**Rotational atherectomy and same day discharge: safety and growth from a national perspective**

Paraskevi Taxiarchi1, Glen P. Martin1, Nick Curzen2, Tim Kinnaird3, Peter Ludman 4, Thomas Johnson5, Chun Shing Kwok 6, Muhammad Rashid 6, Evangelos Kontopantelis7, Mamas A. Mamas 6,7,8

1. Division of Informatics, Imaging and Data Science, Faculty of Biology, Medicine and Health, University of Manchester, Manchester Academic Health Science Center, Manchester, United Kingdom.
2. Coronary Research Group, University Hospital Southampton and Faculty of Medicine, University of Southampton, UK
3. University Hospital of Wales, Cardiff, UK
4. Institute of Cardiovascular Sciences, University of Birmingham, Birmingham, UK.
5. Bristol Heart Institute, Bristol, UK
6. Keele Cardiovascular Research Group, Keele University, UK
7. Division of Population Health, Health Services Research & Primary Care; University of Manchester; Manchester; UK
8. Thomas Jefferson University, Philadelphia, USA

**Correspondence to:**

Mamas A. Mamas

Professor of Cardiology

Keele Cardiovascular Research Group,

Centre for Prognosis Research, Institute for Primary Care and Health Sciences,

Keele University, UK

mamasmamas1@yahoo.co.uk

**Word count:**  3496

**Keywords:** Rotational Atherectomy,elective Percutaneous Coronary Intervention, Same day discharge, Mortality

## **Abstract**

## **Objectives**

We explore whether same day discharge (SDD) is a feasible and safe practice following rotational atherectomy (ROTA) treatment during elective percutaneous coronary intervention (PCI), and examine which baseline characteristics are independently associated with SDD.

**Background**

SDD following elective ROTA PCI is not recommended as per the recent SCAI consensus. However, reports show it is practiced and no previous study has evaluated its safety and feasibility.

**Methods**

Our dataset included 4,591 patients undergoing elective ROTA PCI in England & Wales within an 8-years period. Independent associations with SDD were quantified via a multiple logistic regression model and the BCIS 30-day mortality risk model was used to evaluate the safety of SDD.

**Results**

The majority of elective ROTA PCI cases remain at the hospital for overnight (ON) observation, although SDD rates increased substantially from 6.7% in 2007 to 35.5% in 2014. The use of glycoprotein IIb/IIIa antagonists, Q wave AMI, left main PCI and valvular heart disease were independently associated with ON, while patients operated underwent transradial PCI were more likely to be SDD (OR=1.77, 95% CI [1.45-2.15]). Over the study period, observed mortality rates were not significantly higher than those expected from the BCIS risk model.

**Conclusions**

Our findings did not show superiority of the ON strategy over SDD for higher risk cases undergoing elective ROTA PCI, in terms of 30-day mortality. This is the first study to examine the safety of SDD after elective ROTA PCI and more should follow.

**Introduction**

Same day discharge (SDD) after elective percutaneous coronary intervention (PCI) procedures is increasingly common practice in the UK. This is driven by financial pressures, a need for improved bed utilization, and patient preference. Over half of all elective PCI cases undertaken in the United Kingdom in 2014 were SDD.1 The increase in life expectancy, as well as more complex multi-morbid patient groups increasingly treated with PCI, has meant that lesions encountered are increasingly complex, with significant coronary artery calcification (CAC).2 Coronary calcification reduces wall compliance, prevents adequate stent expansion, predisposes to coronary perforation and is associated with an increased risk of procedural failure and subsequent stent thrombosis (ST).3 Moreover, it has been shown to be independently associated with major adverse cardiovascular events (MACE) and mortality.4-7 Rotational atherectomy (ROTA) is commonly used for lesion preparation in such patients presenting with complex heavily calcific lesions8 with up to 3% of all contemporary PCI procedures utilising ROTA for lesion preparation.8-11 At the same time, ROTA is associated with an increased risk of procedural complications, including abrupt vessel closure, slow flow and coronary perforation.12-15

The recent consensus around SDD following PCI by the Society for Cardiovascular Angiography and Interventions (SCAI) recommends that patients who underwent atherectomy, even clinically stable patients, should be considered for overnight stay.16 However, there is a paucity of data around the safety and outcomes associated with SDD for elective PCI patients treated with ROTA. A large multicentre observational study of 672,470 elective patients, from 493 US centers, included 492 patients treated with ROTA and 11.6% of them were SDD, corresponding to 0.00008% of the total elective cohort. The safety outcomes associated with SDD for the ROTA patients were not specifically reported.17

Therefore, we examined all patients treated by PCI in England and Wales over an eight-year period to address three questions. First, to examine the temporal changes of SDD prevalence for uncomplicated elective PCI patients that underwent ROTA. Second, to detect the factors that were independently associated with SDD in this cohort. Third, to explore safety of this practice by examining the difference between the observed 30-day mortality rate to the expected mortality calculated by the British Cardiovascular Intervention Society (BCIS) 30-day mortality risk model.18

**Methods**

Because of the sensitive nature of the data collected for this study, requests to access the dataset from qualified researchers trained in human subject confidentiality protocols may be sent to the British Cardiovascular Intervention Society.

***BCIS dataset and study sample***

The data for this study were anonymised and derived from the British Cardiovascular Intervention Society (BCIS), which collects and manages all new records in co-ordination with the National Institute of Cardiovascular Outcomes Research (NICOR) and according to the GDPR principles for data protection. The BCIS dataset included records from the majority (>95%) of all PCI procedures conducted in the National Health Service (NHS) in England and Wales. Approximately 100,000 new cases enter the BCIS database every year, with data input being mandatory for all primary operators in the context of their professional revalidation. The dataset contains 113 clinical and procedural variables. Data ascertainment and extra details on the BCIS dataset have been recently reported.19 The unique NHS identifier of each patient in England and Wales was used to track all-cause mortality records at the Office for National Statistics. As it is legally obligatory for all deaths to be reported in the UK, these data are robust. The following analysis has been authorised by a national Data and Monitoring group of BCIS-NICOR.

Within the analysis we included patients with stable angina that underwent ROTA (rotablator procedures) during the PCI procedure in an NHS center in England and Wales form January 2007 to December 2014. Exclusion criteria included any patient aged under 18 or over 100 years, or who had missing information on their discharge status, sex, age or post-discharge mortality tracking. To avoid bias in our analysis by favouring results towards SDD we excluded 296 patients (6%)that experienced in total 441 peri- or post-procedural complications, as such cases would be admitted for overnight (ON) observation. Supplementary Table 1 includes information on all complications including arterial and procedural complications, bleeding and adverse hospital outcomes.

***Statistical Analysis***

We produced graphs to display the percentage of elective PCI that underwent ROTA prior to the procedure over time, as a whole cohort and across groups of SDD or ON observation. We also graphically explored how SDD practice within the ROTA PCI group varied geographically in England and Wales at each year point. Descriptive analysis was performed using the raw data to compare patients’ clinical and procedural characteristics within the SDD and ON cohorts. Continuous variables were summarised using the mean and standard deviation, while categorical variables were summarised using the frequency of occurrence. Additionally, to examine whether the prevalence of each baseline characteristic was different within the SDD and the ON cohorts, we fitted appropriate models to each characteristic as the outcome (i.e. linear regression for continuous and logistic regression for binary). The variables included are all described in Supplementary Table 2; the center size variable presents counts of ROTA treatments at each center and was categorized into tertiles per year. Temporal changes of the prevalence of each characteristic within the SDD and ON cohorts were also examined. Linear models for continuous and logistic models for binaries were fitted to test for differences over time for each characteristic and at each discharge status.

Missing values were imputed using multiple imputation by chained equations (MICE); a technique which draws values from the posterior distribution of regression models conditional to the rest variables plus a random error replace those incomplete.20, 21 Within the imputation models for a variable with missing data, we included all other variables and the outcome.20 All subsequent analyses were performed separately in each of the 10 imputed datasets produced and their estimators were subsequently pooled to a single estimate according to Rubin’s rules.22

To evaluate the factors that were independently associated with SDD (i.e. our second study aim), we fitted a mixed effects multivariable logistic regression model where all the previously described variables were included as the covariates of interest, additionally including year. Center level data were used to structure random effects: a random intercept for location of PCI center (Strategic Health Authority -SHA, which are organisations established to manage local health service and are used in our analysis to adjust for regional differences), a random intercept for center and a random slope for center volume. Variance Inflation Factors (VIFs) were estimated to ascertain multicollinearity issues between the covariates of interest. To address our third aim we examined the temporal trends of 30-day mortality separately for the SDD and the ON cohorts and graphically compared them with the expected mortality rates obtained from a 30-day mortality risk model previously published by BCIS and used nationwide to evaluate mortality risks.18 Also, we examined whether SDD in the ROTA PCI cohort was independently associated with 30-day mortality by fitting a mixed effects logistic regression model and adjusting for patient case-mix (using the aforementioned variables and similarly structured). Finally, we graphically displayed trends of mortality for all elective PCIs and only elective ROTA PCIs. Trends of mortality were compared through the interaction term of group and year via linear regression models. A sensitivity analysis was structured to include ON stay cases that experienced peri or post procedural complications.

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

Secondary use of anonymised BCIS dataset for research purposes is authorised under NHS research governance arrangements and further supported under section 251 of NHS act 2006 (NIGB: ECC1-06(d)/2011), which allows researchers to use patient information collected  
within the dataset for medical research without patient consent. Therefore,  
a formal ethical approval was not sought for this study.

**Results**

Our study included 4,591 cases that underwent elective ROTA PCI without having any complications (2.8% of total uncomplicated elective PCIs). Figure 1 shows increased ROTA use over time from 255 (1.4% of total uncomplicated elective PCIs) in 2007 to 527 (3.8%) in 2014 -decline of ROTA PCI from 2013 to 2014 reflects the overall decline of elective PCIs throughout that period . Within the cohort of ROTA PCI cases, SDD practice increased from 6.7% in 2007 to 35.5% in 2014 (Figure 2), with much heterogeneity across regions (Figure 3).

***Demographics and clinical characteristics***

Table 1 displays the patients’ demographic and clinical characteristics prevalence within the SDD and the ON cohorts separately. The temporal changes of these characteristics within each cohort are also presented in Supplementary Table 3. We found that females were less likely to be SDD than males, with this difference increasing over time, as were older patients. Also, SDD was more commonly practiced in the higher volume centers, i.e. in the institutions with higher counts of ROTA PCI.

No significant differences were observed between the SDD and the ON groups in the prevalence of prior PCI and stroke, as well as high cholesterol, hypertension, diabetes mellitus, renal impairment, and multivessel disease. In contrast, patients with history of MI were observed less commonly in the SDD cohort (34.1% vs 38%), as did those with history of CABG (16.4% vs 21%), and with peripheral vascular disease (8.6% vs 11%) (Table 1). A downward trend was observed in the prevalence of a number of comorbid conditions in the SDD cohort, including prior history of MI (from 50% in 2007 to 37.7% in 2014), CABG (from 22.2% to 12.9%), PCI (from 53.8% to 37.1%) and diabetes from 41.2% to 28.1% in 2014. However, we observed an increased prevalence of hypertension (58.8% to 73.6%) and prior stroke (from 0 to 6.5%) in the SDD cohort (Supplementary Table 3). We also found higher prevalence of patients with a prior Q-wave MI in the ON group (4.5% in the SDD vs 9.7% in the ON group), as did for patients with valvular heart disease (2.9% in the SDD vs 4.2% in the ON group), while patients that displayed good LVEF were more commonly SDD (75.1% vs 70.8%) (Table 1). Similar results were obtained when the complicated cases were included in the analysis (Supplementary Table 4).

***Procedural characteristics***

Patients with multivessel and left main stem (LMS) PCI had lower rates in the SDD cohort (14% vs 18.8%) and (8% vs 13.1%), respectively, although their SDD rates increased over time from 11.8% in 2007 to 15.9% in 2014 and from 5.9% to 9.5%, respectively (Table 2 and Supplementary Table 5). However, the rates of CTO cases within the SDD and the ON cohorts did not differ, with SDD rates also increasing from 5.9% to 8%. Cases that received glycoprotein IIb/IIIa antagonists were also less likely to be SDD (3.7% vs 11.9%) (Table 2), although the proportion of patients receiving glycoprotein IIb/IIIa inhibitor decreased substantially over time in both cohorts, from 17.6% to 2% in the SDD and from 23% to 2.8% in the ON group (Supplementary Table 5). Cases that underwent the procedure transradially were more likely to be SDD (48.3% in the SDD vs 30.1% in the ON group) than when undertaken via the femoral site (49.5% in the SDD vs 67.8% in the ON group) (Table 2). No substantial differences were found when patients that underwent peri- or post-procedural complications were included in the analysis (Supplementary Table 6).

***Associations with SDD***

Table 3 displays the odds ratios from the multivariable logistic regression model with SDD as the outcome. Older patients were significantly less likely to be SDD, (OR 0.97 per one year increase in age, 95% CI [0.96-0.98]) as were patients receiving glycoprotein inhibitor IIb/IIIa, those with prior history of Q wave MI and those that underwent ad hoc PCI, with OR=0.42 (95% CI [0.28-0.61]), OR=0.53 (95% CI [0.35-0.82]) and OR=0.73 (95% CI [0.57-0.94]) for SDD respectively. Similarly, patients with valvular heart disease and LMS were less likely to be SDD, with OR=0.48 (95% CI 0.30-0.78) and OR=0.63 (95% CI 0.43-0.91) for SDD, respectively, as did those who received intravascular imaging OR=0.72 (95% CI 0.55-0.94), and those with longest stents deployed. In contrast, transradial access was independently associated with SDD (OR=1.77, 95% CI [1.45-2.15]). Finally, , while a one calendar year increase was independently associated with 24% increased odds of SDD after adjusting for case mix (OR=1.28, 95% CI [1.21-1.35]). VIF values for multicollinearity assessment are listed in descending order in Supplementary Table 7. Findings were similar when patients who experienced complications were included in the analysis (Supplementary Table 8).

***Trends of mortality***

The 30-day mortality rates were low and similar between the two cohorts (Table 2). Mortality trends within the SDD cohorts were similar between all elective PCI cases and just elective ROTA PCI cases (Figure 4); 30-day mortality records of elective PCI within the SDD obtained from a previously published paper1. Figure 5 illustrates the temporal trends of observed and expected 30-day mortality rates for the SDD, the ON, all the ON cases including complications, and all the elective ROTA PCI cases, computed by the BCIS risk model. We observed only minor changes in the expected mortality rates over time for the SDD cases with similar observed mortality rates that did not significantly exceed those predicted by the BCIS model at any time point. Similar results were detected for the 30-day mortality rates in the ON and when complications included (sensitivity analysis) with the observed rates consistently lower than the expected. We found no evidence of an independent association of SDD practice with 30-day mortality after adjusting for case-mix both for the main (OR=2.85, 95% CI [0.78-10.49]) (Table 4) and the sensitivity analysis, when complicated cases included (OR=1.45, 95% CI [0.50-4.18]) (Supplementary Table 9).

Similar results were obtained from the sensitivity analysis and are demonstrated in the Supplementary files.

**Discussion**

The present study is the first national analysis of SDD practice following elective ROTA PCI to be undertaken in a nationwide healthcare system in which SDD is the predominant practice after uncomplicated elective PCI.1 Over an 8-year period we observed a more than 5 times increase in SDD rates in patients undergoing ROTA PCI, with one in three ROTA cases discharged on the same day as the procedure was undertaken. We show significant regional variations in practice, with significant differences between institutions based on their center volume of elective ROTA PCI cases. We show that over time, rates of SDD increased even in the higher risk ROTA cases (i.e. those who were increasingly older and more comorbid). Finally, our findings demonstrate that despite temporal changes towards higher risk in SDD cohorts, this did not adversely affect 30-day mortality outcomes, as these were consistently in line with the expected mortality rates based on the BCIS risk model. Overall, our analysis provides the first insight of the safety and feasibility of SDD practice for elective patients that underwent complex ROTA PCI from a national healthcare system.

A recently published study demonstrated that only 6% of US cardiologists and 19% of non-US cardiologists practice SDD following ROTA PCI.23 However, no previous studies have examined patients’ clinical and procedural characteristics in detail or the safety of this practice. Our data illustrate relatively similar risk profiles between the SDD and ON cases undergoing ROTA PCI in a national cohort, with similar medical history burden, such as prior PCI, cholesterol, hypertension, or stroke and comparable comorbidities, such as diabetes and renal disease. Surprisingly, the prevalence of poor LVEF was not significantly higher in the ON cohort than in the SDD, despite patients with severe left ventricular dysfunction being considered high risk ROTA cases.24 Likewise, relatively similar rates of CTO were observed within the two cohorts suggesting that even in highly complex ROTA PCI cases, SDD is feasible and its practice has increased in the UK. Although infrequently used in CTO PCI, ROTA might be necessary as a bailout procedure in cases of balloon uncrossable lesions and undilatable lesions.25-27

Factors independently associated with ON included use of GP IIb/IIIa inhibitor, previous Q wave AMI, valvular heart disease, left main disease and deployment of long stents. Previous studies examining the effectiveness of ROTA treatment in complex calcified LMS disease have revealed increased long term mortality rates.28-30 Operators might favour overnight admission in such cases to reduce the risk of out of hospital complications. On the other hand, our findings show that transradial PCI was independently associated with SDD after adjusting for case mix. These results are in line with a previously published study using data derived from the BCIS registry over the same period which showed that transition from transfemoral to transradial PCI following ROTA treatment was associated with reduced major bleeding and in-hospital death events, as well with increased rates of SDD.31

An important finding from this study is that patients who underwent PCI at higher volume centers were more likely to be SDD. The most recent European expert consensus and the North American expert review on ROTA emphasise the significant experience that both the operator and the laboratory team should have to undertake such procedures,9, 32 while Sakakura et al. showed that center volume was inversely associated with in-hospital outcomes, including in-hospital death, cardiac tamponade, and emergent surgery after ROTA.10 Although in our study we focus on post-discharge adverse outcomes, these findings could be associated with the observed increase of SDD as experienced ROTA operators in high volume centers might consider ROTA a more routine treatment in the elective setting and, subsequently, be more in favour of SDD practice compared to operators in low volume centers.

Whilst the most recent US consensus statement for SDD following elective PCI included ROTA treatment in the unfavourable group of factors for SDD,16 our study showed increasing practice of SDD in this population group in the UK. Our results show that SDD was not significantly associated with increased mortality at 30 days following ROTA PCI treatment, after adjustment for differences in patients’ clinical and procedural characteristics as well as regional and center volume differences.

To evaluate the safety of SDD practice we compared the observed 30-day mortality outcomes to the “expected” outcomes predicted using the BCIS risk model. This is a well validated model used for national public reporting combining both clinical and procedural characteristics, where online access is provided by the BCIS registry via <https://www.bcis.org.uk/resources/pci-risk-calculator/>. This approach is more appropriate than a direct comparison of the mortality outcomes between SDD and ON, as higher risk cases with complex disease are more likely to be admitted for overnight monitoring, that may drive worse outcomes in the ON cohort. We report that despite the increasing complexity of SDD ROTA cases over time, the observed 30-day mortality rates were consistently in line with the mortality rates expected from the BCIS risk model. These findings show no evidence against the notion of a proportion of patients selectively being sent home on the same day following ROTA safely, and that ROTA should may be considered a contra-indication to SDD.

Like all observational analyses, this study is subject to several limitations. First, we are unable to determine factors that might be associated with SDD *a priori*, as we lack information about patients that were initially planned for SDD in which the decision was changed to overnight stay due to complications during or post procedure (intention to treat). Second, we lacked procedural information around ROTA treatment, for example the severity of calcification in the lesions and the burr sizes used. These factors might have provided a clearer insight on the SDD decision making process, as severe CAC is associated with increased risk of adverse outcomes, such as death, MI, target vessel revascularisation (TVR) and late stent thrombosis,4, 33, 34 while smaller burr size is associated with less complications compared to larger burrs.35, 36 Third, our analysis’ primary endpoint was restricted to 30-day mortality, and we had no insight on post-discharge complications or 30-day readmissions that might be associated with SDD, as the BCIS dataset does not capture this information. Fourth, due the very low outcome numbers high uncertainty is introduced to the multivariable logistic regression analysis on 30-day mortality, reflected by the very wide confidence interval of SDD. For that reason, this analysis should be considered exploratory. Finally, the BCIS dataset does not capture important information that may impact on whether to undertake SDD, such as patients’ preference and residential distance from the closest catheterisation laboratory37 and availability of radial lounge38, 39.

To conclude, this study is the first to examine SDD practice in higher risk, more complex elective cases that underwent ROTA treatment followed by PCI. We showed that SDD is not inferior to ON in this high-risk cohort despite a significant increase in the procedural complexity and clinical characteristics of the patients. The increased adoption of SDD was mainly driven by increased uptake of radial access in the UK and ROTA PCI patients treated at high volume centers were more likely to be discharged on the same day. Our study also provides insights into unfavourable characteristics such as left main disease, valvular heart disease and previous Q wave AMI in which patients were more likely to be admitted for ON monitoring. Finally, SDD appeared safe with 30-day mortality rates in line with those estimated from the national PCI risk score used for public reporting.

**List of Supports/Grants Information:** None.

**Acknowledgement:** We are grateful to the British Cardiovascular Intervention Society and the National Institute for Cardiovascular Outcomes Research for providing the data used in the analysis.

**Conflict of interest disclosures**: None.

**References**

1. Taxiarchi P, Kontopantelis E, Martin GP, et al. Same-Day Discharge After Elective Percutaneous Coronary Intervention: Insights From the British Cardiovascular Intervention Society. *JACC Cardiovasc Interv*. 2019;12:1479-1494.

2. Divo MJ, Martinez CH and Mannino DM. Ageing and the epidemiology of multimorbidity. *Eur Respir J*. 2014;44:1055-68.

3. Cockburn J, Hildick-Smith D, Cotton J, Doshi S, Hanratty C, Ludman P, Robinson D, Redwood S, de Belder M and de Belder A. Contemporary clinical outcomes of patients treated with or without rotational coronary atherectomy--an analysis of the UK central cardiac audit database. *Int J Cardiol*. 2014;170:381-7.

4. Huisman J, van der Heijden LC, Kok MM, et al. Impact of severe lesion calcification on clinical outcome of patients with stable angina, treated with newer generation permanent polymer-coated drug-eluting stents: A patient-level pooled analysis from TWENTE and DUTCH PEERS (TWENTE II). *Am Heart J*. 2016;175:121-9.

5. Poornima IG, Mackey RH, Allison MA, Manson JE, Carr JJ, LaMonte MJ, Chang Y, Kuller LH, Whi and Investigators W-CS. Coronary Artery Calcification (CAC) and Post-Trial Cardiovascular Events and Mortality Within the Women's Health Initiative (WHI) Estrogen-Alone Trial. *J Am Heart Assoc*. 2017;6.

6. Raffield LM, Cox AJ, Criqui MH, Hsu FC, Terry JG, Xu J, Freedman BI, Carr JJ and Bowden DW. Associations of coronary artery calcified plaque density with mortality in type 2 diabetes: the Diabetes Heart Study. *Cardiovasc Diabetol*. 2018;17:67.

7. Wang XR, Zhang JJ, Xu XX and Wu YG. Prevalence of coronary artery calcification and its association with mortality, cardiovascular events in patients with chronic kidney disease: a systematic review and meta-analysis. *Ren Fail*. 2019;41:244-256.

8. Arora S, Panaich SS, Patel N, et al. Coronary Atherectomy in the United States (from a Nationwide Inpatient Sample). *Am J Cardiol*. 2016;117:555-562.

9. Barbato E, Carrie D, Dardas P, et al. European expert consensus on rotational atherectomy. *EuroIntervention*. 2015;11:30-6.

10. Sakakura K, Inohara T, Kohsaka S, et al. Incidence and Determinants of Complications in Rotational Atherectomy: Insights From the National Clinical Data (J-PCI Registry). *Circ Cardiovasc Interv*. 2016;9.

11. Bamford P, Parkinson MD, Gunalingam B, David M and Lau GT. A New Era for Rotational Atherectomy: An Australian Perspective. *Clin Med Insights Cardiol*. 2019;13:1179546819852070.

12. Dash D. Complications of coronary intervention: abrupt closure, dissection, perforation. *Heart Asia*. 2013;5:61-5.

13. Sharma SK, Dangas G, Mehran R, Duvvuri S, Kini A, Cocke TP, Kakarala V, Cohen AM, Marmur JD and Ambrose JA. Risk factors for the development of slow flow during rotational coronary atherectomy. *Am J Cardiol*. 1997;80:219-22.

14. Woodfield SL, Lopez A and Heuser RR. Fracture of coronary guidewire during rotational atherectomy with coronary perforation and tamponade. *Cathet Cardiovasc Diagn*. 1998;44:220-3.

15. Yamamoto S, Sakakura K, Funayama H, Wada H, Fujita H and Momomura S. Percutaneous Coronary Artery Bypass for Type 3 Coronary Perforation. *JACC Cardiovasc Interv*. 2015;8:1396-8.

16. Seto AH, Shroff A, Abu-Fadel M, et al. Length of stay following percutaneous coronary intervention: An expert consensus document update from the society for cardiovascular angiography and interventions. *Catheter Cardiovasc Interv*. 2018.

17. Amin AP, Pinto D, House JA, et al. Association of Same-Day Discharge After Elective Percutaneous Coronary Intervention in the United States With Costs and Outcomes. *JAMA Cardiol*. 2018;3:1041-1049.

18. McAllister KS, Ludman PF, Hulme W, et al. A contemporary risk model for predicting 30-day mortality following percutaneous coronary intervention in England and Wales. *Int J Cardiol*. 2016;210:125-32.

19. Rashid M, Ludman PF and Mamas MA. British Cardiovascular Intervention Society registry framework: a quality improvement initiative on behalf of the National Institute of Cardiovascular Outcomes Research (NICOR). *Eur Heart J Qual Care Clin Outcomes*. 2019.

20. Sterne JA, White IR, Carlin JB, Spratt M, Royston P, Kenward MG, Wood AM and Carpenter JR. Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. *BMJ*. 2009;338:b2393.

21. White IR, Royston P and Wood AM. Multiple imputation using chained equations: Issues and guidance for practice. *Stat Med*. 2011;30:377-99.

22. Rubin DB. Multiple Imputation after 18+ Years. *Journal of the American Statistical Association*. 1996;91:473-489.

23. Din JN, Snow TM, Rao SV, Klinke WP, Nadra IJ, Della Siega A and Robinson SD. Variation in practice and concordance with guideline criteria for length of stay after elective percutaneous coronary intervention. *Catheter Cardiovasc Interv*. 2017;90:715-722.

24. Tomey MI, Kini AS and Sharma SK. Current status of rotational atherectomy. *JACC Cardiovasc Interv*. 2014;7:345-53.

25. Karacsonyi J, Karmpaliotis D, Alaswad K, et al. Prevalence, indications and management of balloon uncrossable chronic total occlusions: Insights from a contemporary multicenter US registry. *Catheter Cardiovasc Interv*. 2017;90:12-20.

26. Brilakis E. *Manual of coronary chronic total occlusion interventions : a step-by-step approach*; 2014.

27. Patel SM, Pokala NR, Menon RV, et al. Prevalence and treatment of "balloon-uncrossable" coronary chronic total occlusions. *J Invasive Cardiol*. 2015;27:78-84.

28. Yabushita H, Takagi K, Tahara S, et al. Impact of rotational atherectomy on heavily calcified, unprotected left main disease. *Circ J*. 2014;78:1867-72.

29. Garcia-Lara J, Pinar E, Valdesuso R, Lacunza J, Gimeno JR, Hurtado JA and Valdes-Chavarri M. Percutaneous coronary intervention with rotational atherectomy for severely calcified unprotected left main: immediate and two-years follow-up results. *Catheter Cardiovasc Interv*. 2012;80:215-20.

30. Sulimov DS, Abdel-Wahab M, Toelg R, Kassner G, Geist V and Richardt G. High-speed rotational atherectomy of the left main coronary artery: a single-center experience in 50 high-risk patients. *Cardiovasc Revasc Med*. 2015;16:284-9.

31. Kinnaird T, Cockburn J, Gallagher S, Choudhury A, Sirker A, Ludman P, de Belder M, Copt S, Mamas M and de Belder A. Temporal changes in radial access use, associates and outcomes in patients undergoing PCI using rotational atherectomy between 2007 and 2014: results from the British Cardiovascular Intervention Society national database. *Am Heart J*. 2018;198:46-54.

32. Sharma SK, Tomey MI, Teirstein PS, et al. North American Expert Review of Rotational Atherectomy. *Circ Cardiovasc Interv*. 2019;12:e007448.

33. Lasala JM, Cox DA, Dobies D, et al. Drug-eluting stent thrombosis in routine clinical practice: two-year outcomes and predictors from the TAXUS ARRIVE registries. *Circ Cardiovasc Interv*. 2009;2:285-93.

34. Mosseri M, Satler LF, Pichard AD and Waksman R. Impact of vessel calcification on outcomes after coronary stenting. *Cardiovasc Revasc Med*. 2005;6:147-53.

35. Safian RD, Feldman T, Muller DW, Mason D, Schreiber T, Haik B, Mooney M and O'Neill WW. Coronary angioplasty and Rotablator atherectomy trial (CARAT): immediate and late results of a prospective multicenter randomized trial. *Catheter Cardiovasc Interv*. 2001;53:213-20.

36. Whitlow PL, Bass TA, Kipperman RM, et al. Results of the study to determine rotablator and transluminal angioplasty strategy (STRATAS). *Am J Cardiol*. 2001;87:699-705.

37. Kim M, Muntner P, Sharma S, Choi JW, Stoler RC, Woodward M, Mann DM and Farkouh ME. Assessing patient-reported outcomes and preferences for same-day discharge after percutaneous coronary intervention: results from a pilot randomized, controlled trial. *Circ Cardiovasc Qual Outcomes*. 2013;6:186-92.

38. Biasco L, Pedrazzini GB, Araco M, et al. Evaluation of a protocol for same-day discharge after radial lounge monitoring in a southern Swiss referral percutaneous coronary intervention centre. *J Cardiovasc Med (Hagerstown)*. 2017;18:590-595.

39. Brewster S, Khimdas K, Cleary N, Penswick A, Cliffe S, Weerackody R, Wragg A, Rothman MT and Archbold RA. Impact of a dedicated "radial lounge" for percutaneous coronary procedures on same-day discharge rates and bed utilization. *Am Heart J*. 2013;165:299-302.

Table 1: Pre-procedural characteristics within the SDD and uncomplicated ON

|  |  |  |  |
| --- | --- | --- | --- |
|  | **SDD** | **uncON** | **p-value** |
| **Size,** n | 1201 | 3390 |  |
| **Center size** |  |  |  |
| Low | 101 (8.41) | 374 (11.03) | 0.011 |
| Medium | 232 (19.32) | 1114 (32.86) | <0.001 |
| High | 868 (72.27) | 1902 (56.11) | <0.001 |
| **Age**, mean (SD) | 71.2 (8.8) | 72.1 (9.1) | 0.003 |
| **Gender** |  |  |  |
| Male | 914 (76.10) | 2504 (73.86) | 0.126 |
| Female | 287 (23.90) | 886 (26.14) |  |
| **Ethnicity** |  |  |  |
| Caucasian | 749 (86.39) | 2467 (90.83) | <0.001 |
| Black | 2 (0.23) | 17 (0.63) | 0.181 |
| Asian | 37 (4.27) | 125 (4.60) | 0.680 |
| Other | 79 (9.11) | 107 (3.94) | <0.001 |
| **Medical history** |  |  |  |
| Prior MI | 391 (34.15) | 1168 (37.96) | 0.023 |
| Prior CABG | 152 (16.36) | 511 (21.05) | 0.002 |
| Prior PCI | 426 (36.50) | 1195 (35.91) | 0.715 |
| High Cholesterol | 835 (70.58) | 2333 (70.44) | 0.927 |
| Hypertension | 847 (71.60) | 2429 (73.34) | 0.247 |
| Peripheral Vascular disease | 102 (8.62) | 366 (11.05) | 0.019 |
| Prior Stroke | 80 (6.76) | 217 (6.55) | 0.802 |
| **Qwave on ECG** | 50 (4.53) | 272 (9.75) | <0.001 |
| **Diabetes mellitus** | 361 (30.46) | 993 (30.15) | 0.842 |
| **Renal disease** | 45 (3.77) | 167 (4.97) | 0.091 |
| **Smoking** |  |  |  |
| Ex smoker | 606 (54.99) | 1678 (54.82) | 0.922 |
| Current smoker | 79 (7.17) | 203 (6.63) | 0.543 |
| Never smoked | 417 (37.84) | 1180 (38.55) | 0.678 |
| **LVEF** |  |  |  |
| Good | 595 (75.13) | 1473 (70.85) | 0.023 |
| Moderate  (30-50%) | 153 (19.32) | 460 (22.13) | 0.101 |
| Poor (<30%) | 44 (5.56) | 146 (7.02) | 0.159 |
| **Multivessel disease** | 423 (36.28) | 1198 (38.08) | 0.278 |
| **Valvular Heart disease** | 34 (2.87) | 138 (4.17) | 0.048 |

\*CABG=Coronary Artery Bypass Graft; ECG=Electrocardiogram; LVEF=Left ventricular ejection fraction; MI=Myocardial infarction; PCI=Percutaneous Coronary Intervention; SDD=Same Day Discharge; uncON= uncomplicated ON

Table 2: Procedural characteristics within the SDD and uncomplicated ON

|  |  |  |  |
| --- | --- | --- | --- |
|  | **SDD** | **uncON** | **p-value** |
| **Medication** |  |  |  |
| Warfarin | 21 (1.82) | 56 (1.76) | 0.901 |
| Bivalirudin | 4 (0.35) | 18 (0.57) | 0.372 |
| Clopidogrel | 1070 (98.17) | 2717 (97.77) | 0.442 |
| GP IIb\IIIa inhibitor | 43 (3.68) | 381 (11.94) | <0.001 |
| **Offsite surgical cover** | 503 (43.36) | 727 (23.06) | <0.001 |
| **Ad hoc PCI** | 129 (11.25) | 521 (16.73) | <0.001 |
| **Multivessel attempted** | 167 (13.97) | 634 (18.79) | <0.001 |
| **CTO** | 112 (9.56) | 313 (9.80) | 0.816 |
| **LMS** | 95 (7.95) | 441 (13.07) | <0.001 |
| **Stents used** |  |  |  |
| No stents | 34 (2.91) | 120 (3.63) | 0.245 |
| BMS | 100 (8.55) | 345 (10.44) | 0.064 |
| DES | 1002 (85.71) | 2714 (82.14) | 0.005 |
| Both | 33 (2.82) | 125 (3.78) | 0.128 |
| **Largest**, mean (SD) | 3.48 (0.6) | 3.50 (0.6) | 0.335 |
| **Longest**, mean (SD) | 34.67 (19.3) | 33.94 (19.1) | 0.277 |
| **Intravascular imaging** | 167 (14.38) | 441 (13.83) | 0.640 |
| **Penetration catheter** | 22 (1.83) | 75 (2.21) | 0.431 |
| **Microcatheter** | 59 (4.91) | 161 (4.75) | 0.820 |
| **Access site** |  |  |  |
| Femoral | 591 (49.50) | 2268 (67.76) | <0.001 |
| Radial | 577 (48.32) | 1008 (30.12) | <0.001 |
| Multiple / Other | 26 (2.18) | 71 (2.12) | 0.908 |
| **Mortality 30-day** | 6 (0.50) | 12 (0.35) | 0.409 |

\*BMS=Bare mare stent; CTO=Chronic Total Occlusion; DES=Drug-eluting stent; GP=Glycoprotein; LMS=Left Main Stem; MI=Myocardial infarction; PCI=Percutaneous Coronary Intervention; SHA=Strategic Health Authorities; SDD=Same Day Discharge; uncON= uncomplicated ON

Table 3: Mixed effects multivariable logistic regression model (with adjusted ORs) for the SDD

|  |  |  |  |
| --- | --- | --- | --- |
| ***Fixed effects*** | **OR** | **p-value** | **[95% CI]** |
| **Age** | 0.97 | <0.001 | [0.96-0.98] |
| **Female** | 0.87 | 0.165 | [0.71-1.06] |
| **Caucasian** | 0.92 | 0.682 | [0.60-1.40] |
| **Medical History** |  |  |  |
| Previous MI | 1.05 | 0.604 | [0.87-1.28] |
| Previous CABG | 1.09 | 0.529 | [0.83-1.43] |
| Previous PCI | 1.00 | 0.979 | [0.83-1.20] |
| High Cholesterol | 1.11 | 0.304 | [0.91-1.37] |
| Hypertension | 0.96 | 0.729 | [0.79-1.18] |
| Peripheral Vascular Disease | 0.77 | 0.092 | [0.58-1.04] |
| Previous Stroke | 0.91 | 0.617 | [0.64-1.30] |
| Q Wave on ECG | 0.53 | 0.004 | [0.35-0.82] |
| Diabetes | 0.98 | 0.835 | [0.81-1.18] |
| Renal Disease | 0.66 | 0.063 | [0.43-1.02] |
| **Smoking** |  |  |  |
| Never | Ref. |  |  |
| Ex-smoker | 1.01 | 0.953 | [0.82-1.23] |
| Current smoker | 0.87 | 0.484 | [0.60-1.27] |
| **LVEF** |  |  |  |
| Good | Ref. |  |  |
| Moderate (LVEF 30-50%) | 0.98 | 0.885 | [0.73-1.31] |
| Poor (LVEF<30%) | 0.83 | 0.416 | [0.52-1.31] |
| **MVL disease** | 0.96 | 0.686 | [0.77-1.18] |
| **Valvular Heart Disease** | 0.48 | 0.003 | [0.30-0.78] |
| **Medication** |  |  |  |
| Warfarin | 0.86 | 0.631 | [0.46-1.59] |
| Bivalirudin | 1.07 | 0.912 | [0.31-3.66] |
| Clopidogrel | 1.41 | 0.254 | [0.78-2.54] |
| GP IIb\IIIa inhibitor | 0.42 | <0.001 | [0.28-0.61] |
| **Offsite surgical cover** | 2.23 | 0.007 | [1.24-4.01] |
| **Ad hoc PCI** | 0.73 | 0.016 | [0.57-0.94] |
| **MVL attempted** | 0.78 | 0.103 | [0.57-1.05] |
| **CTO** | 0.91 | 0.525 | [0.67-1.22] |
| **LMS** | 0.63 | 0.014 | [0.43-0.91] |
| **Stent use** |  |  |  |
| No stent | Ref. |  |  |
| BMS only | 1.49 | 0.166 | [0.85-2.64] |
| DES only | 1.59 | 0.066 | [0.97-2.62] |
| Both | 0.98 | 0.954 | [0.48-1.99] |
| **Largest stent** | 0.97 | 0.720 | [0.81-1.15] |
| **Longest stent** | 0.99 | <0.001 | [0.98-1.00] |
| **Intravascular imaging** | 0.72 | 0.018 | [0.55-0.94] |
| **Penetration catheter** | 0.94 | 0.838 | [0.52-1.69] |
| **Microcatheter** | 1.08 | 0.707 | [0.73-1.57] |
| **Access site** |  |  |  |
| Femoral | Ref. |  |  |
| Radial | 1.77 | <0.001 | [1.45-2.15] |
| Multiple/ Other | 0.63 | 0.125 | [0.35-1.13] |
| **Year** | 1.28 | <0.001 | [1.21-1.35] |
|  |  |  |  |
| ***Random effects***  ***(sd)*** | **Estimate** | **SE** | **[95% CI]** |
| Intercept for SHA | 8.63e-07 | 1.11 | [0- .] |
| Intercept for centre | 0.33 | 0.11 | [0.17-0.65] |
| Slope for centre volume | 1.39 | 0.19 | [1.05-1.82] |

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

Table 4: Mixed effects multivariable logistic regression model (with adjusted ORs) for 30-days mortality

|  |  |  |  |
| --- | --- | --- | --- |
| ***Fixed effects*** | **OR** | **p-values** | **[95% CI]** |
| **SDD** | 2.85 | 0.114 | [0.78-10.49] |
| **Age** | 1.12 | 0.004 | [1.03-1.21] |
| **Female** | 0.36 | 0.209 | [0.08-1.76] |
| **Caucasian** | 0.59 | 0.554 | [0.10-3.41] |
| **Medical History** |  |  |  |
| Previous MI | 1.08 | 0.891 | [0.34-3.44] |
| Previous CABG | 1.07 | 0.934 | [0.21-5.51] |
| Previous PCI | 1.84 | 0.296 | [0.58-5.80] |
| High Cholesterol | 1.07 | 0.917 | [0.32-3.53] |
| Hypertension | 0.46 | 0.203 | [0.14-1.51] |
| Peripheral Vascular Disease | 0.94 | 0.941 | [0.21-4.20] |
| Previous Stroke | 4.46 | 0.034 | [1.12-17.86] |
| Q Wave on ECG | 0.37 | 0.430 | [0.03-4.77] |
| Diabetes | 1.50 | 0.480 | [0.49-4.62] |
| **Smoking** |  |  |  |
| Never | Ref. |  |  |
| Ex-smoker | 1.77 | 0.356 | [0.53-5.97] |
| Current smoker | 3.92 | 0.179 | [0.53-28.77] |
| **LVEF** |  |  |  |
| Good | Ref. |  |  |
| Moderate (LVEF 30-50%) | 1.10 | 0.914 | [0.20-6.13] |
| Poor (LVEF<30%) | 3.47 | 0.135 | [0.68-17.79] |
| **MVL disease** | 1.28 | 0.721 | [0.33-5.04] |
| **Valvular Heart Disease** | 5.16 | 0.034 | [1.13-23.64] |
| **Medication** |  |  |  |
| Bivalirudin | 43.40 | 0.001 | [4.44-423.94] |
| GP IIb\IIIa inhibitor | 2.02 | 0.424 | [0.36-11.36] |
| **Offsite surgical cover** | 0.35 | 0.263 | [0.06-2.20] |
| **Ad hoc PCI** | 0.96 | 0.962 | [0.18-5.09] |
| **MVL attempted** | 1.00 | 0.999 | [0.17-5.92] |
| **LMS** | 1.35 | 0.759 | [0.20-9.13] |
| **Stent use** |  |  |  |
| No stent | Ref. |  |  |
| BMS only | 0.26 | 0.416 | [0.01-6.52] |
| DES only | 0.58 | 0.651 | [0.06-5.95] |
| Both | 1.13 | 0.940 | [0.05-27.58] |
| **Largest stent** | 1.10 | 0.854 | [0.41-2.96] |
| **Longest stent** | 1.00 | 0.979 | [0.97-1.03] |
| **Intravascular imaging** | 1.72 | 0.427 | [0.45-6.55] |
| **Year** | 0.87 | 0.332 | [0.65-1.16] |
|  |  |  |  |
| ***Random effects***  **(sd)** | **Estimate** | **SE** | **[95% CI]** |
| Intercept for SHA | 0.03 | 151924.1 | [0- .] |
| Intercept for centre | 4.62e-09 | 103.68 | [0- .] |
| Slope for centre volume | 1.24 | 0.74 | [0.39-4.00] |

\* Variable on clopidogrel use, Warfarin, renal disease, penetration catheter, microcatheter, access site and CTO were excluded from the analysis because of perfect prediction due to the low counts of mortality

\*\*BMS=Bare mare stent; CABG=Coronary Artery Bypass Graft; DES=Drug-eluting stent; ECG=Electrocardiogram; GP=Glycoprotein; LVEF=Left ventricular ejection fraction; LMS=Left Main Stem; MI=Myocardial infarction; MVL=Multivessel; PCI=Percutaneous Coronary Intervention; SDD=Same Day Discharge; SHA=Strategic Health Authorities

Figure 1: Rotational Atherectomy treatment; Count and percentage of total uncomplicated elective PCI



Figure 2: Percentage of same day discharge (SDD) and overnight (ON) observation within the uncomplicated ROTA PCI cases



Figure 3: Spatial Maps; Prevalence of same day discharge over time in England and Wales (per Primary care trusts) for elective ROTA PCI treatment

****

**Figure 4: Mortality rates at 30 days following procedure for all uncomplicated elective SDD PCI cases and SDD ROTA PCI cases**

\*p-value=0.835; 95% CI [-0.002, 0.002]

Figure 5: Expected and observed (with 95% CI) 30-days mortality over time for elective ROTA PCI treatment

\*Overall: p-value=0.351; 95% CI [-0.001, 0.001], SDD: p-value=0.936; 95% CI [-0.002, 0.002], uncomplicated Overnight stay: p-value=0.960; 95% CI [-0.001, 0.001], Overnight stay: p-value=0.151; 95% CI [-0.001, 0.0002]

**Supplementary Table 1: Procedural and arterial complications, bleeding and adverse hospital outcomes following rotational atherectomy PCI**

|  |  |  |  |
| --- | --- | --- | --- |
| **Adverse hospital outcome**  **(n=172)** | **Procedural complications**  **(n=175)** | **Arterial complications**  **(n=40)** | **Bleeding up to discharge**  **(n=11)** |
| Q wave MI (stable angina and NSTEMI patients only)  (n=9) | Aortic dissection  (n=6) | False aneurysm - conservative management (n=1) | Type 1  (n=4) |
| Non Q wave MI (stable angina patients only)  (n=44) | Coronary perforation  (n=40) | False aneurysm – compression  (n=2) | Type 2  (n=5) |
| Emergency CABG  (n=2) | Heart block requiring pacing  (n=17) | False aneurysm - thrombin injection (n=4) | Type 3a  (n=1) |
| Arterial complication  (n=23) | DC cardioversion  (n=12) | False aneurysm - surgical management (n=1) | Type 3b  (n=1) |
| Death  (n=6) | No flow/slow flow phenomenon  (n=21) | Haemorrhage - no haematoma  (n=4) | Type 3c  (n=0) |
| CVA – Embolic  (n=0) | Ventilated  (n=0) | Haemorrhage - delayed discharge  (n=6) | Type 4  (n=0) |
| CVA – Bleed  (n=0) | Shock induced by procedure  (n=6) | Haemorrhage - surgery required  (n=0) | Type 5a  (n=0) |
| TIA / RIND  (n=2) | Unlisted  (n=73) | Haemorrhage – retroperitoneal  (n=4) | Type 5b  (n=0) |
| Re-intervention PCI  (n=8) |  | Arterial occlusion  (n=0) |  |
| Blood Transfusion  (n=15) |  | Arterial dissection  (n=5) |  |
| Renal failure/dialysis  (n=4) |  | Any other surgical intervention  (n=0) |  |
| GI bleed  (n=0) |  | Unlisted  (n=13) |  |
| Tamponade  (n=18) |  |  |  |
| Platelet Transfusion  (n=1) |  |  |  |
| Unlisted  (n=40) |  |  |  |

\*CABG=Coronary Artery Bypass Graft; CVA=Cerebrovascular accident; DC=Direct Current; GI=Gastrointestinal; MI=Myocardial infarction; NSTEMI=Non-ST-elevation myocardial infraction; PCI=Percutaneous Coronary Intervention; RIND=Reversible Ischemic Neurologic Deficit; TIA=Transient Ischemic Attacks.

Supplementary Table 2: Covariates used in the analysis

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Demographic** | **Medical history** | **Structural Cardiac** | **Medication** | **Procedure** | **Center volume** | **Access site** | **Region** |
| Age | Previous MI | LVEF | Warfarin | Offsite surgical cover | Center size | Access site | SHA |
| Sex | Previous CABG | Multivessel Disease | Bivalirudin | Ad hoc PCI |  |  |  |
| Ethnicity | Previous PCI | Valvular Heart Disease | Clopidogrel | Multivessel attempted |  |  |  |
|  | High Cholesterol |  | GP IIb/IIIa inhibitor | LMS |  |  |  |
|  | Hypertension |  |  | CTO |  |  |  |
|  | PVD |  |  | Stent type |  |  |  |
|  | Previous Stroke |  |  | Largest stent |  |  |  |
|  | Q wave on ECG |  |  | Longest stent |  |  |  |
|  | Diabetes |  |  | Intravascular imaging |  |  |  |
|  | Renal History |  |  | Penetration catheter |  |  |  |
|  | Smoking |  |  |  |  |  |  |

\*CABG=Coronary Artery Bypass Graft; CTO=Chronic Total Occlusion; ECG=Electrocardiogram; GP=Glycoprotein; LVEF=Left ventricular ejection fraction; LMS=Left Main Stem; MI=Myocardial infarction; PCI=Percutaneous Coronary Intervention; PVD=Peripheral Vascular Disease; SHA=Strategic Health Authorities

Supplementary Table 3: Pre-procedural characteristics within the SDD and uncomplicated ON over time

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **p-value**  **[95% CI]** |
| **Size,** n (%)a | **SDD** | 17  (6.7) | 65  (14.0) | 74  (16.3) | 121  (21.5) | 186  (28.3) | 258  (32.1) | 277  (33.7) | 203  (35.5) | <0.001  [1.21-1.30] |
|  | **uncON** | 238  (93.3) | 398  (86.0) | 379  (83.7) | 443  (78.5) | 472  (71.7) | 545  (67.9) | 546  (66.3) | 369  (65.5) |  |
| **Center size** |  |  |  |  |  |  |  |  |  |  |
| Low | **SDD** | 58.8 | 3.1 | 8.1 | 5.8 | 6.5 | 7.0 | 11.6 | 6.9 | 0.358  [0.85-1.06] |
|  | **uncON** | 6.3 | 11.6 | 9.2 | 13.5 | 10.0 | 11.0 | 13.2 | 10.6 | 0.125  [0.99-1.09] |
| Medium | **SDD** | 11.8 | 27.7 | 28.4 | 30.6 | 14.5 | 14.0 | 18.8 | 19.2 | 0.023  [0.84-0.99] |
|  | **uncON** | 26.5 | 34.4 | 34.8 | 34.3 | 29.7 | 31.9 | 32.2 | 37.9 | 1.02  [0.99-2.05] |
| High | **SDD** | 29.4 | 69.2 | 63.5 | 63.6 | 79 | 79.1 | 69.7 | 73.9 | 0.010  [1.02-1.17] |
|  | **uncON** | 67.2 | 54.0 | 55.9 | 52.1 | 60.4 | 57.1 | 54.6 | 51.5 | 0.042  [0.94-1.00] |
| **Age** | **SDD** | 69.9 | 69.8 | 70.3 | 70.0 | 71.7 | 70.6 | 71.8 | 72.3 | 0.07  [0.11-0.67] |
|  |  | (7.3) | (9.0) | (8.1) | (8.0) | (9.2) | (9.2) | (8.1) | (9.6) |  |
|  | **uncON** | 70.1 | 71.0 | 71.7 | 72.1 | 72.8 | 72.5 | 72.4 | 73.2 | <0.001  [0.20-0.48] |
|  |  | (8.8) | (9.1) | (9.3) | (9.0) | (9.1) | (8.8) | (9.3) | (9.1) |  |
| **Gender** |  |  |  |  |  |  |  |  |  |  |
| Male | **SDD** | 58.8 | 72.3 | 66.2 | 77.7 | 76.9 | 74.0 | 79.4 | 78.8 | 0.02  [1.01-1.17] |
|  | **uncON** | 76.5 | 75.1 | 71.5 | 75.2 | 73.7 | 71.7 | 73.6 | 75.3 | 0.99  [0.96-1.03] |
| Female | **SDD** | 41.2 | 27.7 | 33.8 | 22.3 | 23.1 | 26.0 | 20.6 | 21.2 |  |
|  | **uncON** | 23.5 | 24.9 | 28.5 | 24.8 | 26.3 | 28.3 | 26.4 | 24.7 |  |
| **Ethnicity** |  |  |  |  |  |  |  |  |  |  |
| Caucasian | **SDD** | 92.3 | 85.6 | 92.9 | 91.4 | 95.3 | 86.7 | 86.3 | 77.6 | 0.089  [0.80-1.02] |
|  | **uncON** | 88.6 | 85.2 | 93.5 | 92.1 | 94.2 | 90.8 | 90.1 | 89.5 | 0.519  [0.96-1.09] |
| Black | **SDD** | 0.0 | 0.0 | 2.4 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.077  [0.24-1.08] |
|  | **uncON** | 1.8 | 1.1 | 0.3 | 0.0 | 0.5 | 0.7 | 0.5 | 1.0 | 0.524  [0.74-1.17] |
| Asian | **SDD** | 0.0 | 0.0 | 2.4 | 2.2 | 2.0 | 3.3 | 5.9 | 8.3 | 0.001  [1.19-1.97] |
|  | **uncON** | 5.4 | 5.6 | 2.9 | 6.4 | 3.8 | 5.3 | 4.1 | 3.6 | 0.365  [0.88-1.05] |
| Other | **SDD** | 7.7 | 44.4 | 2.4 | 5.4 | 2.7 | 9.9 | 7.8 | 14.1 | 0.958  [0.87-1.15] |
|  | **uncON** | 4.2 | 8.1 | 3.2 | 1.5 | 1.5 | 3.2 | 5.4 | 5.9 | 0.781  [0.92-1.11] |
| **Medical history** |  |  |  |  |  |  |  |  |  |  |
| Prior MI | **SDD** | 50.0 | 26.6 | 28.2 | 28.9 | 34.3 | 33.8 | 36.8 | 37.7 | 0.044  [1.00-1.15] |
|  | **uncON** | 31.9 | 36.6 | 40.9 | 36.8 | 41.9 | 38.7 | 37.7 | 35.7 | 0.663  [0.97-1.04] |
| Prior CABG | **SDD** | 22.2 | 16.7 | 12.5 | 17.7 | 12.9 | 16.6 | 21.0 | 12.9 | 0.782  [0.92-1.12] |
|  | **uncON** | 25.8 | 23.9 | 21.4 | 17.9 | 24.0 | 22.7 | 16.7 | 20.2 | 0.064  [0.91-1.00] |
| Prior PCI | **SDD** | 53.8 | 36.9 | 31.9 | 41.7 | 35.3 | 35.9 | 35.4 | 37.1 | 0.645  [0.92-1.05] |
|  | **uncON** | 34.8 | 33.5 | 35.9 | 35.2 | 34.3 | 35.4 | 39.2 | 38.0 | 0.099  [0.99-1.06] |
| High Cholesterol | **SDD** | 47.1 | 56.9 | 79.7 | 71.9 | 73.9 | 70.4 | 68.8 | 72.6 | 0.293  [0.97-1.11] |
|  | **uncON** | 59.9 | 66.7 | 74.0 | 76.3 | 72.7 | 68.8 | 72.9 | 66.3 | 0.292  [0.98-1.05] |
| Hypertension | **SDD** | 58.8 | 56.9 | 73.0 | 70.2 | 69.9 | 68.9 | 78.3 | 73.6 | 0.005  [1.03-1.18] |
|  | **uncON** | 62.1 | 69 | 71.1 | 75.4 | 76.4 | 76.1 | 76.5 | 72.4 | <0.001  [1.03-1.11] |
| Peripheral Vascular disease | **SDD** | 5.9 | 1.5 | 13.5 | 10.7 | 9.7 | 9.3 | 8.1 | 7.0 | 0.764  [0.88-1.10] |
|  | **uncON** | 9.7 | 8.3 | 10.6 | 11.2 | 13.7 | 9.1 | 12.9 | 12.2 | 0.075  [0.99-1.10] |
| Prior Stroke | **SDD** | 0.0 | 3.1 | 12.2 | 6.6 | 5.1 | 7.4 | 7.4 | 6.5 | 0.649  [0.91-1.17] |
|  | **uncON** | 4.8 | 5.4 | 5.8 | 6.8 | 7.4 | 6.5 | 6.3 | 8.6 | 0.084  [0.99-1.13] |
| **Qwave on ECG** | **SDD** | 18.2 | 1.7 | 4.8 | 3.6 | 4.6 | 4.3 | 5.0 | 4.7 | 0.827  [0.86-1.20] |
|  | **uncON** | 13.1 | 10.2 | 10.2 | 9.9 | 10.9 | 8.6 | 9.3 | 8.2 | 0.097  [0.89-1.01] |
| **Diabetes mellitus** | **SDD** | 41.2 | 25.0 | 34.7 | 30.6 | 26.1 | 32.5 | 32.7 | 28.1 | 0.998  [0.93-1.07] |
|  | **uncON** | 23.7 | 27.5 | 28.5 | 32.7 | 31.4 | 29.7 | 33.5 | 30.1 | 0.027  [1.00-1.08] |
| **Renal disease** | **SDD** | 0.0 | 4.6 | 2.7 | 5.8 | 2.7 | 2.7 | 4.0 | 5.0 | 0.611  [0.88-1.24] |
|  | **uncON** | 5.0 | 4.8 | 5.0 | 5.0 | 5.2 | 4.8 | 4.8 | 5.2 | 0.986  [0.93-1.08] |
| **Smoking** |  |  |  |  |  |  |  |  |  |  |
| Ex smoker | **SDD** | 76.9 | 52.5 | 50.7 | 57.1 | 51.8 | 55.2 | 57.8 | 53.3 | 0.943  [0.94-1.07] |
|  | **uncON** | 55.4 | 54.5 | 57.7 | 53.4 | 55.9 | 57.6 | 54.7 | 47.9 | 0.211  [0.94-1.01] |
| Current smoker | **SDD** | 0.0 | 9.8 | 7.2 | 7.1 | 9.6 | 7.5 | 5.5 | 6.5 | 0.400  [0.83-1.07] |
|  | **uncON** | 8.7 | 5.5 | 6.0 | 6.9 | 6.1 | 7.1 | 7.0 | 6.3 | 0.915  [0.94-1.07] |
| Never smoked | **SDD** | 23.1 | 37.7 | 42.0 | 35.7 | 38.6 | 37.3 | 36.7 | 40.2 | 0.707  [0.95-1.08] |
|  | **uncON** | 35.9 | 39.9 | 36.4 | 39.7 | 38.0 | 35.3 | 38.2 | 45.8 | 0.221  [0.99-1.06] |
| **LVEF** |  |  |  |  |  |  |  |  |  |  |
| Good | **SDD** | 100.0 | 76.7 | 68.0 | 71.6 | 78.8 | 79.5 | 72.9 | 72.9 | 0.717  [0.90-1.08] |
|  | **uncON** | 71.0 | 68.2 | 68.0 | 71.3 | 68.4 | 74.1 | 70.7 | 74.2 | 0.161  [0.99-1.08] |
| Moderate  (30-50%) | **SDD** | 0.0 | 18.6 | 28.0 | 22.7 | 16.8 | 12.3 | 21.0 | 23.6 | 0.768  [0.92-1.12] |
|  | **uncON** | 19.4 | 21.3 | 23.9 | 25.5 | 23.5 | 20.9 | 21.2 | 20.1 | 0.554  [0.94-1.03] |
| Poor (<30%) | **SDD** | 0.0 | 4.7 | 4.0 | 5.7 | 4.4 | 8.2 | 6.1 | 3.6 | 0.860  [0.85-1.21] |
|  | **uncON** | 9.7 | 10.4 | 8.1 | 3.3 | 8.1 | 5.0 | 8.2 | 5.7 | 0.125  [0.87-1.02] |
| **Multivessel disease** | **SDD** | 31.2 | 31.2 | 29.2 | 35.6 | 32.6 | 35.9 | 37.4 | 43.6 | 0.013  [1.02-1.17] |
|  | **uncON** | 32.7 | 33.1 | 37.5 | 37.7 | 40.4 | 41.8 | 38.6 | 38.5 | 0.021  [1.01-1.08] |
| **Valvular Heart disease** | **SDD** | 5.9 | 4.6 | 2.7 | 2.5 | 0.6 | 4.7 | 2.6 | 2.5 | 0.693  [0.80-1.16] |
|  | **uncON** | 0.4 | 1.8 | 4.2 | 4.3 | 6.7 | 4.8 | 5.0 | 3.3 | 0.010  [1.03-1.21] |

\*CABG=Coronary Artery Bypass Graft; ECG=Electrocardiogram; LVEF=Left ventricular ejection fraction; MI=Myocardial infarction; PCI=Percutaneous Coronary Intervention; SDD=Same Day Discharge; uncON= uncomplicated ON

Supplementary Table 4: Pre-procedural characteristics within the SDD and ON (including complicated cases)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **SDD** | **ON** | **p-value** |
| **Size,** n | 1201 | 3686 |  |
| **Center size** |  |  |  |
| Low | 89 (7.41) | 425 (11.53) | <0.001 |
| Medium | 197 (16.40) | 1101 (29.87) | <0.001 |
| High | 915 (76.19) | 2160 (58.60) | <0.001 |
| **Age**, mean (SD) | 71.2 (8.8) | 72.1 (9.1) | 0.003 |
| **Gender** |  |  | 0.065 |
| Male | 914 (76.10) | 2706 (73.41) |  |
| Female | 287 (23.90) | 980 (26.59) |  |
| **Ethnicity** |  |  |  |
| Caucasian | 749 (86.39) | 2662 (90.95) | <0.001 |
| Black | 2 (0.23) | 19 (0.65) | 0.163 |
| Asian | 37 (4.27) | 132 (4.51) | 0.761 |
| Other | 79 (9.11) | 114 (3.89) | <0.001 |
| **Medical history** |  |  |  |
| Prior MI | 391 (34.15) | 1280 (38.19) | 0.015 |
| Prior CABG | 152 (16.36) | 558 (21.06) | 0.002 |
| Prior PCI | 426 (36.50) | 1297 (35.83) | 0.676 |
| High Cholesterol | 835 (70.58) | 2546 (70.68) | 0.948 |
| Hypertension | 847 (71.60) | 2647 (73.49) | 0.204 |
| Peripheral Vascular disease | 102 (8.62) | 394 (10.94) | 0.024 |
| Prior Stroke | 80 (6.76) | 244 (6.77) | 0.989 |
| **Qwave on ECG** | 50 (4.53) | 293 (9.61) | <0.001 |
| **Diabetes mellitus** | 361 (30.46) | 1073 (29.96) | 0.745 |
| **Renal disease** | 45 (3.77) | 176 (4.81) | 0.132 |
| **Smoking** |  |  |  |
| Ex smoker | 606 (54.99) | 1826 (54.87) | 0.943 |
| Current smoker | 79 (7.17) | 219 (6.58) | 0.499 |
| Never smoked | 417 (37.84) | 1283 (38.55) | 0.674 |
| **LVEF** |  |  |  |
| Good | 595 (75.13) | 1609 (70.91) | 0.023 |
| Moderate  (30-50%) | 153 (19.32) | 508 (22.39) | 0.071 |
| Poor (<30%) | 44 (5.56) | 152 (6.70) | 0.258 |
| **Multivessel disease** | 423 (36.28) | 1308 (38.22) | 0.237 |
| **Valvular Heart disease** | 34 (2.87) | 152 (4.22) | 0.039 |

\*CABG=Coronary Artery Bypass Graft; ECG=Electrocardiogram; LVEF=Left ventricular ejection fraction; MI=Myocardial infarction; ON=Overnight Stay; PCI=Percutaneous Coronary Intervention; SDD=Same Day Discharge

Table 5: Procedural characteristics within the SDD and uncomplicated ON over time

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **p-value**  **[95% CI]** |
| **Medication** |  |  |  |  |  |  |  |  |  |  |
| Warfarin | **SDD** | 0.0 | 0.0 | 2.9 | 1.8 | 0.0 | 1.2 | 4.1 | 1.6 | 0.133  [0.94-1.65] |
|  | **uncON** | 0.5 | 0.8 | 0.6 | 1.5 | 0.7 | 2.5 | 2.1 | 4.8 | <0.001  [1.20-1.62] |
| Bivalirudin | **SDD** | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.7 | 0.5 | 0.273  [0.72-3.27] |
|  | **uncON** | 0.0 | 0.6 | 0.0 | 0.2 | 0.4 | 1.3 | 1.0 | 0.3 | 0.095  [0.96-1.57] |
| Clopidogrel | **SDD** | 100.0 | 100.0 | 100.0 | 100.0 | 98.3 | 99.1 | 99.2 | 92.9 | <0.001  [0.27-0.69] |
|  | **uncON** | 100.0 | 99.7 | 99.7 | 99.4 | 98.5 | 97.8 | 96.5 | 91.8 | <0.001  [0.44-0.64] |
| GP IIb\IIIa inhibitor | **SDD** | 17.6 | 9.4 | 9.7 | 1.8 | 2.8 | 4.0 | 2.2 | 2.0 | <0.001  [0.64-0.87] |
|  | **uncON** | 23.0 | 25.2 | 18.4 | 15.7 | 10.6 | 6.4 | 4.0 | 2.8 | <0.001  [0.67-0.74] |
| **Offsite surgical cover** | **SDD** | 28.6 | 46.2 | 40.0 | 41.9 | 37.9 | 46.4 | 43.1 | 47.0 | 0.210  [0.98-1.11] |
|  | **uncON** | 9.5 | 14.2 | 14 | 19.3 | 23.3 | 29.1 | 33.1 | 30.2 | <0.001  [1.18-1.29] |
| **Ad hoc PCI** | **SDD** | 0.0 | 9.2 | 6.1 | 11.1 | 6.6 | 8.9 | 13.8 | 18.8 | <0.001  [1.10-1.39] |
|  | **uncON** | 11.6 | 13.9 | 14.2 | 14.1 | 19.8 | 18.8 | 19.5 | 17.1 | 0.001  [1.03-1.13] |
| **Multivessel attempted** | **SDD** | 11.8 | 13.8 | 17.6 | 14.2 | 9.7 | 14.8 | 13.8 | 15.9 | 0.668  [0.93-1.12] |
|  | **uncON** | 20.0 | 16.7 | 18.0 | 17.0 | 19.1 | 18.7 | 20.3 | 20.7 | 0.181  [0.99-1.07] |
| **CTO** | **SDD** | 5.9 | 9.2 | 8.3 | 12.9 | 9.4 | 8.0 | 11.4 | 8.0 | 0.915  [0.89-1.11] |
|  | **uncON** | 8.4 | 10.6 | 6.7 | 13.4 | 9.2 | 9.8 | 10.2 | 8.7 | 0.940  [0.95-1.06] |
| **LMS** | **SDD** | 5.9 | 4.6 | 13.5 | 7.5 | 4.3 | 7.4 | 9.5 | 9.5 | 0.334  [0.94-1.20] |
|  | **uncON** | 12.3 | 10.4 | 11.9 | 10.7 | 14.5 | 12.8 | 14.5 | 17.1 | 0.005  [1.02-1.12] |
| **Stents used** |  |  |  |  |  |  |  |  |  |  |
| No stents | **SDD** | 5.9 | 4.6 | 0.0 | 0.9 | 2.2 | 3.7 | 3.3 | 3.5 | 0,383  [0.89-1.34] |
|  | **uncON** | 5.1 | 3.4 | 3.2 | 3.5 | 2.6 | 4.4 | 3.4 | 4.1 | 0.974  [0.92-1.09] |
| BMS | **SDD** | 29.4 | 16.9 | 13.7 | 13.7 | 13.1 | 9.1 | 2.6 | 2.5 | <0.001  [0.64-0.79] |
|  | **uncON** | 20.9 | 17.6 | 15.9 | 10.2 | 9.0 | 9.6 | 4.1 | 3.3 | <0.001  [0.72-0.81] |
| DES | **SDD** | 64.7 | 66.2 | 84.9 | 79.5 | 82.0 | 86.0 | 91.9 | 92.5 | <0.001  [1.21-1.44] |
|  | **uncON** | 66.7 | 72.9 | 75.5 | 84.0 | 85.3 | 82.9 | 89.4 | 90.7 | <0.001  [1.19-1.29] |
| Both | **SDD** | 0.0 | 12.3 | 1.4 | 6.0 | 2.7 | 1.2 | 2.2 | 1.5 | 0.001  [0.63-0.89] |
|  | **uncON** | 7.3 | 6.2 | 5.4 | 2.3 | 3.1 | 3.1 | 3.2 | 1.9 | <0.001  [0.77-0.91] |
| **Largest** | **SDD** | 3.3 | 3.4 | 3.5 | 3.3 | 3.5 | 3.5 | 3.5 | 3.6 | <0.001  [0.01-0.03] |
|  |  | (0.4) | (0.5) | (0.6) | (0.5) | (0.6) | (0.6) | (0.6) | (0.6) |  |
|  | **uncON** | 3.5 | 3.4 | 3.4 | 3.5 | 3.6 | 3.6 | 3.6 | 3.5 |  |
|  |  | (0.6) | (0.5) | (0.6) | (0.6) | (0.6) | (0.6) | (0.6) | (0.6) |  |
| **Longest** | **SDD** | 26.2 | 34.8 | 35.1 | 30.6 | 34.1 | 36.6 | 35.4 | 34.6 | <0.001  [0.39-1,04] |
|  |  | (10.3) | (20.6) | (19.3) | (18.2) | (19.4) | (20.3) | (19.1) | (18.7) |  |
|  | **uncON** | 32.8 | 32.0 | 32.3 | 32.2 | 32.9 | 35.0 | 37.3 | 35.1 |  |
|  |  | (18.2) | (17.9) | (16.9) | (17.7) | (19.1) | (19.3) | (21.7) | (19.4) |  |
| **Intravascular imaging** | **SDD** | 0.0 | 10.9 | 15.3 | 15.9 | 16.9 | 15.2 | 10.9 | 16.6 | 0.667  [0.93-1.12] |
|  | **uncON** | 10.1 | 10.7 | 13.4 | 15.3 | 18.0 | 15.0 | 12.5 | 12.7 | 0.303  [0.98-1.08] |
| **Penetration catheter** | **SDD** | 0.0 | 0.0 | 1.4 | 0.0 | 1.1 | 1.2 | 2.5 | 4.4 | 0.003  [1.20-2.43] |
|  | **uncON** | 0.0 | 0.0 | 0.5 | 1.8 | 2.1 | 3.3 | 2.7 | 6.0 | <0.001  [1.33-1.76] |
| **Microcatheter** | **SDD** | 0.0 | 0.0 | 0.0 | 0.0 | 3.8 | 3.5 | 7.6 | 10.8 | <0.001  [1.46-2.32] |
|  | **uncON** | 0.0 | 0.0 | 0.0 | 0.0 | 3.8 | 6.6 | 10.4 | 13.6 | <0.001  [1.77-2.27] |
| **Access site** |  |  |  |  |  |  |  |  |  |  |
| Femoral | **SDD** | 58.8 | 68.8 | 67.1 | 70.0 | 51.4 | 46.5 | 37.5 | 42.6 | <0.001  [0.74-0.85] |
|  | **uncON** | 79.4 | 83.3 | 79.3 | 73.2 | 67.2 | 60.8 | 56.3 | 54.1 | <0.001  [0.77-0.83] |
| Radial | **SDD** | 35.3 | 31.2 | 32.9 | 28.3 | 47.6 | 51.2 | 59.6 | 54.0 | <0.001  [1.15-1.32] |
|  | **uncON** | 18.1 | 15.9 | 19.7 | 25.4 | 29.6 | 37.2 | 40.4 | 43.7 | <0.001  [1.21-1.30] |
| Multiple / Other | **SDD** | 5.9 | 0.0 | 0.0 | 1.7 | 1.1 | 2.3 | 2.9 | 3.5 | 0.052  [1.00-1.68] |
|  | **uncON** | 2.5 | 0.8 | 1.1 | 1.4 | 3.2 | 2.0 | 3.3 | 2.2 | 0.046  [1.00-1.26] |
| **Mortality 30-day** | **SDD** | 0.0 | 0.0 | 1.4 | 0.0 | 1.1 | 0.4 | 0.7 | 0.0 | 0.741  [0.60-1.43] |
|  | **uncON** | 0.4 | 0.0 | 0.5 | 0.2 | 1.1 | 0.2 | 0.4 | 0.0 | 0.800  [0.74-1.26] |

\*BMS=Bare mare stent; CTO=Chronic Total Occlusion; DES=Drug-eluting stent; GP=Glycoprotein; LMS=Left Main Stem; MI=Myocardial infarction; PCI=Percutaneous Coronary Intervention; SHA=Strategic Health Authorities; SDD=Same Day Discharge; uncON= uncomplicated ON

Supplementary Table 6: Procedural characteristics within the SDD and ON (including complicated cases)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **SDD** | **ON** | **p-value** |
| **Medication** |  |  |  |
| Warfarin | 21 (1.82) | 62 (1.79) | 0.949 |
| Bivalirudin | 4 (0.35) | 21 (0.61) | 0.304 |
| Clopidogrel | 1070 (98.17) | 2959 (97.69) | 0.358 |
| GP IIb\IIIa inhibitor | 43 (3.68) | 428 (12.29) | <0.001 |
| **Offsite surgical cover** | 503 (43.36) | 783 (22.85) | <0.001 |
| **Ad hoc PCI** | 129 (11.25) | 563 (16.59) | <0.001 |
| **Multivessel attempted** | 167 (13.97) | 690 (18.81) | <0.001 |
| **CTO** | 112 (9.56) | 354 (10.19) | 0.540 |
| **LMS** | 95 (7.95) | 480 (13.09) | <0.001 |
| **Stents used** |  |  |  |
| No stents | 34 (2.91) | 143 (3.98) | 0.093 |
| BMS | 100 (8.55) | 386 (10.75) | 0.032 |
| DES | 1002 (85.71) | 2923 (81.42) | 0.001 |
| Both | 33 (2.82) | 138 (3.84) | 0.105 |
| **Largest**, mean (SD) | 3.48 (0.6) | 3.51 (0.6) | 0.245 |
| **Longest**, mean (SD) | 34.67 (19.3) | 34.10 (19.2) | 0.396 |
| **Intravascular imaging** | 167 (14.38) | 482 (13.87) | 0.662 |
| **Penetration catheter** | 22 (1.83) | 85 (2.31) | 0.330 |
| **Microcatheter** | 59 (4.91) | 178 (4.83) | 0.907 |
| **Access site** |  |  |  |
| Femoral | 591 (49.50) | 2474 (67.97) | <0.001 |
| Radial | 577 (48.32) | 1083 (29.75) | <0.001 |
| Multiple / Other | 26 (2.18) | 83 (2.28) | 0.836 |
| **Mortality 30-day** | 6 (0.50) | 22 (0.60) | 0.698 |

\*BMS=Bare mare stent; CTO=Chronic Total Occlusion; DES=Drug-eluting stent; GP=Glycoprotein; LMS=Left Main Stem; MI=Myocardial infarction; ON=Overnight stay; PCI=Percutaneous Coronary Intervention; SHA=Strategic Health Authorities; SDD=Same Day Discharge;

**Supplementary Table 7: Variance Inflation Factor (VIF) of each variable included in the mixed effects multivariable regression models.**

|  |  |  |
| --- | --- | --- |
| **Variable** | **VIF** | **Tolerance** |
| LMS | 1.78 | 0.56 |
| MVL attempted | 1.76 | 0.57 |
| MVL disease | 1.37 | 0.73 |
| Previous CABG | 1.32 | 0.76 |
| Year | 1.26 | 0.79 |
| Previous MI | 1.24 | 0.80 |
| Hypertension | 1.17 | 0.86 |
| Largest stent | 1.15 | 0.87 |
| High Cholesterol | 1.14 | 0.87 |
| LVEF | 1.14 | 0.88 |
| Previous PCI | 1.13 | 0.88 |
| Age | 1.13 | 0.89 |
| Q Wave on ECG | 1.12 | 0.90 |
| Longest stent | 1.11 | 0.90 |
| Offsite surgical cover | 1.11 | 0.90 |
| Female | 1.10 | 0.91 |
| Intravascular imaging | 1.10 | 0.91 |
| Access site | 1.10 | 0.91 |
| GP IIb\IIIa inhibitor | 1.10 | 0.91 |
| Smoking | 1.09 | 0.92 |
| Microcatheter | 1.08 | 0.92 |
| Stent use | 1.08 | 0.93 |
| Peripheral Vascular Disease | 1.07 | 0.93 |
| Diabetes | 1.07 | 0.93 |
| Penetration catheter | 1.06 | 0.94 |
| Caucasian | 1.06 | 0.94 |
| CTO | 1.06 | 0.94 |
| Clopidogrel | 1.06 | 0.95 |
| Renal Disease | 1.04 | 0.96 |
| Previous Stroke | 1.03 | 0.97 |
| Valvular Heart Disease | 1.03 | 0.97 |
| Warfarin | 1.02 | 0.98 |
| Ad hoc PCI | 1.01 | 0.99 |
| Bivalirudin | 1.01 | 0.99 |

\*Tolerance = 1/VIF

\*\*CABG=Coronary Artery Bypass Graft; CTO=Chronic Total Occlusion; ECG=Electrocardiogram; GP=Glycoprotein; LVEF=Left ventricular ejection fraction; LMS=Left Main Stem; MI=Myocardial infarction; MVL=Multivessel; PCI=Percutaneous Coronary Intervention; SHA=Strategic Health Authorities

Supplementary Table 8: Mixed effects multivariable logistic regression model (with adjusted ORs) for the SDD when complicated ON cases included

|  |  |  |  |
| --- | --- | --- | --- |
| ***Fixed effects*** | **OR** | **p-value** | **[95% CI]** |
| **Age** | 0.98 | <0.001 | [0.97-0.99] |
| **Female** | 0.84 | 0.093 | [0.69-1.02] |
| **Caucasian** | 0.85 | 0.354 | [0.60-1.20] |
| **Medical History** |  |  |  |
| Previous MI | 1.03 | 0.778 | [0.84-1.26] |
| Previous CABG | 1.09 | 0.547 | [0.82-1.46] |
| Previous PCI | 0.99 | 0.946 | [0.83-1.19] |
| High Cholesterol | 1.08 | 0.456 | [0.88-1.32] |
| Hypertension | 0.93 | 0.514 | [0.76-1.14] |
| Peripheral Vascular Disease | 0.77 | 0.083 | [0.58-1.03] |
| Previous Stroke | 0.89 | 0.505 | [0.64-1.25] |
| Q Wave on ECG | 0.54 | 0.002 | [0.37-0.80] |
| **Diabetes** | 0.98 | 0.857 | [0.82-1.18] |
| **Renal Disease** | 0.71 | 0.106 | [0.46-1.08] |
| **Smoking** |  |  |  |
| Never | Ref. |  |  |
| Ex-smoker | 1.04 | 0.695 | [0.86-1.26] |
| Current smoker | 0.94 | 0.721 | [0.65-1.35] |
| **LVEF** |  |  |  |
| Good | Ref. |  |  |
| Moderate (LVEF 30-50%) | 0.96 | 0.772 | [0.75-1.24] |
| Poor (LVEF<30%) | 0.87 | 0.540 | [0.54-1.38] |
| **MVL disease** | 0.95 | 0.656 | [0.77-1.17] |
| **Valvular Heart Disease** | 0.50 | 0.004 | [0.31-0.80] |
| **Medication** |  |  |  |
| Warfarin | 0.97 | 0.914 | [0.52-1.80] |
| Bivalirudin | 0.87 | 0.824 | [0.26-2.89] |
| Clopidogrel | 1.26 | 0.426 | [0.71-2.25] |
| GP IIb\IIIa inhibitor | 0.39 | <0.001 | [0.27-0.57] |
| **Offsite surgical cover** | 1.98 | 0.018 | [1.13-3.49] |
| **Ad hoc PCI** | 0.76 | 0.034 | [0.59-0.98] |
| **MVL attempted** | 0.79 | 0.121 | [0.59-0.98] |
| **CTO** | 0.87 | 0.345 | [0.65-1.16] |
| **LMS** | 0.62 | 0.012 | [0.43-0.90] |
| **Stent use** |  |  |  |
| No stent | Ref. |  |  |
| BMS only | 1.60 | 0.093 | [0.92-2.79] |
| DES only | 1.83 | 0.013 | [1.13-2.97] |
| Both | 1.14 | 0.709 | [0.58-2.24] |
| **Largest stent** | 0.96 | 0.613 | [0.81-1.13] |
| **Longest stent** | 0.99 | <0.001 | [0.98-1.00] |
| **Intravascular imaging** | 0.77 | 0.062 | [0.59-1.01] |
| **Penetration catheter** | 0.94 | 0.840 | [0.54-1.66] |
| **Microcatheter** | 1.05 | 0.808 | [0.72-1.52] |
| **Access site** |  |  |  |
| Femoral | Ref. |  |  |
| Radial | 1.81 | <0.001 | [1.50-2.19] |
| Multiple/ Other | 0.66 | 0.153 | [0.38-1.16] |
| **Year** | 1.27 | <0.001 | [1.21-1.33] |
|  |  |  |  |
| ***Random effects*** | **Estimate** | **SE** | **[95% CI]** |
| Intercept for SHA | 2.04e-07 | 1.35 | [0 - .] |
| Intercept for centre | 0.37 | 0.12 | [0.19-0.71] |
| Slope for centre volume | 1.23 | 0.21 | [0.87-1.73] |

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

Supplementary Table 9: Mixed effects multivariable logistic regression model (with adjusted ORs) for 30-days mortality when complicated ON cases included

|  |  |  |  |
| --- | --- | --- | --- |
| ***Fixed effects*** | **OR** | **p-value** | **[95% CI]** |
| **SDD** | 1.45 | 0.488 | [0.50-4.18] |
| **Age** | 1.10 | 0.001 | [1.04-1.17] |
| **Female** | 0.80 | 0.656 | [0.30-2.15] |
| **Caucasian** | 0.55 | 0.502 | [0.09-3.26] |
| **Medical History** |  |  |  |
| Previous MI | 1.19 | 0.698 | [0.49-2.90] |
| Previous CABG | 0.74 | 0.646 | [0.20-2.68] |
| Previous PCI | 1.11 | 0.827 | [0.45-2.73] |
| High Cholesterol | 1.08 | 0.879 | [0.42-2.76] |
| Hypertension | 0.81 | 0.666 | [0.31-2.12] |
| Peripheral Vascular Disease | 0.91 | 0.880 | [0.28-3.02] |
| Previous Stroke | 2.31 | 0.173 | [0.69-7.70] |
| **Q Wave on ECG** | 0.22 | 0.169 | [0.02-1.90] |
| **Diabetes** | 1.77 | 0.184 | [0.76-4.14] |
| **Smoking** |  |  |  |
| Never | Ref. |  |  |
| Ex-smoker | 2.09 | 0.153 | [0.76-5.74] |
| Current smoker | 4.45 | 0.057 | [0.95-20.76] |
| **LVEF** |  |  |  |
| Good | Ref. |  |  |
| Moderate (LVEF 30-50%) | 0.94 | 0.925 | [0.27-3.34] |
| Poor (LVEF<30%) | 3.51 | 0.049 | [1.01-12.27] |
| **MVL disease** | 1.99 | 0.186 | [0.72-5.53] |
| **Valvular Heart Disease** | 5.43 | 0.005 | [1.66-17.81] |
| **Medication** |  |  |  |
| Bivalirudin | 22.44 | 0.002 | [3.19-157.66] |
| GP IIb\IIIa inhibitor | 3.66 | 0.021 | [1.22-11.01] |
| **Offsite surgical cover** | 0.31 | 0.106 | [0.08-1.28] |
| **Ad hoc PCI** | 1.15 | 0.831 | [0.30-4.42] |
| **MVL attempted** | 0.38 | 0.188 | [0.09-1.61] |
| **LMS** | 2.01 | 0.381 | [0.42-9.55] |
| **Stent use** |  |  |  |
| No stent | Ref. |  |  |
| BMS only | 0.38 | 0.473 | [0.03-5.43] |
| DES only | 0.62 | 0.672 | [0.07-5.75] |
| Both | 2.67 | 0.443 | [0.22-36.11] |
| **Largest stent** | 0.96 | 0.927 | [0.43-2.14] |
| **Longest stent** | 1.01 | 0.209 | [0.99-1.03] |
| **Intravascular imaging** | 1.19 | 0.755 | [0.39-3.66] |
| **Year** | 1.03 | 0.767 | [0.83-1.29] |
|  |  |  |  |
| ***Random effects*** | **Estimate** | **SE** | **[95% CI]** |
| Intercept for SHA | 0.77 | 0.44 | [0.25 - .2.34] |
| Intercept for centre | 0.00 | 583787.9 | [0 - .] |
| Slope for centre volume | 0.50 | 2.20 | [0.00-2606.2] |

\* Variable on clopidogrel use, Warfarin, renal disease, penetration catheter, microcatheter, access site and CTO were excluded from the analysis because of perfect prediction due to the low counts of mortality

\*BMS=Bare mare stent; CABG=Coronary Artery Bypass Graft; DES=Drug-eluting stent; ECG=Electrocardiogram; GP=Glycoprotein; LVEF=Left ventricular ejection fraction; LMS=Left Main Stem; MI=Myocardial infarction; MVL=Multivessel; PCI=Percutaneous Coronary Intervention; SDD=Same Day Discharge; SHA=Strategic Health Authorities

**Visual abstract**

****