Predictors and Outcomes of Emergency Department Visits Within 30 Days Following Percutaneous Coronary Intervention

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Our objective was to determine the frequency and predictive factors for cardiac-related emergency department (ED) encounters within 30 days after percutaneous coronary intervention (PCI). The data source was an electronic database of 2,731 patients who had PCI from 2002 to 2004. Almost all underwent stent placement. Risk factors for returning to the ED were identified from clinical, anatomic, and demographic candidate variables using multivariate logistic regression. Approximately 9% of the cohort (255 of 2,731 patients) returned to the ED for cardiac reasons within 30 days, peaking around 3 days. ED visits were more likely in those whose index PCI was emergent or urgent (odds ratio [OR] 2.0, 95% confidence interval [CI] 1.3 to 3.0), in women (OR 1.9, 95% CI 1.5 to 2.5), and in those who had previous encounters with the ED or hospital (OR 1.7, 95% CI 1.5 to 2.0). Patients receiving stents were somewhat less likely to return (OR 0.7, 95% CI 0.5 to 1.0). In conclusion, the clinical courses of the 255 returning patients were generally benign, but 12% had a subsequent myocardial infarction or repeat PCI within 30 days of the ED encounter. **(Am J Cardiol 2007;99:197–201)**

Understanding the frequency, timing, and risk factors for emergency department (ED) visits after percutaneous coronary intervention (PCI) may offer potential opportunities to improve health care quality and decrease unnecessary utilization. Such information could influence the postdischarge management of PCI patients, such as when to schedule a routine follow-up visit, when or whether to perform noninvasive testing, or how to triage those with symptoms to the most appropriate site and level of care. This study was an effort to extend the understanding of the postprocedure clinical course of patients after PCI by examining the experience of a cohort of patients who underwent procedures from 2002 through the first half of 2004.

Methods

The study population consisted of patients who underwent PCI at a single site, St. Joseph Mercy Hospital (Ann Arbor, Michigan) from February 2002 to April 2004. The study site is a tertiary care community hospital that is part of a health system with 3 EDs in the service area. Patients after PCI routinely received postprocedure education concerning coronary artery disease and treatment of chest pain. Two data sources were used to identify subjects for this study. The first consisted of hospital billing data to identify patients whose primary or secondary procedure code was represented by Clinical Classification Software procedure code 45[1] or *International Classification of Diseases, Ninth Revision* procedure codes 36.01, 36.02, 36.05, 36.06, or 36.07. The second source was the hospital registry for the Blue Cross Blue Shield of Michigan Cardiovascular Consortium, which is based on the procedure log of the catheterization laboratory.[2] Data from the 2 sources were linked together so that a valid patient medical record number could be used to ascertain the follow-up status of subjects, the primary outcome of which was a return to the ED within 30 days of hospitalization for cardiac evaluation. A patient's index procedure was defined as the first PCI intervention during the study period that was not preceded by a PCI in the previous 30 days (January 2002). Of the 2,899 index procedures, 2,786 (96%) were found in the 2 data sources, 48 (2%) from the hospital billing system only, and 65 (2%) from the registry only. The group of 2,786 was further refined by excluding those who underwent a coronary artery bypass procedure (because the postprocedure course would be expected to be different from that in nonsurgical patients) or who had died during the index hospitalization (n = 55), leaving 2,731 patients as the study cohort. The final cohort included 4 patients whose lesions could not be crossed. Follow-up information was obtained by searching our health system's data repository for evidence of any postprocedure ED visits or hospitalizations each study subject might have had within the health system. We also queried the Social Security Death Index with each subject's Social Security number to determine deaths.

The primary outcome of interest was the occurrence of an ED encounter during which cardiac markers (serum troponin, creatine kinase, creatine kinase-MB fraction, myoglobin, or B-type natriuretic peptide) were obtained within 30 days of the index hospitalization. Potential explanatory variables considered were demographics (age, gender, body mass index, discharged to an extended care facility), previous utilization (number of ED visits or hos-

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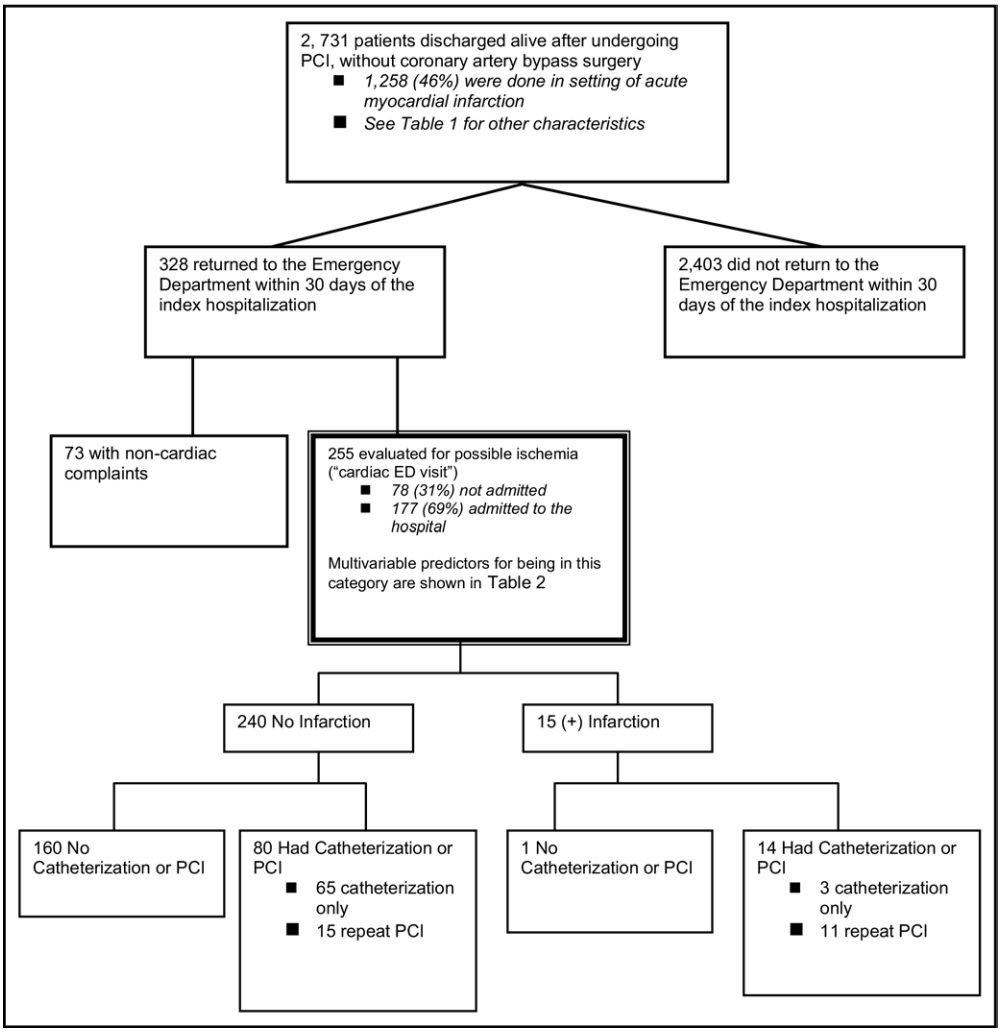

Figure 1. Postdischarge experience of 2,731 patients after PCI. The focus of the study was on the characteristics and outcomes of the 255 patients who subsequently returned to the ED within 30 days of discharge after their index procedure for cardiac evaluation.

pitalizations in previous 6 months), co-morbidities (atrial fibrillation, stroke, chronic obstructive pulmonary disease, smoking history, hypertension, diabetes, serum glucose level, gastrointestinal bleed, peripheral vascular disease, valvular heart disease, renal failure treated with dialysis, serum creatinine, low-density lipoprotein cholesterol, serum potassium, hemoglobin, white blood cell count, serum sodium), severity of illness (predicted mortality risk,[2] cardiopulmonary resuscitation performed, peak levels of creatine kinase, creatine kinase-MB fraction, troponin, myoglobin, principal diagnosis of acute myocardial infarction, history of cardiac arrest, intra-aortic balloon pump), urgency of procedure (considered an emergency if ischemic symptoms continued at rest with therapy or presence of intra-aortic balloon pump, acute evolving infarction, shock, or pulmonary edema requiring intubation; considered urgent if PCI required during same hospitalization but not on an emergency or elective basis),[3] coronary artery anatomy (American College of Cardiology lesion complexity,[4] ostial lesion, presence of moderate or heavy calcification, thrombus, subacute closure, left main stenosis, lesion location, pre- and postprocedure percent stenosis, Thrombolysis In Myocardial Infarction flow grade,[5] number of diseased vessels, or chronic total occlusion), left ventricular pump function (evidence of congestive heart failure during the hospitalization, ejection fraction, and B-type natriuretic peptide level), type of intervention (any or drug-eluting stent vs no stent), concomitant medication use (aspirin, β blockers, calcium channel blockers, unfractionated heparin, low-molecular-weight heparin, glycoprotein IIb/IIIa inhibitor, angiotensin-converting enzyme inhibitor, clopidogrel, cholesterol-lowering agents), and procedural complications (in-laboratory acute closure, in-laboratory no reflow, ventricular tachycardia or fibrillation, vessel perforation, dissection, angina for >30 minutes, stroke, transient ischemic attack, or side branch occlusion).

Secondary outcomes included events within 30 days after the postprocedure ED encounter (repeat cardiac catheterization, repeat PCI, new acute myocardial infarction, and death). New myocardial infarctions that occurred during follow-up were determined by a 2-step process. Laboratory values during the 30-day follow-up period for troponin, creatine kinase-MB fraction, and the percentage above threshold limits were used to screen for patients with pos-