 0.822 | [0.784, 1.213] |
| **GP IIa/IIIb inhibitor** | 0.27 | 0.007 | <0.001 | [0.257, 0.285] |
| **Stent type** |  |  |  |  |
| No stents | Ref |  |  |  |
| Bare metal | 0.77 | 0.019 | <0.001 | [0.737, 0.811] |
| Drug-eluting | 0.71 | 0.015 | <0.001 | [0.683, 0.742] |
| BMS and DES | 0.66 | 0.024 | <0.001 | [0.611, 0.704] |
| **Access site** |  |  |  |  |
| Femoral | Ref |  |  |  |
| Radial  | 1.69 | 0.022 | <0.001 | [1.653, 1.738] |
| Multiple | 0.87 | 0.034 | <0.001 | [0.802, 0.936] |
| Other | 1.12 | 0.107 | 0.227 | [0.931, 1.351] |
| **Year** | 1.25 | 0.004 | <0.001 | [1.241, 1.257] |
| **Centre elective prevalence** | 0.59 | 0.034 | <0.001 | [0.531, 0.666] |
| **Centre elective size** | 1.001 | 0.00002 | <0.001 | [1.001, 1.002] |
| **SHA** |  |  |  |  |
| London | Ref |  |  |  |
| North East  | 0.22 | 0.007 | <0.001 | [0.204, 0.231] |
| North West  | 0.80 | 0.017 | <0.001 | [0.770, 0.841] |
| Yorkshire and the Humber  | 0.18 | 0.005 | <0.001 | [0.168, 0.187] |
| East Midlands  | 1.13 | 0.027 | <0.001 | [1.075, 1.181] |
| West Midlands  | 0.87 | 0.021 | <0.001 | [0.850, 0.933] |
| East of England  | 0.42 | 0.009 | <0.001 | [0.513, 0.562] |
| South East Coast  | 0.69 | 0.016 | <0.001 | [0.672, 0.737] |
| South Central  | 1.57 | 0.041 | <0.001 | [1.235, 1.364] |
| South West  | 0.70 | 0.016 | <0.001 | [0.623, 0.685] |
| Wales  | 1.90 | 0.062 | <0.001 | [1.584, 1.786] |
| **Intercept**  | 2.3e-184 | 1.5e-183 | <0.001 | [1.0e-189, 5.3e-179] |

BMS=Bare mare stent; CABG=Coronary Artery Bypass Graft; CTO=Chronic Total Occlusion; DES=Drug-eluting stent; GP=Glycoprotein; LVEF=Left ventricular ejection fraction; MI=Myocardial infarction; PCI=Percutaneous Coronary Intervention; SHA=Strategic Health Authorities

**Table 2: Multivariable logistic regression model (with adjusted ORs) for 30-days mortality**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Odds Ratio** | **Std. Err.** | **p-value** | **[95% Confidence Interval]** |
| **SDD** | 0.58 | 0.075 | <0.001 | [0.448, 0.747] |
| **Female** | 1.01 | 0.130 | 0.944 | [0.784, 1.299] |
| **Age** *(per year)* | 1.05 | 0.007 | <0.001 | [1.038, 1.064] |
| **Ethnicity** |  |  |  |  |
| Caucasian | Ref |  |  |  |
| Black | 1.08 | 0.743 | 0.917 | [0.271, 4.265] |
| Asian | 0.87 | 0.238 | 0.619 | [0.509, 1.496] |
| Other | 0.63 | 0.204 | 0.163 | [0.324, 1.220] |
| **Medical history** |  |  |  |  |
| Previous MI | 1.35 | 0.179 | 0.025 | [1.038, 1.748] |
| Previous CABG | 0.59 | 0.100 | 0.002 | [0.418, 0.821] |
| Previous PCI | 0.99 | 0.126 | 0.951 | [0.773, 1.274] |
| High Cholesterol | 0.73 | 0.089 | 0.009 | [0.574, 0.925] |
| Hypertension | 0.82 | 0.101 | 0.113 | [0.649, 1.047] |
| Peripheral Vascular Disease | 1.53 | 0.265 | 0.014 | [1.089, 2.149] |
| Previous Stroke | 1.76 | 0.337 | 0.003 | [1.211, 2.562] |
| Diabetes | 1.67 | 0.199 | <0.001 | [1.317, 2.107] |
| **Renal history** |  |  |  |  |
| No renal | Ref |  |  |  |
| High Creatinine(>μmol/l – no dialysis) | 2.25 | 0.507 | <0.001 | [1.443, 3.495] |
| Dialysis | 2.75 | 0.816 | 0.001 | [1.541, 4.923] |
| **Smoking** |  |  |  |  |
| Never smoked | Ref |  |  |  |
| Ex smoker | 0.92 | 0.112 | 0.513 | [0.729, 1.171] |
| Current smoker | 1.29 | 0.257 | 0.209 | [0.868, 1.902] |
| **LVEF** |  |  |  |  |
| Good | Ref |  |  |  |
| Moderate (LVEF 30-50%) | 1.91 | 0.268 | <0.001 | [1.453, 2.521] |
| Poor (LVEF < 30%) | 2.98 | 0.593 | <0.001 | [2.013, 4.419] |
| **Multi-vessel Disease** | 2.01 | 0.282 | <0.001 | [1.526, 2.661] |
| **Left Main Stem attempted** | 1.75 | 0.331 | 0.003 | [1.208, 2.537] |
| **Valvular Heart Disease** | 1.93 | 0.465 | 0.006 | [1.205, 3.097] |
| **CTO attempted** | 1.10 | 0.185 | 0.553 | [0.795, 1.535] |
| **Antiplatelet use** |  |  |  |  |
| Clopidogrel | Ref |  |  |  |
| Ticagrelor | 0.97 | 0.525 | 0.957 | [0.335, 2.818] |
| Prasugrel | 0.33 | 0.325 | 0.261 | [0.047, 2.299] |
| Ticlopidine | 1.60 | 1.948 | 0.700 | [0.136, 18.843] |
| **Warfarin** | 0.45 | 0.226 | 0.112 | [0.166, 1.205] |
| **Bivalirudin** | 1.40 | 1.024 | 0.643 | [0.335, 5.872] |
| **GP IIa/IIIb inhibitor** | 1.75 | 0.306 | 0.001 | [1.238, 2.462] |
| **Stent type** |  |  |  |  |
| No stents | Ref |  |  |  |
| BMS | 1.07 | 0.227 | 0.747 | [0.706, 1.624] |
| Drug-eluting | 0.62 | 0.113 | 0.009 | [0.433, 0.886] |
| BMS and DES | 1.01 | 0.289 | 0.971 | [0.577, 1.771] |
| **Access site** |  |  |  |  |
| Femoral | Ref |  |  |  |
| Radial | 0.90 | 0.116 | 0.407 | [0.697, 1.157] |
| Multiple | 1.04 | 0.374 | 0.918 | [0.512, 2.103] |
| Other | 0.63 | 0.634 | 0.644 | [0.086, 4.567] |
| **Year** | 1.10 | 0.035 | 0.002 | [1.038, 1.176] |
| **Centre elective prevalence** | 0.61 | 0.335 | 0.369 | [0.209, 1.788] |
| **Centre elective size** | 1.00 | 0.000 | 0.194 | [1.000, 1.001] |
| **SHA** |  |  |  |  |
| London | Ref |  |  |  |
| North East | 0.20 | 0.079 | <0.001 | [0.092, 0.434] |
| North west | 0.68 | 0.162 | 0.105 | [0.425, 1.084] |
| Yorkshire and the Humber | 0.75 | 0.167 | 0.203 | [0.488, 1.165] |
| East Midlands | 0.70 | 0.152 | 0.097 | [0.454, 1.068] |
| West Midlands | 0.47 | 0.126 | 0.005 | [0.279, 0.796] |
| East of England | 0.77 | 0.159 | 0.208 | [0.515, 1.156] |
| South East Coast | 0.56 | 0.138 | 0.018 | [0.344, 0.907] |
| South Central | 0.56 | 0.162 | 0.045 | [0.318, 0.987] |
| South West | 0.57 | 0.133 | 0.016 | [0.360, 0.902] |
| Wales | 2.36 | 0.587 | 0.001 | [1.450, 3.846] |
| **Intercept** | 1.09e-91 | 7.00e-90 | 0.001 | [1.80e-146, 6.67e-37] |

BMS=Bare mare stent; CABG=Coronary Artery Bypass Graft; CTO=Chronic Total Occlusion; DES=Drug-eluting stent; GP=Glycoprotein; LVEF=Left ventricular ejection fraction; MI=Myocardial infarction; PCI=Percutaneous Coronary Intervention; SDD=Same Day Discharge; SHA=Strategic Health Authorities

**Table 3: Multivariable logistic regression model (with adjusted ORs) for 3-days mortality**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Odds Ratio** | **Std. Err.** | **p-value** | **[95% Confidence Interval]** |
| **SDD** | 1.23 | 0.330 | 0.431 | [0.731, 2.083] |
| **Female** | 1.27 | 0.354 | 0.385 | [0.739, 2.195] |
| **Age** *(per year)* | 1.05 | 0.014 | 0.000 | [1.025, 1.081] |
| **Caucasian** | 1.13 | 0.484 | 0.769 | [0.485, 2.653] |
| **Medical history** |  |  |  |  |
| Previous MI | 1.03 | 0.308 | 0.935 | [0.567, 1.853] |
| Previous CABG | 0.52 | 0.236 | 0.153 | [0.212, 1.280] |
| Previous PCI | 1.25 | 0.369 | 0.451 | [0.699, 2.232] |
| High Cholesterol | 0.57 | 0.152 | 0.034 | [0.335, 0.957] |
| Hypertension | 0.87 | 0.235 | 0.593 | [0.508, 1.472] |
| Peripheral Vascular Disease | 1.79 | 0.717 | 0.146 | [0.816, 3.927] |
| Previous Stroke | 1.52 | 0.730 | 0.385 | [0.592, 3.896] |
| Diabetes | 1.33 | 0.377 | 0.311 | [0.765, 2.321] |
| **Renal history** |  |  |  |  |
| No renal | Ref |  |  |  |
| High Creatinine(>μmol/l – no dialysis) | 1.84 | 1.124 | 0.319 | [0.555, 6.092] |
| Dialysis | 4.65 | 2.876 | 0.013 | [1.382, 15.628] |
| **Smoking** |  |  |  |  |
| Never smoked | Ref |  |  |  |
| Ex smoker | 1.26 | 0.353 | 0.412 | [0.726, 2.181] |
| Current smoker | 1.39 | 0.622 | 0.468 | [0.574, 3.343] |
| **LVEF** |  |  |  |  |
| Good | Ref |  |  |  |
| Moderate (LVEF 30-50%) | 1.72 | 0.562 | 0.099 | [0.902, 3.278] |
| Poor (LVEF < 30%) | 1.64 | 0.881 | 0.359 | [0.567, 4.743] |
| **Multi-vessel Disease** | 1.96 | 0.591 | 0.028 | [1.076, 3.553] |
| **Left Main Stem attempted** | 3.20 | 1.184 | 0.002 | [1.552, 6.610] |
| **Valvular Heart Disease** | 1.09 | 0.808 | 0.903 | [0.257, 4.654] |
| **CTO attempted** | 2.01 | 0.638 | 0.028 | [1.077, 3.745] |
| **Clopidogrel** | 0.65 | 0.481 | 0.558 | [0.151, 2.778] |
| **GP IIa/IIIb inhibitor** | 1.84 | 0.688 | 0.105 | [0.880, 3.829] |
| **Stent type** |  |  |  |  |
| No stents | Ref |  |  |  |
| BMS | 2.39 | 1.442 | 0.148 | [0.733, 7.815] |
| Drug-eluting | 1.41 | 0.769 | 0.528 | [0.484, 4.111] |
| BMS and DES | 3.51 | 2.404 | 0.068 | [0.913, 13.503] |
| **Access site** |  |  |  |  |
| Femoral | Ref |  |  |  |
| Radial | 0.78 | 0.241 | 0.429 | [0.429, 1.433] |
| Multiple or Other | 1.90 | 1.078 | 0.255 | [0.627, 5.786] |
| **Year** | 0.95 | 0.070 | 0.456 | [0.819, 1.094] |
| **Centre elective prevalence** | 0.08 | 0.128 | 0.102 | [0.004, 1.640] |
| **Centre elective size** | 1.00 | 0.001 | 0.073 | [1.000, 1.002] |
| **SHA** |  |  |  |  |
| London | Ref |  |  |  |
| North East | 0.27 | 0.226 | 0.117 | [0.053, 1.384] |
| North west | 0.99 | 0.513 | 0.990 | [0.361, 2.732] |
| Yorkshire and the Humber | 0.46 | 0.290 | 0.217 | [0.131, 1.587] |
| East Midlands | 0.96 | 0.497 | 0.934 | [0.347, 2.646] |
| West Midlands | 0.52 | 0.356 | 0.341 | [0.138, 1.982] |
| East of England | 1.12 | 0.535 | 0.817 | [0.437, 2.854] |
| South East Coast | 0.87 | 0.493 | 0.810 | [0.289, 2.638] |
| South Central | 0.83 | 0.507 | 0.763 | [0.252, 2.749] |
| South West | 0.95 | 0.484 | 0.912 | [0.347, 2.578] |
| Wales | 4.40 | 2.132 | 0.002 | [1.703, 11.376] |
| **Intercept** | 8.24e+37 | 1.22e+40 | 0.556 | [6.5e-89, 1e+164] |

BMS=Bare mare stent; CABG=Coronary Artery Bypass Graft; CTO=Chronic Total Occlusion; DES=Drug-eluting stent; GP=Glycoprotein; LVEF=Left ventricular ejection fraction; MI=Myocardial infarction; PCI=Percutaneous Coronary Intervention; SDD=Same Day Discharge; SHA=Strategic Health Authorities

\*Due to low numbers of 3-day mortality Warfarin and Bivalirudin use were excluded; Ethnicity was transformed to Caucasian or else, Antiplatelets use was transformed to Clopidogrel use or else and multiple or other access site were combined in one category

**Table 4: Multivariable logistic regression model (with adjusted ORs) for 30-days mortality only SDD cases**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Odds Ratio** | **Std. Err.** | **p-value** | **[95% Confidence Interval]** |
| **Female** | 0.86 | 0.233 | 0.567 | [0.501, 1.459] |
| **Age** *(per year)* | 1.04 | 0.012 | <0.001 | [1.019, 1.067] |
| **Caucasian** | 1.32 | 0.524 | 0.491 | [0.593, 2.928] |
| **Medical history** |  |  |  |  |
| Previous MI | 1.52 | 0.377 | 0.092 | [0.934, 2.471] |
| Previous CABG | 0.79 | 0.256 | 0.459 | [0.415, 1.489] |
| Previous PCI | 1.02 | 0.255 | 0.944 | [0.623, 1.663] |
| High Cholesterol | 0.75 | 0.183 | 0.246 | [0.468, 1.215] |
| Hypertension | 0.82 | 0.197 | 0.416 | [0.514, 1.317] |
| Peripheral Vascular Disease | 1.81 | 0.627 | 0.086 | [0.919, 3.572] |
| Previous Stroke | 1.84 | 0.719 | 0.118 | [0.856, 3.958] |
| Diabetes | 1.55 | 0.372 | 0.065 | [0.972, 2.486] |
| **Renal history** |  |  |  |  |
| No renal | Ref |  |  |  |
| High Creatinine(>μmol/l – no dialysis) | 2.38 | 1.294 | 0.111 | [0.818, 6.911] |
| Dialysis | 4.28 | 2.683 | 0.020 | [1.252, 14.625] |
| **Smoking** |  |  |  |  |
| Never smoked | Ref |  |  |  |
| Ex smoker | 1.18 | 0.300 | 0.510 | [0.719, 1.943] |
| Current smoker | 2.26 | 0.752 | 0.014 | [1.181, 4.340] |
| **LVEF** |  |  |  |  |
| Good | Ref |  |  |  |
| Moderate (LVEF 30-50%) | 1.47 | 0.468 | 0.228 | [0.782, 2.765] |
| Poor (LVEF < 30%) | 3.10 | 1.271 | 0.007 | [1.368, 7.007] |
| **Multi-vessel Disease** | 2.02 | 0.515 | 0.007 | [1.218, 3.338] |
| **Left Main Stem attempted** | 2.49 | 0.939 | 0.016 | [1.186, 5.210] |
| **Valvular Heart Disease** | 0.45 | 0.463 | 0.437 | [0.060, 3.384] |
| **CTO attempted** | 0.81 | 0.301 | 0.574 | [0.392, 1.681] |
| **Clopidogrel** | 1.05 | 0.747 | 0.941 | [0.261, 4.251] |
| **Warfarin** | 0.42 | 0.425 | 0.391 | [0.057, 3.071] |
| **Bivalirudin** | 2.80 | 2.994 | 0.335 | [0.345, 22.745] |
| **GP IIa/IIIb inhibitor** | 2.53 | 1.018 | 0.021 | [1.149, 5.569] |
| **Stent type** |  |  |  |  |
| No stents | Ref |  |  |  |
| BMS | 1.79 | 0.839 | 0.213 | [0.715, 4.491] |
| Drug-eluting | 0.96 | 0.405 | 0.931 | [0.422, 2.200] |
| BMS and DES | 2.06 | 1.207 | 0.215 | [0.656, 6.497] |
| **Access site** |  |  |  |  |
| Femoral | Ref |  |  |  |
| Radial | 1.23 | 0.319 | 0.415 | [0.744, 2.048] |
| Multiple | 3.02 | 1.689 | 0.048 | [1.011, 9.037] |
| Other | 3.49 | 3.627 | 0.229 | [0.456, 26.741] |
| **Year** | 1.02 | 0.066 | 0.713 | [0.902, 1.163] |
| **Centre elective prevalence** | 0.55 | 0.726 | 0.649 | [0.040, 7.410] |
| **Centre elective size** | 1.00 | 0.001 | 0.271 | [1.000, 1.002] |
| **SHA** |  |  |  |  |
| London | Ref |  |  |  |
| North East | 0.35 | 0.286 | 0.198 | [0.071, 1.727] |
| North west | 0.41 | 0.224 | 0.104 | [0.143, 1.197] |
| Yorkshire and the Humber | 1.12 | 0.611 | 0.831 | [0.386, 3.263] |
| East Midlands | 0.70 | 0.322 | 0.443 | [0.287, 1.727] |
| West Midlands | 0.70 | 0.355 | 0.478 | [0.256, 1.891] |
| East of England | 0.85 | 0.385 | 0.720 | [0.349, 2.068] |
| South East Coast | 0.76 | 0.414 | 0.618 | [0.263, 2.212] |
| South Central | 0.95 | 0.468 | 0.917 | [0.362, 2.493] |
| South West | 0.96 | 0.405 | 0.921 | [0.419, 2.195 |
| Wales | 3.06 | 1.195 | 0.004 | [1.420, 6.578] |
| **Intercept** | 3.23e-26 | 4.22e-24 | 0.653 | [1.80e-137, 5.76e+85] |

BMS=Bare mare stent; CABG=Coronary Artery Bypass Graft; CTO=Chronic Total Occlusion; DES=Drug-eluting stent; GP=Glycoprotein; LVEF=Left ventricular ejection fraction; MI=Myocardial infarction; PCI=Percutaneous Coronary Intervention; SHA=Strategic Health Authorities

**Table 5: Multivariable logistic regression model (with adjusted ORs) for 3-days mortality only SDD cases**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Odds Ratio** | **Std. Err.** | **p-value** | **[95% Confidence Interval]** |
| **Female** | 1.12 | 0.509 | 0.801 | [0.461, 2.729] |
| **Age** *(per year)* | 1.04 | 0.022 | 0.037 | [1.003, 1.087] |
| **Caucasian** | 1.08 | 0.660 | 0.906 | [0.318, 3.640] |
| **Medical history** |  |  |  |  |
| Previous MI | 1.17 | 0.538 | 0.731 | [0.475, 2.890] |
| Previous CABG | 0.94 | 0.550 | 0.922 | [0.301, 2.962] |
| Previous PCI | 1.00 | 0.462 | 0.994 | [0.401, 2.474] |
| High Cholesterol | 0.48 | 0.201 | 0.080 | [0.213, 1.091] |
| Hypertension | 1.26 | 0.539 | 0.587 | [0.546, 2.916] |
| Peripheral Vascular Disease | 2.21 | 1.442 | 0.224 | [0.616, 7.940] |
| Previous Stroke | 0.77 | 0.799 | 0.799 | [0.099, 5.915] |
| Diabetes | 0.60 | 0.337 | 0.366 | [0.203, 1.803] |
| **Renal history** | 2.96 | 2.321 | 0.166 | [0.637, 13.767] |
| **Smoking** |  |  |  |  |
| Never smoked | Ref |  |  |  |
| Ex smoker | 1.77 | 0.865 | 0.242 | [0.680, 4.617] |
| Current smoker | 3.64 | 2.168 | 0.030 | [1.134, 11.698] |
| **LVEF** |  |  |  |  |
| Good | Ref |  |  |  |
| Moderate (LVEF 30-50%) | 2.91 | 1.777 | 0.089 | [0.842, 10.043] |
| Poor (LVEF < 30%) | 2.17 | 2.237 | 0.458 | [0.271, 17.315] |
| **Multi-vessel disease** | 1.40 | 0.690 | 0.497 | [0.526, 3.727] |
| **Left Main stem attempted** | 0.88 | 0.926 | 0.906 | [0.113, 6.902] |
| **CTO attempted** | 1.37 | 0.784 | 0.585 | [0.445, 4.206] |
| **Clopidogrel** | 0.52 | 0.557 | 0.542 | [0.064, 4.224] |
| **GP IIa/IIIb inhibitor** | 4.69 | 2.594 | 0.005 | [1.584, 13.874] |
| **Stent type** |  |  |  |  |
| No stents | Ref |  |  |  |
| BMS | 3.80 | 4.174 | 0.225 | [0.438, 32.906] |
| Drug-eluting | 2.12 | 2.247 | 0.479 | [0.263, 17.041] |
| BMS and DES | 6.69 | 7.917 | 0.109 | [0.656, 68.239] |
| **Access site** |  |  |  |  |
| Femoral | Ref |  |  |  |
| Radial | 0.68 | 0.327 | 0.426 | [0.267, 1.747] |
| Multiple or Other | 3.10 | 2.485 | 0.158 | [0.644, 14.923] |
| **Year** | 0.88 | 0.104 | 0.293 | [0.702, 1.113] |
| **Centre elective prevalence** | 0.68 | 1.535 | 0.863 | [0.008, 57.665] |
| **Centre elective size** | 1.00 | 0.001 | 0.460 | [0.999, 1.002] |
| **SHA** |  |  |  |  |
| London | Ref |  |  |  |
| North East | 1.00 | (omitted) |  |  |
| North west | 0.23 | 0.251 | 0.180 | [0.026, 1.986] |
| Yorkshire and the Humber | 1.04 | 0.900 | 0.966 | [0.190, 5.676] |
| East Midlands | 0.49 | 0.388 | 0.368 | [0.104, 2.311] |
| West Midlands | 0.76 | 0.650 | 0.746 | [0.141, 4.073] |
| East of England | 0.68 | 0.506 | 0.606 | [0.159, 2.924] |
| South East Coast | 0.61 | 0.532 | 0.574 | [0.113, 3.357] |
| South Central | 0.24 | 0.272 | 0.207 | [0.027, 2.186] |
| South West | 0.63 | 0.467 | 0.534 | [0.148, 2.692] |
| Wales | 2.78 | 1.888 | 0.131 | [0.737, 10.519] |
| **Intercept** | 5.30e+102 | 1.30e+105 | 0.317 | [2.65e-99, 1.1e+304] |

BMS=Bare mare stent; CABG=Coronary Artery Bypass Graft; CTO=Chronic Total Occlusion; DES=Drug-eluting stent; GP=Glycoprotein; LVEF=Left ventricular ejection fraction; MI=Myocardial infarction; PCI=Percutaneous Coronary Intervention; SHA=Strategic Health Authorities

\*Due to low numbers of 3-day mortality Warfarin and Bivalirudin use were excluded; Ethnicity was transformed to Caucasian or else, Renal history was transformed to Renal history disease or no; Antiplatelets use was transformed to Clopidogrel use or else and multiple or other access site were combined in one category

**Table 6: Difference-in-differences analysis for the observed and expected mortality risk between the two cohorts**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **OR** | **SE** | **p-value** | **[95% Confidence Interval]** |
| ***Observed 30-day mortality*** |  |  |  |
| **Year** | 2.26 | 0.607 | 0.002 | [1.336, 3.826] |
| **SDD** | 0.32 | 0.197 | 0.063 | [0.099, 1.064] |
| **Year:SDD interaction** | 1.15 | 0.797 | 0.844 | [0.294, 4.475] |
| **Intercept** | 0.00 | 0.000 | <0.001 | [0.001, 0.003] |
| ***Expected 30-day mortality*** |  |  |  |  |
| **Year** | 1.30 | 1.013 | <0.001 | [1.266, 1.333] |
| **SDD** | 0.99 | 1.013 | <0.001 | [0.858, 0.904] |
| **Year:SDD interaction** | 0.93 | 1.020 | 0.001 | [0.899, 0.972] |
| **Intercept** | 0.00 | 1.007 | <0.001 | [0.0036, 0.0037] |
| ***Observed 3-day mortality*** |  |  |
| **Year** | 1.30 | 0.797 | 0.667 | [0.392, 4.324] |
| **SDD** | 0.81 | 0.643 | 0.793 | [0.172, 3.828] |
| **Year:SDD interaction** | 0.69 | 0.757 | 0.735 | [0.080, 5.944] |
| **Intercept** | 0.00 | 1.000 | <0.001 | [0.0002, 0.001] |

\*An OR higher (lower) than 1 indicates higher (lower) odds of observed or expected 30-day mortality

**Figure legends:**

**Figure 1: Sample flow chart;** Sample selection - inclusion and exclusion criteria

\*The PCT’s are defined based on the patient’s address postcode

***Figure 2: Spatial maps over time;*** *Same day discharge prevalence (%) per Primary care trusts in England and Wales.*

***Central Illustration: Expected and observed (with 95% CI) 30-days mortality over time;*** *(A) Overall sample, (B) Only SDD cases, (C) Only uncomplicated Overnight stay cases, (D) Only Overnight stay cases*

\*Death events in the SDD cohort in 2007: 3; 2008: 21; 2009: 11

***Supplementary Figure 1: Same day discharge within regions;*** *Annual changes of same day discharge (%) per region*