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ORIGINAL ARTICLE

Association Between 30-Day Mortality After Percutaneous Coronary Intervention and Education and Certification Variables for New York State Interventional Cardiologists

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Sameed Ahmed M. Khatana, MD
Paul N. Fiorilli, MD
Ashwin S. Nathan, MD
Daniel M. Kolansky, MD
Nandita Mitra, PhD
Peter W. Groeneveld, MD, MS
Jay Giri, MD, MPH

BACKGROUND: Patients and other providers have access to few publicly available physician attributes that identify interventional cardiologists with better postprocedural outcomes, particularly in states without public reporting of outcomes. Interventional cardiology board certification, maintenance of certification, graduation from a US medical school, medical school ranking, and length of practice represent such publicly available attributes. Previous studies on these measures have shown mixed results.

METHODS AND RESULTS: We included interventional cardiologists practicing in New York State in the years 2011 to 2013. The primary outcome was 30-day risk-standardized mortality rate (RSMR) after percutaneous coronary intervention. Hierarchical regression modeling was used to analyze the physician attributes and was adjusted for provider caseload. A total of 356 providers were studied. The average 30-day RSMR was 1.1 (SD=0.1) deaths per 100 cases for all percutaneous coronary interventions and 0.7 (SD=0.1) deaths per 100 cases for nonemergent procedures. The primary outcome was slightly lower among providers with interventional cardiology board certification compared with noncertified providers (1.06 [SD=0.14] versus 1.14 [SD=0.14] deaths per 100 cases; $P<0.001$). In multivariable hierarchical regression modeling, after adjusting for provider caseload, none of the physician attributes were associated with the primary outcome. Provider caseload was significantly associated with 30-day RSMR independent of the other attributes.

CONCLUSIONS: Interventional cardiology board-certified providers had a modestly lower 30-day RSMR before accounting for caseload. However, after adjusting for provider caseload, none of the examined publicly available physician attributes, including interventional cardiology board certification, were independently associated with 30-day RSMR.

Key Words: certification ■ education, medical ■ outcome assessment (health care) ■ percutaneous coronary intervention ■ quality of health care

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WHAT IS KNOWN

- Patients and other providers have few markers of quality available to them to help in making a choice of interventional cardiologist.
- Some publicly physician attributes—board certification, medical school training, and duration of practice—have been found to be associated with certain quality outcomes in other specialties.

WHAT THE STUDY ADDS

- Provider caseload was associated with 30-day mortality after percutaneous coronary intervention after accounting for patient factors, as well as the other studied physician attributes.
- Independent of provider caseload, several publicly available attributes—interventional cardiology board certification, maintenance of certification, graduation from the United States or a top-ranked medical school or years of practice—were not associated with 30-day mortality after percutaneous coronary intervention in New York State.
- In the absence of public reporting of patient outcomes, a greater availability of information about provider caseload may aid patients and other providers in identifying interventional cardiologists with lower post-percutaneous coronary intervention mortality.

Potential markers of physician outcomes are of great interest to patients, as well as payers and health organizations. However, patients and referring providers have access to few such markers when choosing a physician. Health organizations similarly have a limited ability in predicting, which physicians will have better outcomes when making hiring and promotion decisions. The now decades-long push to retrospectively publish outcomes for certain specialties, including interventional cardiology, attempts to address this.[1] However, this reporting is mandatory in only a few states, and studies of the impact of such public reporting on patient choice of providers have shown equivocal results.[2,3] Thus the identification of factors that may aid patients in provider choice is important.

One group of physician attributes that is publicly available and may be associated with patient outcomes is board certification and maintenance of certification (MOC) status. Systematic reviews of studies involving board certification in several different specialties have shown mixed results about an association with clinical outcomes.[4,5] In January 2014, the American Board of Internal Medicine updated its MOC policies so that physicians would be publicly listed according to whether or not they were taking part in MOC.[6] The individual criteria have continued to evolve, and although the ongoing changes in MOC have garnered some controversy,[7] there are no major studies examining characteristics of physicians who have chosen to enroll under the current MOC criteria. Prior studies that have assessed the association between certain MOC criteria and physician performance measures and processes of care have also had conflicting results.[8,9] Factors related to a physician's training, such as medical school education and provider experience and their association with outcomes have also been examined by some studies. The results of such studies have been mixed, with some analyses showing an association between medical school training and certain quality measures,[10,11] whereas other studies have not shown any significant associations.[12,13] A large meta-analysis examining the association between years of practice for providers of different specialties (predominantly internal medicine) and quality measures, observed a general decrease in performance with increasing years of practice.[14] Most of these studies, however, have been limited by a reliance on administrative rather than clinical data and have mostly been focused on nonprocedural specialties.

Despite the emphasis on patient outcomes for interventional cardiologists, few large studies have examined the association between patient outcomes and publicly available attributes for such providers. One recent study demonstrated a modest association of interventional cardiology board certification with lower in-hospital mortality after percutaneous coronary intervention (PCI).[15] However, this study only focused on board certification, the mortality outcomes were limited to the index hospitalization, and certification did not have an association with the overall primary outcome. An earlier single-site study revealed no association between board certification and provider experience for interventional cardiologists and in-hospital outcomes after PCI.[16] The impact of other publicly available factors of interest to patients, such as medical school education or MOC, have not been systematically studied for interventional cardiologists.

To identify publicly available attributes of interventional cardiologists that may be associated with lower mortality after PCI in the context of this prior research, we aimed to study the association between board certification, MOC, years of practice, graduation from the United States versus foreign medical school and medical school ranking with 30-day mortality after PCI using data collected from clinical sources.

METHODS

All data used in the analysis are from publicly available sources, and the analytic methods will be made available to other researchers for purposes of reproducing the results. Public reporting of cardiologist-specific mortality data after PCI in New York (NY) State began in 1995.[17] All nonfederal hospitals performing PCI in NY State are required to submit to the NY State Department of Health detailed information about

each patient who presents for the procedure. For this study, we included all patients who underwent PCI in a nonfederal hospital in NY State, were discharged between January 1, 2011 and November 30, 2013, and were included in the NY State PCI reporting system. Included providers were those who performed at least 1 procedure annually or 200 cumulative procedures over the 3-year study period.[18] Institutional review board approval was not required as all analyses were performed on publicly available data aggregated at the provider level.

Risk-Adjusted Mortality Rates

As of 2013, the data submitted to the Department of Health included patients' demographics and clinical characteristics, including detailed information on patient comorbidities, indication for intervention, time of onset of symptoms and intervention, electrocardiographic changes, access site, use of thrombolytics, coronary vascular anatomy at the time of angiography, type of intervention performed and devices used, postprocedure complications, patient disposition, 30-day vitality status, as well as primary interventional cardiologist involved in case. Data were verified through cross-matching of PCI data with other Department of Health databases and a limited audit of medical records for a selected sample of patients. Emergent cases were defined as those where the patient was considered to be in a state of hemodynamic instability or if a patient had experienced a myocardial infarction in the 24 hours before the procedure. All other cases were defined as nonemergent.

Mortality rates were based on deaths that occurred during the index hospitalization or within 30 days after the procedure. The risk-adjusted mortality rate obtained from the PCI reporting system represents an estimate of what a provider's mortality rate would be if the provider had treated patients with average clinical and demographic characteristics. Therefore, the risk-adjusted mortality rate accounts for differences in patient and presentation characteristics. Provider caseload, deaths, and risk-standardized mortality were all cumulative for the 3-year study period. No individual patient-level data were used. All data were aggregated at the provider level. The number of procedures performed, number of patient deaths and risk-adjusted mortality rates by each provider were obtained from the 2011 to 2013 NY State PCI registry report.

Risk-Standardized Mortality Rates

Because risk-adjusted mortality rates may not accurately reflect the actual mortality rates of low volume providers (eg, a provider with average patients and 1 death in 5 cases will have a risk-adjusted mortality rate of 20%) the primary outcome for our study was the 30-day risk-standardized mortality rate (RSMR), which was derived from each provider's risk-adjusted mortality rate and their caseload. Detailed methods have been described previously by Dimick et al,[19,20] but briefly, RSMRs were calculated via a hierarchical Poisson estimator that incorporated both the risk-adjusted mortality estimate, as well as each provider's case volume, with mortality estimates from low-case-volume providers shrunken toward the provider population's mean mortality. These estimate stabilizing Bayesian approaches are widely used for calculating both hospital and provider outcomes, such as by the Center for Medicare and Medicaid Services in their public reports of hospital quality outcomes.[21]

Provider Characteristics

Providers' interventional cardiology board certification and MOC status, as of June 2016, were obtained from the American Board of Internal Medicine. Although there have been some changes in MOC criteria since public listing of MOC status began in 2014, the primary aim of the study is to examine attributes and outcomes of physicians who have chosen to enroll in MOC rather than the effects of specific individual MOC criteria. Medical school and years of practice since completion of fellowship were determined through Doximity, a professional networking site for medical providers, which has been used to identify physician characteristics in prior studies.[22,23] Years in practice were determined by the number of years between graduation from fellowship (either interventional cardiology fellowship or general cardiology fellowship if no separate interventional fellowship) and the first year of the 3-year measurement interval. If a provider finished fellowship after the first year of the measurement interval, they were given 1 year for number of years in practice. Top medical school ranking was based on graduation from one of the top 25 ranked schools according to US News and World Report medical school rankings in primary care or research in 2016.[24] Medical school and certification information was available for all providers and years of practice for around 97% of providers.

Univariate Analyses

Descriptive statistics were calculated for the prevalence of each of the included physician attributes, as well as the average number of cases performed, number of deaths and the mortality rate among the studied group of interventional cardiologists in the 3-year period. Differences in the mean number of cases performed, number of patient deaths, and the 30-day RSMR among providers were assessed according to each of the studied attributes using Student *t* test (for board certification, MOC, foreign versus US medical graduates, and medical school ranking) and simple linear regression (for years since fellowship). To assess the relationship between provider caseload and risk-standardized mortality, we categorized the data according to quintiles of caseload and calculated the average mortality rate by each quintile. The differences in RSMRs between quintiles of caseload were assessed using 1-way ANOVA. Univariate analyses were conducted on data aggregated at the provider level, combining each hospital he/she practiced at.

Multivariable Analyses

Our data structure involved both physicians who practiced at the same hospitals, as well as physicians who practiced at multiple hospitals. To assess the influence of hospitals on the primary outcome, we first restricted our dataset to only include each provider's highest volume hospital, thereby creating a hierarchical data structure. We created a 2-level intercepts only linear regression model with only the average intercept across each hospital and error term for each provider in each hospital at the first level, and the overall average intercept across providers and hospitals plus the error term for each hospital at the second level. This was used to calculate

an intraclass correlation coefficient to assess the variance contribution of hospitals to the total variance in mortality. The intraclass correlation coefficient was <10%, suggesting hospital-level effects did not contribute substantially to differences in the primary outcome, and therefore hospital effects were not included in our final model.

We then used the entire dataset (including physician's outcomes at all of their hospitals). Because physicians performing PCIs at >1 hospital appeared in this dataset multiple times, we first estimated an intraclass correlation coefficient at the provider level by creating a 2-level intercepts only regression model with the average intercept across each provider and error term for each observation by each provider in the first level and the overall average intercept across all observations and providers plus the error term for each provider at the second level. The intraclass correlation coefficient at the physician level was close to 0 suggesting no significant clustering of outcomes at the physician level. We then estimated a 2-level multivariable hierarchical linear regression model, with 30-day RSMR as the outcome and overall intercept for each provider, provider caseload (modeled as a quadratic term) and all of the physician attributes as independent variables in the first level and the overall average intercept across all observations and providers plus the error term for each provider at the second level. Analyses were performed separately for RSMRs derived from all PCI procedures (ie, combined emergent and nonemergent) as well as from each physician's nonemergent procedures only. All *P* values were 2-sided, and a *P* value of ≤0.05 was considered statistically significant. Analyses were conducted using STATA version 15.0 and SAS version 9.4.

RESULTS

Provider Characteristics

A total of 356 interventional cardiologists were included in the analysis (Table 1). There were a total of 145 247 cases, of which 120 807 were nonemergent cases, performed in the 3-year period. The average number of years of practice, since the end of cardiology fellowship, was 14.14 (SD=9.44). Forty-two percent of providers had graduated from a foreign medical school. Of the US medical school graduates, 32% had attended a top 25 ranked medical school. As of 2016, 77% of providers had interventional cardiology board certification. Among board-certified providers, 52% had active MOC status. The average number of total cases performed was 398.63 (SD=382.09) for all PCIs and 331.89 (SD=360.00) for nonemergent PCIs in the 3-year period (Table 2). The number of cases performed in the 3-year period ranged from 5 to 3925 cases for all procedures (5–3906 for nonemergent procedures).

Table 1. Publicly Available Physician Attributes

No. of providers	356
Years since fellowship	14.14 (SD=9.44) y
Foreign medical graduates	42%
Top 25 medical school ranking (US graduates only)	32%
Interventional cardiology board certification	77%
Maintenance of certification (among board-certified providers)	52%

Mortality Rates

The average number of deaths per operator was 4.08 (SD=3.72) for all PCIs and 2.22 (SD=2.48) for nonemergent PCIs over the study period. The average 30-day RSMR was 1.07 (SD=0.14) deaths per 100 cases. For nonemergent PCIs, the average RSMR was 0.70 (SD=0.08) deaths per 100 cases.

Univariate Analysis Results

There was a significantly higher average number of cases performed by interventional cardiology certified physicians compared with noncertified physicians in the 3-year period for all PCIs (428.44 [SD=385.56] versus 306.21 [SD=360.47]; *P*=0.01), as well as for nonemergent PCIs (355.80 [SD=365.15] versus 258.30 [SD=337.67]; *P*=0.03; Table 3). In univariate analyses, the 30-day RSMR was significantly lower for board-certified physicians compared with noncertified physicians for all PCIs (1.06 [SD=0.14] versus 1.14 [SD=0.14] deaths per 100 cases; *P*<0.01) and for nonemergent PCIs (0.69 [SD=0.08] versus 0.73 [SD=0.08] deaths per 100 cases; *P*<0.01). There were no other significant differences in the number of cases performed, number of deaths or 30-day RSMR according to the other attributes analyzed. The 30-day RSMR for all PCIs in providers in the lowest quintile of caseload (5–148 cases) was 1.18 (SD=0.10) deaths per 100 cases and in the highest quintile (552–3925 cases) was 0.99 (SD=0.17) deaths per 100 cases (Figure). For nonemergent cases, the mortality rate was 0.75 (SD=0.05) deaths per 100 cases in the lowest quintile (0–119 cases) and 0.64 (SD=0.10) deaths per 100 cases in the highest quintile (483–3006 cases). The RSMR was significantly different across quintiles of caseload for all PCIs (*P*<0.01) and nonemergent PCIs (*P*<0.01).

Multivariable Analysis Results

In the multivariable hierarchical regression model with each of the physician attributes and provider caseload

Table 2. Provider Outcomes (Cumulative Over 3-Year Period 2011–2013)

	All PCI Procedures	Nonemergent PCI Procedures Only
No. of cases	398.63 (SD=382.09)	331.89 (SD=360.00)
No. of deaths	4.08 (SD=3.73)	2.22 (SD=2.48)
Risk-standardized mortality rate (deaths/100 cases)	1.07 (SD=0.14)	0.70 (SD=0.08)

PCI indicates percutaneous coronary intervention.

Table 3. Provider Outcomes by Physician Attribute (Cumulative Over 3-Year Period 2011–2013)

	All PCI Procedures			Nonemergent PCI Procedures Only		
	Mean No. of Cases	Mean No. of Deaths	30-Day Risk-Standardized Mortality Rate (Deaths per 100 Cases)	No. of Cases	Deaths	30-Day Risk-Standardized Mortality Rate (Deaths per 100 Cases)
Interventional cardiology board certified N=273	428.44 (SD=385.56)*	4.30 (SD=3.69)	1.06 (SD=0.14)†	355.80 (SD=365.15)‡	2.32 (SD=2.45)	0.69 (SD=0.08)†
Interventional cardiology board noncertified (N=80)	306.21 (SD=360.47)*	3.40 (SD=3.85)	1.14 (SD=0.14)†	258.30 (SD=337.67)‡	1.94 (SD=2.62)	0.73 (SD=0.08)†
Maintenance of certification (in board-certified physicians; N=143)	401.08 (SD=340.02)	4.45 (SD=3.58)	1.07 (SD=0.13)	321.26 (SD=309.32)	2.31 (SD=2.34)	0.70 (SD=0.08)
No maintenance of certification (in board-certified physicians; N=130)	458.55 (SD=429.46)	4.14 (SD=3.82)	1.04 (SD=0.14)	393.80 (SD=415.97)	2.32 (SD=2.56)	0.68 (SD=0.08)
US medical graduates (N=206)	399.76 (SD=327.05)	4.00 (SD=3.25)	1.07 (SD=0.14)	331.10 (SD=299.41)	2.21 (SD=2.23)	0.70 (SD=0.08)
Foreign medical graduates (N=150)	397.09 (SD=447.95)	4.19 (SD=4.32)	1.08 (SD=0.15)	332.99 (SD=430.62)	2.23 (SD=2.80)	0.70 (SD=0.09)
Top 25 medical school ranking (among US graduates; N=65)	403.62 (SD=388.05)	4.06 (SD=3.39)	1.07 (SD=0.13)	345.14 (SD=373.88)	2.35 (SD=2.62)	0.69 (SD=0.08)
Not in top 25 medical school ranking (among US graduates; N=141)	397.99 (SD=296.27)	3.96 (SD=3.19)	1.08 (SD=0.14)	324.62 (SD=259.29)	2.15 (SD=2.03)	0.70 (SD=0.08)
Years since fellowship (change per year of fellowship)	3.18 (95% CI, −1.09 to 7.45)	0.02 (95% CI, −0.022 to 0.061)	−0.0003 (95% CI, −0.002 to 0.001)	3.11 (95% CI, −0.92 to 7.14)	0.008 (95% CI, −0.020 to 0.036)	−0.0004 (95% CI, −0.001 to 0.001)

PCI indicates percutaneous coronary intervention.
*P=0.01, †P<0.01, ‡P=0.03.

as independent variables, none of the provider variables were associated with a significant difference in 30-day RSMRs (Table 4). These findings were consistent for mortality rates generated from all PCIs performed by the providers, as well as from providers' nonemergent PCI cases. Provider caseload, however, was statistically significantly associated with RSMR (−0.001 [95% CI, −0.0001 to −0.001]; P<0.01 for all PCIs; −0.001 [95% CI, −0.001 to −0.001]; P<0.01 for nonemergent PCIs) that is for every one additional case performed by a provider over the study period, there were 0.001 fewer deaths per 100 cases.

DISCUSSION

We found that in the years 2011 to 2013 in NY State, providers with interventional cardiology board certification had a modestly lower 30-day RSMR after adjusting for patient-level factors but not after taking into account provider caseload. The remaining studied physician attributes (MOC, foreign versus US medical school attendance, medical school ranking, or years of practice) were not associated with any difference in 30-day risk-standardized mortality. Provider caseload itself did have a significant inverse relationship with the 30-day RSMR.

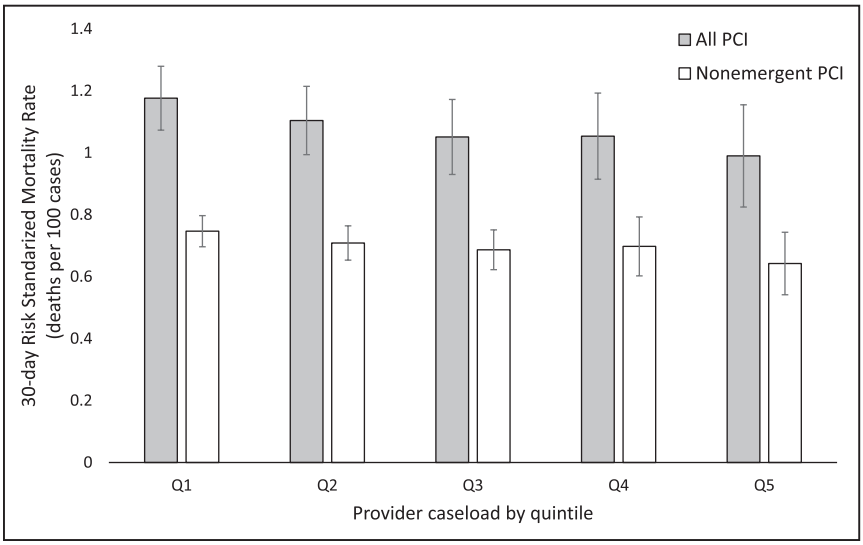

Figure. Thirty-day risk-standardized mortality rate (RSMR) by quintiles of provider caseload.
P<0.01 for 30-d RSMRs across quintiles for all percutaneous coronary interventions (PCIs) and nonemergent PCIs. Cut points for quintiles: 148, 249, 276, 550, and 3925 cases (for all PCI); 119, 199, 296, 434, and 3006 cases (for nonemergent PCI). Error bars represent SDs.

Table 4. Multivariable Hierarchical Linear Regression Outcome: 30-Day Risk-Standardized Mortality (Deaths per 100 Cases)*

	All PCI Procedures	Nonemergent PCI Procedures Only
Top 25 medical school ranking	0.014 (95% CI, −0.032 to 0.060)	−0.002 (95% CI, −0.032 to 0.028)
Foreign medical graduates	−0.013 (95% CI, −0.049 to 0.023)	−0.012 (95% CI, −0.035 to 0.011)
Years since fellowship (Per 1 year of fellowship)	0.0003 (95% CI, −0.001 to 0.002)	−0.0003 (95% CI, −0.001 to 0.001)
Interventional cardiology board certification	−0.035 (95% CI, −0.08 to 0.05)	−0.019 (95% CI, −0.049 to 0.01)
Maintenance of certification	0.017 (95% CI, −0.018 to 0.053)	−0.002 (95% CI, −0.025 to 0.02)
Provider caseload (per 1 case)	−0.001 (95% CI, −0.0001 to −0.001)†	−0.001 (95% CI, −0.001 to −0.001)†

PCI indicates percutaneous coronary intervention.
*Change in 30-d risk-standardized mortality (deaths per 100 cases) per unit change in physician attribute.
†$P<0.01$.

The above-mentioned variables are some of the few publicly available physician attributes that patients have access to and have been suggested as markers of patient outcomes. However, after accounting for patient comorbidities and clinical status, as well as provider caseload, none of these attributes differentiate providers by 30-day RSMR after PCI in NY State. The overall risk of death after PCI is low, and the additional impact of any individual physician attribute on top of patient clinical status and comorbidities and provider caseload may be negligible. Although interventional cardiology board-certified physicians did have lower 30-day risk-standardized mortality when adjusting only for patient-level characteristics, this relationship was attenuated by additional adjustment for provider caseload, which was significantly higher for board-certified physicians. Although a detailed analysis of the volume-outcome relationship for PCI is beyond the scope of this study, it has previously been noted in other studies of PCI, including those performed in NY State and in a nationwide registry.[25,26] Our analysis did not identify an obvious threshold of cases above which there was no difference in risk-standardized mortality. If provider caseload is, in fact, the only identifiable physician characteristic independently associated with lower mortality after PCI, this suggests that patients may benefit from greater transparency about an individual provider's caseload, a characteristic that is not publicly available in most states. Our study also noted that only about half of board-certified providers were enrolled in MOC as of 2016 and that there was no significant difference in 30-day mortality rates compared with those without MOC. Although a minimum caseload is a component of interventional cardiology MOC, we also found that MOC status by itself was not able to differentiate providers based on the number of cases performed.

Other provider attributes that were studied related to medical school education and provider experience as measured by total years in practice did not reveal an association with mortality after PCI. Proficiency in techniques such as radial artery access, which has shown to have lower complications and improved outcomes, have been shown to improve with greater experience.[27] However, whether providers who have been practicing for a greater number of years are necessarily more proficient in such techniques is unclear. Because of the evolving nature of the field, years of practice may not be a good surrogate for procedural experience in updated techniques independent of ongoing caseload. Attempts at identifying the quality of medical education have largely been focused on ranking of medical schools, which although controversial is well established and easily accessible to patients. Additionally, no previous studies have systematically studied the association of medical training with mortality after PCI for interventional cardiologists. Our study did not find any difference in post-PCI mortality based on either United States versus foreign medical school attendance or attendance at a top-ranked US medical school. Given the many different factors involved in success after PCI, including those unrelated to the individual provider, it is unsurprising that the specific medical school attended is not independently associated with lower mortality after PCI.

Limitations

Our study is limited by its reliance on 30-day RSMR as the only marker of patient outcomes. In a low-risk procedure, such as PCI, other outcomes, such as complication rates, appropriateness of the procedure, length of hospital stay, or resolution of symptoms, may also be surrogates of quality. Availability of such metrics would be of great interest to patients and payers but are not readily available or well reported. Mortality remains the most reported quality metric for interventional cardiologists and is of great interest to providers and health organizations. Additionally, unlike these other metrics, the risk-adjustment model for of 30-day mortality after PCI in NY State has been validated previously.[28] A limitation to the use of RSMRs is that it may not have accounted for certain unmeasured patient-level factors that could have an impact on the outcome through confounding. However, as mentioned, the NY State risk-adjustment model has previously been validated, and the use of such risk-adjustment models in NY State extends back to more than 2 decades. Another

limitation to RSMRs is variability from year to year that may not be accounted for in current risk-adjustment models as reported in one recent study using a national database.[29] However, the instability described in that study was in providers who were outliers in terms of RSMRs while our analysis focused on average RSMRs, which should be less affected by such instability. The outcomes analyzed were from the years 2011 to 2013 while board certification, MOC status, and medical school ranking were determined for 2016. However, it is not likely that there would be major differences in rates of board certification or medical school ranking in the 3-year interval. Although MOC requirements have continued to change since our study period, our study aims to examine the type of provider who would enroll in MOC rather than the impact of the specific requirements themselves. Although we did not use individual patient data and used provider level aggregate risk-adjusted and RSMRs for this analysis, the use of a hierarchical Bayesian estimator accounts for the primary source of uncertainty in calculating the risk-adjusted mortality rate, which is the difference in caseload between different providers.[19,20,30] Additionally, given that all the analyses are limited to provider level attributes, this should not be a major source of bias. Although some providers included in this analysis may practice in other states outside of NY, this is not captured in our data. However, the overall number of such providers is likely to be small, and there is no specific reason to think that this would introduce substantial bias into our results. It is also possible that our study does not have sufficient power to detect small associations between the studied attributes and the primary outcome. However, our study is the first of its kind to study many of the analyzed publicly available attributes in interventional cardiologists. Additionally, for interventional cardiology board certification, our results are generally concordant with those noted by Fiorilli et al[15], which included a nationwide database of interventional cardiologists and noted only a small, albeit statistically significant, association between board certification and inpatient mortality after PCI (odds ratio, 1.10; 95% CI, 1.02–1.19).

Conclusions

Interventional cardiology board-certified providers had modestly lower average 30-day RSMR after PCI; however, this was not significant after accounting for differences in provider caseload. No other studied publicly available physician attribute was able to differentiate providers according to 30-day mortality. Provider caseload was the only studied physician attribute that was independently associated with the study outcome but is limited by a lack of transparency for most patients.

ARTICLE INFORMATION

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Correspondence

Sameed Ahmed M. Khatana, MD, Division of Cardiovascular Medicine, Perelman School of Medicine, University of Pennsylvania, 3400 Civic Center Blvd, Philadelphia, PA 19104. Email sameed.khatana@uphs.upenn.edu

Affiliations

Division of Cardiovascular Medicine (S.A.M.K., P.N.F., A.S.N., D.M.K., J.G.), Penn Cardiovascular Outcomes, Quality, and Evaluative Research Center (S.A.M.K., A.S.N., P.W.G., J.G.), Department of Biostatistics, Epidemiology, and Informatics (N.M.), and Division of General Internal Medicine (P.W.G.), Perelman School of Medicine, The Leonard Davis Institute of Health Economics (S.A.M.K., A.S.N., N.M., P.W.G., J.G.), University of Pennsylvania, Philadelphia. Center for Health Equity Research and Promotion, Michael J. Crescenz Veterans Affairs Medical Center, Philadelphia, PA (P.W.G.).

Disclosures

Dr Kolansky has served as a member of the American Board of Internal Medicine Interventional Cardiology test writing committee. The other authors report no conflicts.

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