Collaborative quality improvement vs public reporting for percutaneous coronary intervention: A comparison of percutaneous coronary intervention in New York vs Michigan

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Introduction Public reporting (PR) is a policy mechanism that may improve clinical outcomes for percutaneous coronary intervention (PCI). However, prior studies have shown that PR may have an adverse impact on patient selection. It is unclear whether alternatives to PR, such as collaborative quality improvement (CQI), may drive improvements in quality of care and outcomes for patients receiving PCI without the unintended consequences seen with PR.

Methods Using National Cardiovascular Data Registry CathPCI Registry data from January 2011 through September 2012, we evaluated patients who underwent PCI in New York (NY), a state with PR (N = 51,983), to Michigan, a state with CQI (N = 53,528). We compared patient characteristics, the quality of care delivered, and clinical outcomes.

Results Patients undergoing PCI in NY had a lower-risk profile, with a lower proportion of patients with ST-segment elevation myocardial infarction, non–ST-segment elevation myocardial infarction, or cardiogenic shock, compared with Michigan. Quality of care was broadly similar in the 2 states; however, outcomes were better in NY. In a propensity-matched analysis, patients in NY were less likely to be referred for emergent, urgent, or salvage coronary artery bypass surgery (odds ratio [OR] 0.67, 95% CI 0.51-0.88, $P < .0001$) and to receive blood transfusion (OR 0.7, 95% CI 0.61-0.82, $P < .0001$), and had lower in-hospital mortality (OR 0.72, 95% CI 0.63-0.83, $P < .0001$).

Conclusions Public reporting of PCI data is associated with fewer high-risk patients undergoing PCI compared with CQI. However, in comparable samples of patients, PR is also associated with a lower risk of mortality and adverse events. The optimal quality improvement method may involve combining these 2 strategies to protect access to care while still driving improvements in patient outcomes. (Am Heart J 2015;170:1227-33.)

Public reporting (PR) of mortality rates was first introduced in the late 1980s as a means to improve quality of care by incentivizing hospitals and physicians to "compete" against each other to achieve low mortality rates.[1–3] Public reporting may also improve quality by allowing informed decision making when patients choose a physician or health system. Early analyses examining the effect of PR demonstrated reduced mortality for both coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI).[4–9] However, PR may also have unintended consequences. Prior studies have shown that high-risk patients are less likely to undergo revascularization in states with PR of outcomes, thus denying potentially lifesaving therapy to patients who may benefit from it the most.[10–13] As a result, there is a growing need to identify alternative strategies to improve access to care and patient outcomes after PCI.

Quality improvement (QI) systems that do not publicly report data may result in similar improvement in adherence to quality performance metrics.[14,15] One such QI system,

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termed *collaborative quality improvement* (CQI), provides cross-institutional, peer-reviewed analysis and promotes accountability through sharing of information to institutions and providers.[14,16,17] This information is shared among individual practitioners within the health systems participating in CQI, but does not include practitioner-level PR.

However, little is known regarding how PR and CQI may compare in terms of their effects on practice and outcome. Therefore, we set out to compare patient selection, quality of care, and patient outcomes in 2 US states with very different approaches to the use and publication of quality data: New York (NY), a pioneer in PR, vs Michigan, a leader in CQI implementation.

Methods

Data source

The analytic cohorts for this study were derived from the National Cardiovascular Data Registry (NCDR) CathPCI Registry. Details of the NCDR participants and data collection methods have been previously described.[18–21] The NCDR is an initiative of the American College of Cardiology Foundation and the Society for Cardiovascular Angiography and Interventions. Hospitals participating in the CathPCI Registry provide patient, procedure, and outcome data on all PCI cases performed in their facilities.[22] All index PCIs performed at NCDR reporting centers in NY (N = 51,983) and Michigan (N = 53,528) between January 2011 and September 2012 were included in this analysis. All hospitals in Michigan participate in NCDR; however, only 43 of 59 nonfederal hospitals in NY participate in the registry.[23] Federal hospitals in NY do not participate in NCDR. Index PCI includes the initial PCI performed on a patient during their hospitalization.

Data elements collected in the registry include demographic characteristics (age, gender, race, and insurance status), cardiovascular risk factors (hypertension, dyslipidemia, family history of premature coronary artery disease, diabetes mellitus, end-stage renal disease), cardiovascular disease history (prior myocardial infarction, congestive heart failure [CHF], prior PCI, cerebrovascular disease, peripheral vascular disease), and clinical presentation (asymptomatic, atypical chest pain, stable angina, unstable angina, non–ST-segment elevation myocardial infarction [NSTEMI], or ST-segment elevation myocardial infarction [STEMI]). Procedure-related information includes indication (acute coronary syndrome, evaluation of cardiomyopathy, preoperative evaluation for noncardiac surgery, or cardiogenic shock within 24 hours prior to procedure), and presence and location (native coronary arteries vs bypass grafts) of coronary stenosis of $\geq$50%.

Outcomes

The primary predictor in this study was state. All analyses compare patients in NY with those in Michigan. Our primary outcomes had 3 components: patient mix (proportion of patients with NSTEMI, STEMI, and cardiogenic shock), quality of care (PCI appropriateness, periprocedural assessment, referral to cardiac rehabilitation, and discharge on optimal medical therapy), and outcomes (contrast-induced nephropathy, renal failure, need for urgent, emergent or salvage CABG, cardiogenic shock/CHF/cerebral vascular accident/tamponade, vascular complications including bleeding within 72 hours of PCI, access site bleeding, access site hematoma, retroperitoneal bleeding, gastrointestinal bleeding, need for blood transfusion, and in-hospital mortality).

Statistical analysis

We performed a baseline, unadjusted analysis to assess for differences in patient characteristics (including demographics, medical history, risk factors, presenting diagnosis, and baseline risk of mortality), procedural characteristics (including diagnostic catheterization procedure, estimate of coronary anatomy, PCI procedure, type of lesions, and devices), quality of care, and outcomes. Categorical variables were presented as frequencies (percentages), and differences between the CQI and PR states were assessed using the χ^2 test when the sample size was sufficient; otherwise, an exact test was used. Continuous variables were presented as median and were compared using the Wilcoxon rank sum test. Baseline risk was estimated using logistic regression with generalized estimating equations to account for within-hospital clustering.

In order to account for the baseline differences between the 2 patient populations, a propensity-matched analysis using the gmatch macro was performed.[24] The propensity-matched analysis was adjusted for all precatheterization variables in the NCDR CathPCI mortality model, version 4, as well as the prespecified outcomes measured and matched on the logit of the propensity score to undergo PCI. We used a caliper with a width of 0.2 times the standard deviation of the logit of the propensity score, which has been shown to result in estimates of the treatment effect with lower mean squared error.[25] We assessed for balance of the covariates between the 2 groups using methods previously described,[26,27] and then assessed PCI outcomes, performance measures, and appropriateness within this cohort. Percutaneous coronary intervention appropriateness was evaluated based on the American College of Cardiology Foundation, American Heart Association, and Society of Cardiovascular Angiography and Interventions appropriateness criteria.[28,29]

To estimate the effect of our primary predictor (state) on quality of care and clinical outcomes among the propensity-matched cohorts, we developed a logistic regression model stratified by matched pair. Matched pairs of patients had similar propensity scores and were more likely to have similar outcomes. This method is a generalization of McNemar test for matched pairs which is expected to reduce most of the observed differences in patient case mix between the 2 groups. We used