Public Reporting on Risk-Adjusted Mortality After Percutaneous Coronary Interventions in New York State Forecasting Ability and Impact on Market Share and Physicians’ Decisions to Discontinue Practice

Lena M. Chen, MD, MS; E. John Orav, PhD; Arnold M. Epstein, MD, MA

**Background**—Since the advent of public reporting on risk-adjusted mortality for coronary artery bypass graft surgery, public reporting on outcomes has expanded to include a variety of dissimilar conditions and procedures. We have little evidence to support such broad-based efforts.

**Methods and Results**—We examined the quality performance of 351 cardiologists at 48 hospitals in New York State, using publicly reported risk-adjusted mortality rates (RAMRs) for nonemergent percutaneous coronary interventions between 1998 and 2007. In the year after report release, we examined the following: (1) average RAMR for hospitals, (2) change in market share for hospitals and cardiologists, and (3) proportion of physicians leaving practice. We found that patients who picked a hospital that performed significantly better than expected in prior years had lower RAMRs (0.47, 0.61, and 0.72 for patients choosing hospitals whose prior reports were better than, as, and worse than expected; \(P=0.02\)). However, choosing a hospital in the top quartile (or decile) of performance in prior years did not decrease a patient’s chance of dying ( \(P=0.29\), or \(P=0.27\)). Performance ranking was not associated with a change in market share for hospitals or for physicians, or with leaving practice (all \(P>0.05\)).

**Conclusions**—Public reporting on nonemergent percutaneous coronary interventions in New York State identifies very high and low performers but provides insufficient information to differentiate between most hospitals. It appears to have had no effect on market share or physicians’ decisions to leave practice. The utility of public reporting on RAMRs may differ for different conditions and procedures. *(Circ Cardiovasc Qual Outcomes. 2012;5:70-75.)*

**Key Words:** quality improvement ■ mortality rates ■ percutaneous coronary intervention

Since the advent of public reporting on risk-adjusted mortality for coronary artery bypass graft (CABG) surgery, the Centers for Medicare and Medicaid Services and multiple states have expanded the scope of public reporting to include outcomes for a variety of dissimilar conditions and procedures. Aiming to improve quality of care, \(>10\) states, including New York, California, and Texas, publicly report on risk-adjusted mortality after CABG, and at least 8 states have embarked on public reporting of outcomes after percutaneous coronary interventions (PCIs).\(^1\) The Centers for Medicare and Medicaid Services also report on risk-adjusted mortality for patients hospitalized with congestive heart failure, pneumonia, and acute myocardial infarction.

Proponents of these efforts hope that the mechanisms by which public reports have improved quality for CABG will also apply to a broader set of conditions. Prior studies have shown that public reports on CABG accurately forecast who will be the best-performing providers after report release,\(^2,3\) are associated with improved patient mortality,\(^4-7\) and likely encourage poor-quality surgeons to leave practice.\(^3\) Thus, for other procedures, such as PCI, it is hoped that public reports will similarly steer patients to high-quality providers, motivate hospitals to engage in quality improvement efforts, and encourage very poor-performing providers to cease practice.

However, whether public reporting of outcomes for PCI will achieve these goals is far from clear. For many reasons, lessons learned from earlier public reporting efforts for CABG may not apply to PCI. First, PCIs have lower mortality rates and, thus, could produce much less reliable profiles of hospitals and physicians. Second, the lower rates may have a weaker influence on physicians’ decisions to leave practice. Finally, referral patterns for the 2 procedures differ. For CABG, cardiologists, who are themselves subject to public reporting for cardiovascular procedures (ie, PCI), refer patients to surgeons. For PCI, cardiologists self-refer or receive referrals from primary care physicians.

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By using PCI as an example of a procedure that differs in important ways from CABG, yet is commonly subject to public reporting, we examined data from New York State to address 3 questions: (1) How well do public performance reports on PCI forecast future performance? (2) What is their impact on cardiologists’ and hospitals’ market share? and (3) Is report performance associated with physicians’ decisions to leave practice?

WHAT IS KNOWN

- Since the advent of public reporting on risk-adjusted mortality for coronary artery bypass graft surgery, at least 8 states have embarked on similar efforts for percutaneous coronary interventions.
- To date, little is known about the utility of PCI public reporting programs.

WHAT THE STUDY ADDS

- Public reporting on nonemergent PCIs in New York State identifies very high and low performers but provides insufficient information to differentiate between most hospitals.
- The utility of public reporting of risk-adjusted mortality rates may vary for different conditions and procedures.

Methods

Data

We used the online, publicly available New York State Department of Health reports (http://www.health.state.ny.us/statistics/diseases/cardiovascular/index.htm) on PCIs from 1998 to 2007. The annual reports include data on cardiologist and hospital performance (risk-adjusted mortality rates [RAMRs] for all cases and nonemergent cases) and volume. Cardiologist performance is reported for physicians who perform at least 1 procedure in each of the 3 years covered by the report and/or who perform ≥200 procedures during that same period. For example, a physician who performed 120 procedures in year 1 of the report, 20 procedures in year 2, and 20 procedures in year 3 (for a total of 160 procedures) would have his or her performance included in the report. A physician who did not perform any procedures in years 1 and 2, and 210 procedures in year 3, would also be included in the report.

Hospital RAMRs and volume are reported for 1- and 3-year time periods; cardiologist RAMRs and volume are reported only for 3-year periods. For example, the 2005 to 2007 report (released in 2010) includes cardiologists’ RAMRs for 2005 to 2007 and hospital RAMRs for 2005 to 2007 and 2007 alone. We supplemented these data with unpublished information on cardiologists’ annual case volume (only 3-year volume was available in the public reports) from the New York State Department of Health.

We obtained data on total hospital beds and membership in the Council of Teaching Hospitals from the American Hospital Association Annual Survey Database. We used state physician registration databases and other publicly available online databases to determine the number of years in practice, sex, and training (foreign medical school or not) of cardiologists.

Variables

The RAMR is the cardiologist’s (or hospital’s) mortality rate had they cared for patients with a case mix similar to that of the state as a whole. Before 2004, only in-hospital deaths were used to calculate the RAMR. Deaths occurring within 30 days of the procedure were included in annual hospital performance measures beginning in 2004, and in 3-year pooled performance measures for cardiologists and hospitals from 2003 to 2005.

We defined performance using RAMRs, classifying those with the lowest RAMRs as high performers and those with the highest RAMRs as poor performers. We did not re-estimate rates using shrinkage or other models because those re-estimated rates, even if superior to the published ones for some purposes, would not have been able to influence the public.

Market share was defined as the number of nonemergent PCIs performed by a physician (or hospital), divided by the total number of nonemergent PCIs performed by physicians (or hospitals) that were present in the baseline report, the prerelease year, and the postrelease year. We assumed that physicians who had not performed any cases in a single year had left practice in the prior year.

Analysis

To examine how well report performance predicts future performance, we first classified baseline hospital performance as better than, as, or worse than expected (as denoted in the reports and based on RAMRs). Hospitals (or cardiologists) who performed better (or worse) than expected had a RAMR with a 95% CI entirely lower (or higher) than the statewide rate. We also classified baseline hospital performance into quartiles based on reported RAMRs (based on 3 years of data). Quartiles did not always contain equal numbers of hospitals because, for some years, the RAMR that formed a quartile’s cut point was shared by several hospitals (or cardiologists).

For each category of performance, we calculated the mean RAMR in the year after publication of the report. For example, we used data from the 1998 to 2000 report (published in 2003) to classify hospitals as performing better than, as, or worse than expected. We then used 2004 data to calculate the average RAMR for each of the 1998 to 2000 performance categories. This average was weighted for number of cases in each hospital in 2004, by using analytic weights in the regression model.

The weighted RAMRs tell us what the RAMR would have been if patients operated on in 2004 had been guided by performance data from 1998 to 2000. For example, if a patient had chosen to undergo PCI in 2004 at a hospital that had been in the highest performance quartile in 1998 to 2000, what would his or her RAMR be?

To test for an association between past and future performance, we used linear regression with hospital performance (specified as a single variable with 3 levels: better than, as, or worse than expected) in the baseline report as the independent variable and weighted RAMR in the postrelease year as the dependent variable. We also analyzed aggregate data across report years. Because a hospital might be classified as a high performer in one report, but a low performer in another report, we used a repeated-measures model with an unstructured covariance structure to examine the association between performance in any baseline report and postrelease RAMR.

In 3 sensitivity analyses, we used linear regression with hospital performance in the baseline report, categorized into quartiles and deciles and specified as a continuous variable. We limited our analyses on forecasting to hospitals because annual RAMRs for cardiologists were not available; thus, we were unable to describe individual performance in the year after a report’s release.

Because 2 reports (1999–2001 and 2000–2002) were published in 2004, we first created a summary performance measure (for 1999–2002) by averaging the RAMRs from the 1999 to 2001 and 2000 to 2002 reports (for quartile and decile analyses). We created a second summary performance measure by classifying hospitals that performed better (or worse) than expected in either the 1999 to 2001 or 2000 to 2002 reports, as performing better (or worse) than expected from 1999 to 2002.

To test for an association between market share and report performance, we created a regression model in which the dependent variable was market share in the postrelease year and the independent variable was hospital (or cardiologist) rank (better than, as, or worse than expected) in the baseline report. For the cardiologist model, covariates were years in practice, sex, graduation from a
Table 1. RAMRs by Hospital Performance Categories: Better Than, As, or Worse Than Expected

<table>
<thead>
<tr>
<th>Report Years</th>
<th>Better Than Expected RAMR</th>
<th>No.</th>
<th>As Expected RAMR</th>
<th>No.</th>
<th>Worse Than Expected RAMR</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000–2002</td>
<td>0.18</td>
<td>1</td>
<td>0.31</td>
<td>36</td>
<td>0.53</td>
<td>3</td>
</tr>
<tr>
<td>2001–2003</td>
<td>NA</td>
<td>0</td>
<td>0.35</td>
<td>38</td>
<td>0.88</td>
<td>1</td>
</tr>
<tr>
<td>2002–2004</td>
<td>0.18</td>
<td>1</td>
<td>0.31</td>
<td>36</td>
<td>0.53</td>
<td>3</td>
</tr>
<tr>
<td>1999–2001</td>
<td>0.15</td>
<td>1</td>
<td>0.38</td>
<td>33</td>
<td>1.18</td>
<td>2</td>
</tr>
<tr>
<td>1998–2000</td>
<td>0.22</td>
<td>3</td>
<td>0.44</td>
<td>30</td>
<td>0.74</td>
<td>2</td>
</tr>
</tbody>
</table>

The RAMR is weighted for number of cases. *P* < 0.001 for all, except for 2003–2005, for which *P* = 0.06. RAMR indicates risk-adjusted mortality rate; NA, not applicable.

Table 2. RAMRs by Hospital Performance Categories: Quartiles

<table>
<thead>
<tr>
<th>Report Years</th>
<th>Quartile 1 (Best) RAMR</th>
<th>No.</th>
<th>Quartile 2 RAMR</th>
<th>No.</th>
<th>Quartile 3 RAMR</th>
<th>No.</th>
<th>Quartile 4 (Worst) RAMR</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005–2007</td>
<td>0.44</td>
<td>15</td>
<td>0.55</td>
<td>9</td>
<td>0.65</td>
<td>12</td>
<td>1.02</td>
<td>11</td>
</tr>
<tr>
<td>2004–2006</td>
<td>0.40</td>
<td>11</td>
<td>0.55</td>
<td>11</td>
<td>0.66</td>
<td>12</td>
<td>0.86</td>
<td>10</td>
</tr>
<tr>
<td>2003–2005</td>
<td>0.47</td>
<td>10</td>
<td>0.61</td>
<td>12</td>
<td>0.69</td>
<td>8</td>
<td>0.86</td>
<td>10</td>
</tr>
<tr>
<td>2002–2004</td>
<td>0.21</td>
<td>11</td>
<td>0.27</td>
<td>9</td>
<td>0.36</td>
<td>10</td>
<td>0.50</td>
<td>10</td>
</tr>
<tr>
<td>2001–2003</td>
<td>0.23</td>
<td>11</td>
<td>0.32</td>
<td>9</td>
<td>0.41</td>
<td>10</td>
<td>0.54</td>
<td>9</td>
</tr>
<tr>
<td>2000–2002</td>
<td>0.23</td>
<td>11</td>
<td>0.28</td>
<td>8</td>
<td>0.42</td>
<td>10</td>
<td>0.67</td>
<td>9</td>
</tr>
<tr>
<td>1999–2001</td>
<td>0.23</td>
<td>9</td>
<td>0.33</td>
<td>9</td>
<td>0.43</td>
<td>9</td>
<td>0.79</td>
<td>9</td>
</tr>
<tr>
<td>1998–2000</td>
<td>0.25</td>
<td>9</td>
<td>0.38</td>
<td>9</td>
<td>0.52</td>
<td>9</td>
<td>0.74</td>
<td>8</td>
</tr>
</tbody>
</table>

The RAMR is weighted for number of cases. *P* < 0.001 for all. RAMR indicates risk-adjusted mortality rate.

Between 1998 and 2007, 351 cardiologists performed nonemergent PCIs at 48 hospitals in New York State, with adequate volume to be included in the public reports. Hospitals that performed PCIs had an average of 673 beds, and 56% were members of the Council of Teaching Hospitals.

Variability in RAMRs
The difference in mortality rates between the best- and worst-performing hospitals ranged from 0.35% (ie, the 2002–2004 report with mortality ranging from 0.18%–0.53%) to 1.03%, depending on the year (Table 1). RAMRs for hospitals that performed worse than expected were 3- to 8-fold higher than those for hospitals that performed better than expected.

Few hospitals performed better or worse than expected. In 4 of the 8 reports, no hospitals performed better than expected. During the 10 years included in our analyses, 4 (9) unique hospitals performed significantly better (worse) than expected in at least 1 report (data not displayed).

When we categorized hospitals into performance quartiles based on RAMRs, each quartile had 8 to 15 hospitals (Table 2). Hospitals in the worst performance quartile had significantly higher RAMRs than those in the best performance quartile (*P* < 0.001 for all report years).

Predictive Ability to Identify High-Performing Hospitals
We found that report cards had good predictive ability at the extremes of performance. Baseline performance seemed to predict future RAMRs in most reports when hospitals were classified as better than, as, or worse than expected (Table 3). Although results were significant only for the 1999 to 2002 combined report, in pooled data, high performers had significantly lower RAMRs than those
performing as or worse than expected after report release (0.47, 0.61, and 0.72; \( P = 0.02 \)).

When quartiles were used to classify hospital performance, poor baseline report performance seemed to be associated with poor subsequent performance in 2007, with mortality rates by baseline performance quartiles of 0.56, 0.57, 0.59, and 0.77 (Table 4). However, the results were not statistically significant (\( P = 0.09 \)), and none of the trends in other years was monotonic or seemed to suggest an important association. When we combined all the years available, there was no consistent trend across quartiles (0.60, 0.60, 0.59, and 0.68; \( P = 0.29 \)). Results were similar when we categorized hospitals into performance deciles using baseline report RAMRs (\( P = 0.27 \)) (data included in the online-only Data Supplement Appendix) or specified baseline RAMR as a continuous variable (data not displayed). Our results were also similar when we examined change in hospital market share by region (data not displayed).

### Impact on Market Share

We found that public reports had no impact on the market share of hospitals or cardiologists. In multivariate regression, hospital performance in the 2002 to 2004 report was not associated with market share in the postrelease year, after adjusting for prerelease market share (\( P = 0.24 \)) (Table 5, Figure 1). Results were similar for cardiologists (data included in the online-only Data Supplement Appendix). In earlier years, we also found no significant association between baseline report performance and postrelease market share (Figure 2). For all report years, our results were similar when we specified hospital (or physician) RAMRs into quartiles, deciles, or as a continuous variable (data not displayed). Our results were also similar when we examined change in hospital market share by region (data not displayed).

### Decision to Leave Practice

Cardiologists with poor performance were no more likely to leave practice than those with good performance. None of the cardiologists who performed better or worse than expected in a baseline report left practice in the year after report release. Among those cardiologists in the top performance quartile in the 2001 to 2003 report, 6% left practice in New York State in the year after release of the report (data not displayed). Of the cardiologists in the lowest performance quartile, 7% left practice in the same time period. The association between performance quartile and leaving practice was not significant after adjusting for number of nonemergent cases in the prerelease year and years in practice (\( P = 0.71 \)).

### Table 3. Accuracy of Hospital Report Card Ratings (Better Than, As, or Worse Than Expected) in Predicting Future Performance

| Baseline Report | Release Year | Year After Release | Better Than Expected | As Expected | Worse Than Expected | \( P \) Value
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2002–2004</td>
<td>2006</td>
<td>2007</td>
<td>0.46</td>
<td>0.62</td>
<td>0.70</td>
<td>0.33</td>
</tr>
<tr>
<td>2001–2003</td>
<td>2005</td>
<td>2006</td>
<td>NA</td>
<td>0.64</td>
<td>0.46</td>
<td>0.59</td>
</tr>
<tr>
<td>1999–2001 and 2000–2002</td>
<td>2004</td>
<td>2005</td>
<td>0.33</td>
<td>0.59</td>
<td>0.87</td>
<td>0.049</td>
</tr>
<tr>
<td>1998–2000</td>
<td>2003</td>
<td>2004</td>
<td>0.49</td>
<td>0.61</td>
<td>0.72</td>
<td>0.20</td>
</tr>
<tr>
<td>All years' summary</td>
<td>2003–2006</td>
<td>2004–2007</td>
<td>0.47</td>
<td>0.61</td>
<td>0.72</td>
<td>0.02</td>
</tr>
</tbody>
</table>

RAMR indicates risk-adjusted mortality rate; NA, not applicable (because of 0 hospitals in that performance category).

*The RAMR is weighted for number of cases in the year after report release.

†For trend.

### Table 4. Accuracy of Hospital Report Card Ratings (Quartiles of Performance) in Predicting Future Performance

| Baseline Report | Release Year | Year After Release | Quartile 1 (Best) | Quartile 2 | Quartile 3 | Quartile 4 (Worst) | \( P \) Value
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2002–2004</td>
<td>2006</td>
<td>2007</td>
<td>0.56</td>
<td>0.57</td>
<td>0.59</td>
<td>0.77</td>
<td>0.09</td>
</tr>
<tr>
<td>2001–2003</td>
<td>2005</td>
<td>2006</td>
<td>0.73</td>
<td>0.60</td>
<td>0.60</td>
<td>0.62</td>
<td>0.50</td>
</tr>
<tr>
<td>1999–2001 and 2000–2002</td>
<td>2004</td>
<td>2005</td>
<td>0.61</td>
<td>0.63</td>
<td>0.47</td>
<td>0.77</td>
<td>0.70</td>
</tr>
<tr>
<td>1998–2000</td>
<td>2003</td>
<td>2004</td>
<td>0.55</td>
<td>0.54</td>
<td>0.70</td>
<td>0.64</td>
<td>0.23</td>
</tr>
<tr>
<td>All years' summary</td>
<td>2003–2006</td>
<td>2004–2007</td>
<td>0.60</td>
<td>0.60</td>
<td>0.59</td>
<td>0.68</td>
<td>0.29</td>
</tr>
</tbody>
</table>

RAMR indicates risk-adjusted mortality rate.

*The RAMR is weighted for number of cases in the year after report release.

†For trend.
We found that the New York State reporting system for PCIs had good forecasting accuracy for hospitals at the extremes of performance but poor ability to detect any difference in quality at most hospitals. We found no evidence that consumers, physicians, or payers are using the public reports to drive market share or that cardiologists who perform poorly are more likely to leave practice after release of a report showing that their performance is substandard.

In the past decade, public reporting of process and outcomes has become much more prevalent, despite some questions about its impact on quality of care. In addition to the statewide CABG and PCI reports previously described, the Centers for Medicare and Medicaid Services also reports risk-adjusted outcomes for acute myocardial infarction, congestive heart failure, and pneumonia. Part of the justification for this effort is the desire to help consumers make wiser choices. Although we are aware of several previous studies that have examined the ability of public reports to forecast future performance for CABG, we know of none that have examined the ability of public reports to forecast future performance for PCI.

Our study results contrast with patterns observed with CABG. These findings may, in part, be explained by the low mortality associated with PCI, because small differences between high and low reporters make discrimination across the full spectrum of providers more difficult. The weaker forecasting ability for PCI (compared with CABG) may also be due to the long time lags between baseline performance and when those data become available to guide treatment choices. For example, for the report released in 2006, baseline performance was measured using data from 2002 to 2004. Such time lags are a challenge for CABG reporting as well, although procedural techniques for PCI may have evolved to a greater extent than for CABG over time. Whatever the explanation, our results underscore the need for caution.

At the extremes, past hospital performance seemed to forecast future performance, and trends were statistically significant for aggregate data. However, few hospitals performed better or worse than expected, suggesting that the reports would be of limited value to patients trying to choose between the few hospitals in their immediate vicinity. Performance quartiles and deciles for PCI mortality did not predict future performance.

Table 5. Impact of Performance Reporting on Hospitals’ Subsequent Market Share

<table>
<thead>
<tr>
<th>Hospital Performance in Baseline Year</th>
<th>Release Year</th>
<th>Prior Year Market Share, %</th>
<th>Subsequent Year Market Share, %</th>
<th>Change*</th>
<th>P Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better</td>
<td>7.0</td>
<td>5.2</td>
<td>1.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>As expected</td>
<td>78.0</td>
<td>79.8</td>
<td>1.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worse</td>
<td>15.0</td>
<td>15.0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Better</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>As expected</td>
<td>97.9</td>
<td>98.1</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worse</td>
<td>2.1</td>
<td>1.9</td>
<td>–0.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Postrelease market share minus prerelease market share (rounded). Because of rounding, change in market share does not always sum to 0.
†The P value is for a model in which postreport market share is the dependent variable and hospital performance (better than, as, or worse than expected) in the baseline report is the primary predictor. The model is adjusted for Council of Teaching Hospital membership, total hospital beds, and market share in the year before report publication.

Figure 1. Impact of performance reporting on hospitals’ subsequent market share, 2002 to 2004 report released in 2006. P = 0.24, and is for a model in which postreport (2007) market share is the dependent variable, and hospital performance (better than, as, or worse than expected) in the 2002 to 2004 report is the primary predictor. The model is adjusted for Council of Teaching Hospital membership, total hospital beds, and market share in the year before report publication.

Figure 2. Impact of performance reporting on hospitals’ subsequent market share, 2001 to 2003 report released in 2005. P = 0.92, and is for a model in which postreport (2006) market share is the dependent variable, and hospital performance (better than, as, or worse than expected) in the 2001 to 2003 report is the primary predictor. The model is adjusted for Council of Teaching Hospital membership, total hospital beds, and market share in the year before report publication.
before generalizing findings on the forecasting ability of public reporting for CABG or its impact on physicians’ practice decisions, to other procedures that may have different patterns of mortality or evolution.

Public reporting efforts are, in part, motivated by the hope that they will spur quality improvement and help steer patients toward the best hospitals. Previous work has found that CABG performance reporting in New York State was associated with substantial lowering of mortality rates, attributed, in part, to hospital-based quality improvement efforts.4,14 Although we could not measure the impact of PCI reporting on quality improvement initiatives or actual improvements in quality of care, further study to address the impact of PCI reporting on outcomes seems important. Prior research has found that public reporting on PCI may discourage physicians from treating high-risk patients.15,16 Current efforts in PCI reporting include those by New York and 7 other states. Given this breadth of effort, our findings raise questions about the practical value of public reporting on mortality for patients seeking to identify the best hospital for their PCI care, and they underscore the challenges of providing data on outcomes that differ among hospitals and matter to patients.

Our study has notable limitations. We restrict our conclusions to associations between public reporting and future performance, market share, and practice decisions. With our data and analyses, we cannot make any conclusions about causality. Because of changes over time in both the actual procedures that comprise PCIs and in New York State’s definition of RAMRs, we were unable to compare RAMRs from year to year in a way that would permit clear interpretation as to whether quality actually improved over time. In our analysis of physicians leaving practice, our sample size limited our ability to detect small differences across performance quartiles. However, the raw numbers did not suggest any trends across quartiles.

In summary, we found that the information provided by the New York State reporting system for PCIs had good forecasting accuracy at the extremes but poor ability to detect any difference in quality at most hospitals. We found no evidence that patients, physicians, or payers are using the public reports to drive market share, or that cardiologists are making decisions to leave practice based on report performance. The utility of public reporting on RAMRs may differ substantially for different procedures.

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Disclosures
None.

References
Public Reporting on Risk-Adjusted Mortality After Percutaneous Coronary Interventions in New York State: Forecasting Ability and Impact on Market Share and Physicians' Decisions to Discontinue Practice
Lena M. Chen, E. John Orav and Arnold M. Epstein

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### Table 1. Accuracy of Hospital Report Cards in Predicting Subsequent Performance (Deciles in Baseline Report)

<table>
<thead>
<tr>
<th>Baseline report</th>
<th>Release year</th>
<th>Year after release</th>
<th>RamR* in the year following release</th>
<th>Performance decile in baseline report</th>
<th>P value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-2004</td>
<td>2006</td>
<td>2007</td>
<td>0.47 0.64 0.54 0.73 0.55 0.56 0.61 1.22 0.62 0.74 0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001-2003</td>
<td>2005</td>
<td>2006</td>
<td>1.19 0.56 0.77 0.49 0.70 0.62 0.64 0.56 0.68 0.47 0.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999-2001 &amp; 2000-2002</td>
<td>2004</td>
<td>2005</td>
<td>0.71 0.57 0.65 0.74 0.47 0.57 0.39 0.37 0.97 0.73 0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998-2000</td>
<td>2003</td>
<td>2004</td>
<td>0.46 0.60 0.63 0.64 0.44 0.60 0.63 0.84 0.74 0.55 0.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All years</td>
<td>2003-2004</td>
<td>2005-2007</td>
<td>0.56 0.57 0.65 0.67 0.54 0.60 0.54 0.67 0.71 0.71 0.27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: RamR is risk-adjusted mortality rate.
*RamR is weighted for number of cases in the year following report release.
†P-value is for trend.
Table 2. Impact of Performance Reporting on Cardiologists’ Subsequent Market Share

<table>
<thead>
<tr>
<th>Cardiologist performance in baseline year</th>
<th>Release year</th>
<th>Prior year market share (%)</th>
<th>Subsequent year market share (%)</th>
<th>Change*</th>
<th>P value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.31</td>
</tr>
<tr>
<td>As expected</td>
<td></td>
<td>98.6</td>
<td>98.4</td>
<td>-0.2</td>
<td></td>
</tr>
<tr>
<td>Worse</td>
<td></td>
<td>1.4</td>
<td>1.6</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Better</td>
<td></td>
<td>4.1</td>
<td>4.8</td>
<td>0.7</td>
<td>0.29</td>
</tr>
<tr>
<td>As expected</td>
<td></td>
<td>93.7</td>
<td>92.9</td>
<td>-0.8</td>
<td></td>
</tr>
<tr>
<td>Worse</td>
<td></td>
<td>2.2</td>
<td>2.3</td>
<td>0.1</td>
<td></td>
</tr>
</tbody>
</table>

* Post-release market share minus pre-release market share.
† P-value is for a model in which post-release market share is the dependent variable, and cardiologist performance (better than/as/worse than expected) in the baseline report is the primary predictor. The model is adjusted for gender, years in practice, graduation from a foreign medical school, and market share in the year prior to report publication.
Figure 1. Impact of Performance Reporting on Cardiologists’ Subsequent Market Share, 2002-2004 report released in 2006
Figure 2. Impact of Performance Reporting on Cardiologists’ Subsequent Market Share, 2001-2003 report released in 2005
Supplemental Figure Legends

Figure 1. Impact of Performance Reporting on Cardiologists' Subsequent Market Share,* 2002-2004 report released in 2006

* P-value=0.31 and is for a model in which post-release (2007) market share is the dependent variable, and cardiologist performance (better than/as/worse than expected) in the 2002-2004 report is the primary predictor. The model is adjusted for gender, years in practice, graduation from a foreign medical school, and market share in the year prior to report publication.

Figure 2. Impact of Performance Reporting on Cardiologists' Subsequent Market Share,* 2001-2003 report released in 2005

* P-value=0.29 and is for a model in which post-release (2006) market share is the dependent variable, and cardiologist performance (better than/as/worse than expected) in the 2001-2003 report is the primary predictor. The model is adjusted for gender, years in practice, graduation from a foreign medical school, and market share in the year prior to report publication.