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CLINICAL RESEARCH

CORONARY

Predictors, Trends, and Outcomes (Among Older Patients ≥65 Years of Age) Associated With Beta-Blocker Use in Patients With Stable Angina Undergoing Elective Percutaneous Coronary Intervention

Insights From the NCDR Registry

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ABSTRACT

OBJECTIVES This study sought to examine predictors, trends, and outcomes associated with β-blocker prescriptions at discharge in patients with stable angina without prior history of myocardial infarction (MI) or systolic heart failure (HF) undergoing elective percutaneous coronary intervention (PCI).

BACKGROUND The benefits of β-blockers in patients with MI and/or systolic HF are well established. However, whether β-blockers affect outcomes in patients with stable angina, especially after PCI, remains uncertain.

METHODS We included patients with stable angina without prior history of MI, left ventricular systolic dysfunction (left ventricular ejection fraction <40%) or systolic HF undergoing elective PCI between January 2005 and March 2013 from the hospitals enrolled in the National Cardiovascular Data Registry (NCDR) CathPCI registry. These patients were retrospectively analyzed for predictors and trends of β-blocker prescriptions at discharge. All-cause mortality (primary endpoint), revascularization, or hospitalization related to MI, HF, or stroke at 30-day and 3-year follow-up were analyzed among patients ≥65 years of age.

RESULTS A total of 755,215 patients from 1,443 sites were studied, and 71.4% population of our cohort was discharged on β-blockers. At 3-year follow-up among patients ≥65 years of age with CMS data linkage (16.3% of the studied population), there was no difference in adjusted mortality rate (14.0% vs. 13.3%; adjusted hazard ratio [HR]: 1.00; 95% confidence interval [CI]: 0.96 to 1.03; $p = 0.84$), MI (4.2% vs. 3.9%; adjusted HR: 1.00; 95% CI: 0.93 to 1.07; $p = 0.92$), stroke (2.3% vs. 2.0%; adjusted HR: 1.08; 95% CI: 0.98 to 1.18; $p = 0.14$) or revascularization (18.2% vs. 17.8%; adjusted HR: 0.97; 95% CI: 0.94 to 1.01; $p = 0.10$) with β-blocker prescription. However, discharge on β-blockers was associated with more HF readmissions at 3-year follow-up (8.0% vs. 6.1%; adjusted HR: 1.18; 95% CI: 1.12 to 1.25; $p < 0.001$). Results at 30-day follow-up were broadly consistent as well. During the period between 2005 and 2013, there was a gradual increase in prescription of β-blockers at the index discharge in our cohort ($p < 0.001$).

CONCLUSIONS Among patients ≥65 years of age with history of stable angina without prior MI, systolic HF or left ventricular ejection fraction <40% undergoing elective PCI, β-blocker use at discharge was not associated with any reduction in cardiovascular morbidity or mortality at 30-day and at 3-year follow-up. Over time, β-blockers use at discharge in this population has continued to increase. (J Am Coll Cardiol Intv 2016;9:1639-48)

ABBREVIATIONS AND ACRONYMS

ACC/AHA = American College of Cardiology/American Heart Association

CABG = coronary artery bypass graft

CAD = coronary artery disease

CI = confidence interval

CMS = Centers for Medicare and Medicaid Services

HF = heart failure

HR = hazard ratio

LV = left ventricular

LVEF = left ventricular ejection fraction

NCDR = National Cardiovascular Data Registry

PCI = percutaneous coronary intervention

Beta-blockers have consistently been shown to improve cardiovascular outcomes, including survival, in coronary artery disease (CAD) patients with myocardial infarction (MI) and in systolic heart failure (HF) (1–4). Based on the strength of evidence, use of β-blockers has a Class 1 recommendation in the American College of Cardiology/American Heart Association (ACC/AHA) guidelines for these cardiovascular conditions (5–7). β-blockers have been shown to be effective in improving cardiac outcomes in patients with CAD with stable angina without prior MI or systolic HF in some studies (8,9), but not in others (10–14). Nevertheless, β-blockers have consistently been shown to provide an antianginal effect (15,16) and are considered a first line for antianginal therapy in this population (17). In addition, β-blockers are recommended as a first line therapy for management of hypertension in

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patients with CAD (18) and have been used extensively for this indication (19,20). Because of these reasons and findings of the landmark COURAGE (Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation) trial (21–23), β-blockers remain an integral component of optimal medical therapy in patients with stable angina not undergoing revascularization. However, whether β-blockers reduce morbidity and mortality in patients with stable angina without prior MI and/or systolic HF, after revascularization with percutaneous coronary intervention (PCI) remains unclear.

Hence, using a very large contemporary database representative of U.S. population, we sought to: 1) evaluate the comparative effectiveness of the use of β-blockers in patients with stable angina without previous history of MI or systolic HF, who underwent an elective PCI; and 2) assess predictors and temporal trends affecting prescription of β-blockers at discharge in this population.

METHODS

STUDY POPULATION. Our analysis included all patients with stable angina undergoing elective PCI at any center participating in the NCDR CathPCI registry between January 1, 2005, and March 31, 2013 (**Figure 1**). Each participating site within the registry had institutional review board approval for waiver of consent for data entry. Patients with prior history of MI, left ventricular (LV) systolic dysfunction (left ventricular ejection fraction [LVEF] <40%), or systolic HF, prior coronary artery bypass graft (CABG), and documented contraindications to β-blockers were excluded. This whole cohort was used to evaluate the trends and predictors of prescription of β-blockers at discharge. Outcomes following discharge were analyzed in a subset of this overall population restricted to patients ≥65 years of age using a link to the Centers for Medicare and Medicaid Services (CMS) fee-for-service data (24,25).

CLINICAL OUTCOMES. Primary outcome was post discharge all-cause mortality (at 30-day and 3-year follow-up) using CMS longitudinal claims data in a subgroup of patients ≥65 years of age. Secondary outcomes included the use of revascularization procedures (PCI or CABG), and cause-specific readmission for MI, HF, and stroke. Additionally, a composite outcome of all-cause mortality, revascularization and cause-specific readmission for MI, HF or stroke was evaluated. The trends and predictors associated with prescription of β-blockers at discharge were also evaluated. The International Classification of Diseases-Ninth Revision codes used to define these events based on primary admission diagnoses were hospitalization due to MI (410.x1), hospitalization due to stroke (434.x1, 436, or 433.x1) hospitalization due to HF (402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.xx), and revascularization (any of ICD-9 procedures PX1, PX2, PX3, PX4, PX5, PX6) has the following: (PCI: 00.66, 36.01-09; CABG: 36.10-19). To evaluate long-term outcomes, CathPCI Registry stent

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