



African-American patients are less likely to receive drug-eluting stents during percutaneous coronary intervention[☆]



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ABSTRACT

Background: Previous research has shown that African-Americans, patients without insurance, and those with government-sponsored insurance are less likely to be referred for invasive cardiovascular procedures. We therefore sought to compare the impact of race and insurance type upon the use of drug-eluting stents (DES).

Methods: Patients undergoing percutaneous coronary intervention (PCI) with stenting from January 2008 to December 2012 at Los Angeles County Hospital and Keck Hospital of USC were retrospectively analyzed. Race was categorized as African-American, Hispanic, or non-African-American/non-Hispanic. Insurance was categorized as private, Medicare, Medicaid, incarcerated, or uninsured. Multivariable logistic regression was performed, with receipt of ≥ 1 DES the outcome variable of interest.

Results: Among 2763 patients undergoing PCI, 62.8% received ≥ 1 DES, 45.4% were Hispanic, 6.7% were African-American, 33.2% were uninsured, 28.5% had Medicaid, 22.5% had Medicare, 14.1% had private insurance, and 1.7% were incarcerated. Following multivariable adjustment, African-Americans, in comparison to non-African-American/non-Hispanic patients, were less likely to receive ≥ 1 DES (odds ratio [OR] 0.57, 95% confidence interval [CI] 0.40–0.82, $p = 0.002$). Hispanic patients, however, were not less likely to receive DES. Uninsured patients (OR 1.51, 95% CI 1.13–2.03, $p = 0.006$) and those with Medicaid (OR 1.49, 95% CI 1.11–2.00, $p = 0.008$) were more likely to receive DES than patients with private insurance, whereas those with Medicare were less likely to receive DES (OR 0.71, 95% CI 0.52–0.95, $p = 0.02$).

Conclusions: African-American race continues to have a significant impact upon the decision to use DES. Future research should focus upon patient and provider perceptions at the time of PCI.

Summary: This study is a retrospective analysis of the impact of race and insurance status upon the utilization of drug-eluting stents. Multivariable logistic regression showed that African-American race was associated with less utilization of drug-eluting stents.

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1. Introduction

Drug-eluting stents (DES), in comparison to bare metal stents, reduce in-stent restenosis and repeat revascularization in a wide range of patients with both stable coronary artery disease and acute coronary syndromes [1,2]. First-generation DES, however, may also result in delayed arterial healing and re-endothelialization, which may increase the risk of very late stent thrombosis [3–6]. In addition, premature discontinuation of dual antiplatelet therapy is associated with an increased risk of stent thrombosis [7–10]. Recent guidelines therefore recommend at least one year of dual antiplatelet therapy for patients undergoing percutaneous coronary intervention (PCI) with

DES [11]. Similarly, guidelines also specify that DES should not be used in patients with financial or social barriers that may limit compliance with dual antiplatelet therapy [11,12]. The identification of such patients who are unlikely to comply, however, is ultimately left to the clinical judgment of the interventional cardiologist. Furthermore, the decision to use DES is often made quickly in the urgent or emergent setting.

Previous studies have shown that poor, uninsured, and African-American patients are less likely to be referred for invasive cardiac procedures, including cardiac catheterization, PCI, coronary artery bypass surgery, and defibrillator implantation [13–18]. The impact of socioeconomic factors upon the decision to use DES vs. BMS, however, is not well-studied. We therefore sought to examine the effect of insurance status, race, and ethnicity upon the use of DES. We hypothesized that incarcerated, uninsured, Medicaid, African-American, and Hispanic patients would be less likely to receive DES than patients with private insurance and non-African-American/non-Hispanic race.

[☆] Conflict of Interest: none.

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2. Methods

2.1. Study population

Clinical, procedural, and follow-up data for patients undergoing PCI with stenting from January 2008 to December 2012 at Los Angeles County + USC Hospital and Keck University Hospital were prospectively entered and retrospectively analyzed. Indications for PCI included stable angina, unstable angina, and acute myocardial infarction (MI). This database was then merged with the hospital demographics database, which includes primary insurance type (or lack thereof) and zip code for each patient at the time of hospital discharge. Zip code was matched with United States Census Bureau data regarding median household income by zip code to approximate patient household income [19].

2.2. Anticoagulation Regimen

All patients received aspirin 325 mg and clopidogrel 300–600 mg or prasugrel 60 mg (at the operator's discretion) prior to or immediately following the procedure. Anticoagulation regimens were chosen at the operator's discretion and included unfractionated heparin targeted to achieve an activated clotting time of 200–300 seconds, with or without a glycoprotein IIb/IIIa inhibitor, or bivalirudin 0.75 mg/kg followed by an infusion of 1.75 mg/kg/hr for the duration of the procedure. Following the procedure, aspirin 81 to 325 mg daily was recommended indefinitely. Clopidogrel or prasugrel was recommended for a minimum of 1 month in patients receiving BMS and 12 months in patients receiving DES.

2.3. Clinical data

The Health Sciences Institutional Review Board at the University of Southern California approved this study. A dedicated data coordinating center performed all data management and analyses. Pre-specified clinical and laboratory data during hospitalization periods were obtained from hospital charts reviewed by independent research personnel blinded to the objectives of the study.

2.4. Study definitions

Patients were placed in the DES group if they underwent PCI with at least one DES, for both on- and off-label indications. Primary insurance type was categorized as private, Medicare, Medicaid, incarcerated, or uninsured. Incarcerated patients received medical care exclusively through the Los Angeles County + USC hospital system free of charge. Race was defined based upon the patient's response upon admission. Patients identified themselves as African-American, Hispanic, Caucasian, Asian, Native American, or other and could only select one. Patients were then defined as African-American, Hispanic, or non-African-American/non-Hispanic for purposes of comparison.

2.5. Statistical analysis

Continuous variables are presented as mean \pm standard deviation; categorical variables are presented as percentages. Differences in continuous variables between groups were compared using analysis of variance. Categorical variables were compared using the χ^2 test or Fisher's exact test where appropriate. A *p* value <0.05 was considered statistically significant. To test the independent effect of insurance type upon the likelihood of receiving ≥ 1 DES, we constructed a logistic regression model. Private insurance and non-African-American/non-Hispanic race were used as reference groups for the analysis. We selected covariables based upon significant univariable *p* values and overall clinical relevance. Covariables included in the logistic regression model included: African-American

race, Hispanic race, insurance type, age (per 10 years), presentation with ST elevation myocardial infarction (STEMI), presentation with non-ST elevation myocardial infarction (NSTEMI) or unstable angina, presentation with shock, baseline hematocrit (per 5%), stented length (per 5 mm), and a history of diabetes mellitus, coronary artery bypass grafting (CABG), PCI, and current smoking.

Insurance type and median household income by zipcode were collinear, and an interaction term between these two variables was not significant (*p* = 0.18); therefore, median income by zipcode was excluded from multivariable analysis. Two separate multivariable logistic regression models, utilizing the same covariables, were also constructed for age <65 and ≥ 65 years. Covariables are expressed as odds ratios (OR) with 95% confidence intervals (CIs). Statistical analyses were performed using SAS version 9.2 (SAS Institute, Cary, North Carolina).

3. Results

3.1. Baseline characteristics

This study included 2763 patients who underwent PCI with stenting (Table 1). The average age was 60.9 years, 2144 (77.6%) were male, 43.8% were diabetic, and 15.2% presented with ST elevation myocardial infarction. In regard to race and ethnicity, 1253 (45.4%) were Hispanic, 741 (26.8%) were Caucasian, 186 (6.7%) were African-American, and 583 (21.1%) were other races. Overall median income by zip code was \$51966; income was lowest among African-American and highest among Caucasian patients (Table 2). In regard to primary insurance type (Table 2), 918 (33.2%) were uninsured, 788 (28.5%) had Medicaid, 621 (22.5%) had Medicare, 390 (14.1%) had private insurance, and 46 (1.7%) were incarcerated. Hispanic patients were most likely to be uninsured (40.1%), African-American patients were most likely to be incarcerated (9.1%), and Caucasian patients were most likely to have Medicare (35.4%) or private insurance (26.7%).

3.2. Procedural characteristics

Overall, 1736 (62.8%) patients received at least one DES. African-Americans were less likely to receive DES than non-African-Americans/non-Hispanic patients (47.3% vs. 64.9%, *p* < 0.0001); Hispanic patients, however, were not less likely to receive DES than non-African-American/non-Hispanic patients (63.0% vs. 64.9%, *p* = 0.31). The proportion of patients by insurance type receiving DES was 67.3% for Medicaid, 66.7% for uninsured, 62.3% for private insurance, 53.8% for Medicare, and 37.0% for incarcerated. Patients receiving DES, compared to patients not receiving DES, were less likely to present with an acute coronary syndrome or in shock; more likely to have undergone CABG or PCI in the past; more likely to have a history of myocardial infarction, diabetes mellitus, hypertension, and hyperlipidemia; and less likely to have a history of chronic renal insufficiency and current smoking. Patients receiving DES were also younger (60.4 vs. 61.8 years, *p* = 0.002), more likely to be uninsured, less likely to have Medicaid or to be incarcerated, and had higher median income by zip code (\$52835 vs. \$50433, *p* = 0.007).

3.3. Multivariable analysis

Results of the multivariable logistic regression (Table 3) showed that African-Americans, in comparison to non-African-American/non-Hispanic patients, were less likely to receive ≥ 1 DES (OR 0.57, 95% CI 0.40–0.82, *p* = 0.002). Uninsured patients (OR 1.51, 95% CI 1.13–2.03, *p* = 0.006) and those with Medicaid (OR 1.49, 95% CI 1.11–2.00, *p* = 0.008) were more likely to receive DES than patients with private insurance, whereas those with Medicare were less likely to receive DES (OR 0.71, 95% CI 0.52–0.95, *p* = 0.02). DES usage was also more likely in those patients with a history of CABG or PCI and with longer

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