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Understanding operator stent choice in the catheterization laboratory using a pre-procedure survey: Opportunities for quality improvement☆,☆☆,★

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ABSTRACT

Objectives: We sought to characterize how the perceived risk of early dual antiplatelet therapy (DAPT) discontinuation is incorporated into operator decision-making regarding stent choice, using a simple pre-procedure survey screening for clinical variables that may lead to early DAPT discontinuation.
Background: Understanding which factors influence operator decision-making regarding stent choice during percutaneous coronary intervention (PCI) could help identify areas for quality improvement.
Methods: We retrospectively identified 1202 patients who underwent PCI from July 2008 to January 2013 at the Durham Veterans Affairs Medical Center. We excluded patients without a complete pre-procedure survey within 14 days of PCI, repeat procedures on the same patient and those who received both drug-eluting stents (DES) and bare-metal stents (BMS) or no stent during PCI, leaving 864 patients. The primary outcome was the independent association of "yes" responses to survey items with the odds of DES use during PCI.
Results: Of 864 patients, 661 received DES and 203 received BMS. A "yes" response to "planned major surgery or dental work in the next year" (OR 0.20, 95% CI 0.11–0.36, $p < 0.001$), "recent bleeding event or bleeding diathesis" (OR 0.31, 95% CI 0.14–0.68, $p = 0.003$) or "currently taking Coumadin" (OR 0.39, 95% CI 0.19–0.78, $p = 0.007$) was independently associated with lower odds of DES use.
Conclusions: Responses to 3 items on a simple pre-procedure survey screening for clinical variables that may lead to early DAPT discontinuation were independently associated with stent type used during PCI, suggesting the importance of these factors in an operator's stent choice.

1. Introduction

Drug-eluting stents (DES) have been shown to reduce angiographic restenosis and target vessel revascularization compared with bare-metal stents (BMS). However, current guidelines recommend a longer duration of dual antiplatelet therapy (DAPT) after DES implantation due to a delay in neointimal coverage of the stent struts [1–3]. Furthermore, early DAPT discontinuation has been shown to be strongly associated with stent thrombosis, a potentially devastating event that can lead to significant morbidity and mortality [4,5]. Although the gap between required duration of DAPT after DES and BMS is narrowing with newer stent technologies, it remains useful to understand how operators incorporate the perceived risk of early DAPT discontinuation into decisions regarding stent choice [6]. Such information could help elucidate differences in practice patterns between operators and potentially identify areas for quality improvement as the paradigm shifts towards the use of DES in nearly all situations. In July 2008, we incorporated a simple pre-procedure survey into the local electronic health record for all patients being evaluated for cardiac catheterization. This survey screened for clinical variables that may lead to early DAPT discontinuation. In this study, we sought to evaluate the utilization of this survey. We hypothesized that a "yes" response to any survey item would be associated with stent type used during percutaneous coronary

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intervention (PCI), since the risk of stent thrombosis with early DAPT discontinuation is higher for DES compared with BMS in the early post-PCI period.

2. Methods

We performed a single center, retrospective cohort study at the Durham Veterans Affairs Medical Center, a 271-bed tertiary care hospital in Durham, NC. Using the Durham Veterans Affairs Medical Center electronic health record, we identified all patients who underwent PCI over 54 months from July 2008 to January 2013. We excluded patients without a complete pre-procedure survey within 14 days of PCI, repeat procedures on the same patient and those who received both DES and BMS or no stent during PCI (Fig. 1). During this time period, clopidogrel was the only thienopyridine used after PCI and Coumadin (warfarin) was the only oral anticoagulant used at our institution.

The pre-procedure survey included 6 yes/no questions: 1) Currently taking Coumadin? 2) Major surgery within the last week? 3) Planned major surgery or dental work in the next year? 4) Recent bleeding event or bleeding diathesis? 5) History of medication noncompliance? 6) Is the patient anemic (hematocrit ≤ 30%)? The first 5 questions were asked to patients by a healthcare provider prior to undergoing cardiac catheterization and the hematocrit was determined from pre-procedure laboratory studies. The responses to the survey were entered into the electronic health record as part of the mandatory pre-catheterization assessment. Once completed, this assessment was reviewed and signed by the interventional cardiology attending prior to the procedure.

We evaluated the utilization of the pre-procedure survey by determining the association of "yes" responses to survey items with the odds of DES use during PCI. The primary outcome was the use of DES during PCI. The DES platforms available at the DVAMC during the study period were the Xience Prime (Abbott Vascular, Santa Clara, CA) and the Resolute Integrity (Medtronic Vascular, Minneapolis, MN).

To reduce the bias of intra-class correlation or clustering, we limited our analysis to the first PCI for each patient during the study period. We determined baseline characteristics of the patients as shown in Table 1. We first performed univariate logistic regression to determine the association between baseline characteristics of the patients and DES use during PCI. Age, hyperlipidemia, congestive heart failure, peripheral vascular disease, serum creatinine, shock on presentation and PCI indication were significantly associated with DES use ($p < 0.10$ for the univariate analysis). Although we planned to include sex in the univariate analysis, there were only 12 females in the study, all of whom received a DES; thus, we were unable to estimate the effect of sex due to the marked imbalance. Sensitivity analysis revealed no significant change in the results when excluding these patients from the analysis. We then performed multivariate logistic regression, adjusting for age, hyperlipidemia, congestive heart failure, peripheral vascular disease, serum creatinine, shock on presentation, PCI indication and survey responses, to determine the independent association between "yes" responses to survey items and DES use. Sensitivity analysis including patients who received both DES and BMS as part of the DES group resulted in no significant changes in the point estimates or statistical significance of the odds ratios in the multivariate model. All analyses were conducted in R (Vienna, Austria). The study was approved by the Durham Veterans Affairs Medical Center institutional review board, which provided a waiver of informed consent due to the retrospective nature of the study.

Table 1
Baseline characteristics of the study patients.

Clinical variable	All patients	Bare-metal stent	Drug-eluting stent	*P* value
	(N = 864)	(N = 203)	(N = 661)	
Age, y*	64.2 ± 8.6	65.7 ± 9.2	63.7 ± 8.3	0.007
Sex, no. (%)				0.09
Male	852 (98.6)	203 (100)	649 (98.2)	
Female	12 (1.4)	0 (0)	12 (1.8)	
Race, no. (%)				0.44
White	600 (69.4)	136 (67.0)	464 (70.2)	
Non-white	264 (30.6)	67 (33.0)	197 (29.8)	
Ethnicity, no. (%)				0.69
Hispanic or Latino	8 (0.9)	1 (0.5)	7 (1.1)	
Non-Hispanic or Latino or unknown/declined to answer	856 (99.1)	202 (99.5)	654 (98.9)	
Cigarette smoking status, no. (%)				0.75
Never smoker	156 (18.0)	33 (16.3)	123 (18.6)	
Former smoker	387 (44.8)	91 (44.8)	296 (44.8)	
Current smoker	245 (28.4)	58 (28.6)	187 (28.3)	
Unknown	76 (8.8)	21 (10.3)	55 (8.3)	
Hypertension, no. (%)	714 (82.6)	164 (80.8)	550 (83.2)	0.43
Diabetes mellitus, no. (%)	396 (45.8)	89 (43.8)	307 (46.4)	0.52
Hyperlipidemia, no. (%)	551 (63.8)	113 (55.7)	438 (66.3)	0.006
Congestive heart failure, no. (%)	168 (19.4)	48 (23.6)	120 (18.2)	0.09
Peripheral vascular disease, no. (%)	120 (13.9)	38 (18.7)	82 (12.4)	0.02
Prior cerebrovascular accident, no. (%)	93 (10.8)	26 (12.8)	67 (10.1)	0.284
Serum creatinine, mg/dl*	1.37 ± 1.27	1.53 ± 1.66	1.33 ± 1.11	0.06
Shock on presentation, no. (%)	6 (0.7)	4 (2.0)	2 (0.3)	0.03
Indication, no. (%)				<0.001
Stable angina	216 (25.0)	56 (27.6)	160 (24.2)	
Unstable angina/NSTEMI	476 (55.1)	74 (36.4)	402 (60.8)	
STEMI	117 (13.5)	54 (26.6)	63 (9.5)	
Unknown	55 (6.4)	19 (9.4)	36 (5.5)	
Target vessel type, no. (%)				0.84
Native	780 (90.3)	184 (90.6)	596 (90.2)	
Vein graft	84 (9.7)	19 (9.4)	65 (9.8)	

NSTEMI = non-ST-elevation myocardial infarction; STEMI = ST-elevation myocardial infarction.

* Mean ± standard deviation is presented for age and serum creatinine.

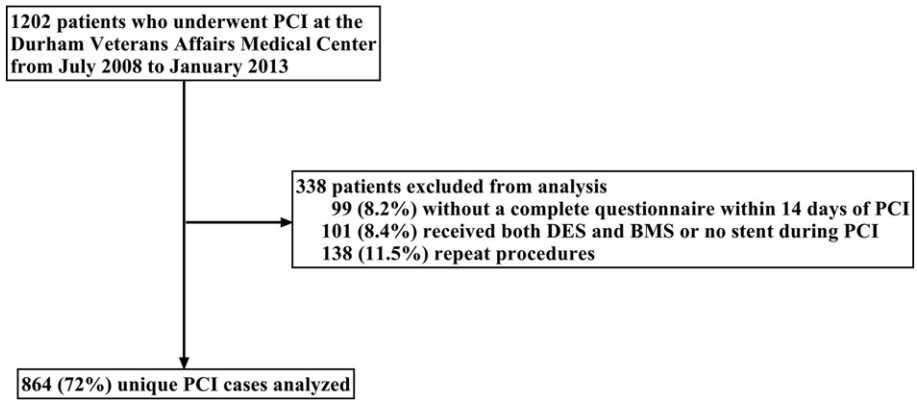

Fig. 1. Analytical cohort. The derivation of the analytical cohort is shown. PCI = percutaneous coronary intervention; DES = drug-eluting stent; BMS = bare-metal stent.