

The Quality of Surgical and Pneumonia Care in Minority-Serving and Racially Integrated Hospitals

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Objective. To explore the association between quality of care for surgical and pneumonia patients and the racial/ethnic composition of hospitals' patients.

Data Source. Our primary data were surgical and pneumonia processes of care indicators from the 2012 Medicare Hospital Compare Data. We merged this data with information from the 2011 American Hospital Association Annual Survey of Hospitals. We computed the racial and ethnic composition of hospital patients using 2008 data from the Healthcare Costs and Utilization Project.

Study Design. The sample included 1,198 acute care general hospitals from 11 states: AZ, CA, FL, IA, MA, MD, NC, NJ, NY, WA, and WI. We compared quality across minority-serving, racially integrated, and majority-white hospitals using unconditional quantile regression models controlling for hospital and market characteristics.

Principal Findings. We found quality differences between the lowest performing minority-serving, racially integrated, and majority-white hospitals. As we moved from 10th to 90th quantile, the quality differences between hospitals by patients' racial composition disappeared. In other words, the best minority-serving and racially integrated hospitals performed as well as the best majority hospitals.

Conclusions. Efforts to improve quality of care for patients in minority-serving and racially integrated hospitals should focus on the lowest performers.

Key Words. Hospitals, disparities, quality

Prior studies have found that racial and ethnic disparities in hospital quality are due to differences across hospitals rather than differences within hospitals (Lucas et al. 2006; Goldman and Dudley 2008; Culler et al. 2010; Hasnain-Wynia et al. 2010; Mayr et al. 2010; Popescu et al. 2010). This calls into question the quality of care provided by hospitals serving minority patients. These studies imply that minority-serving hospitals underperform on quality indicators when compared to other hospitals. Possible explanations for the poor

performance of minority-serving hospitals are a lack of resources (Jha, Orav, and Epstein 2010a; Haider et al. 2013), inadequate budgets, and a culture of mediocre or poor quality. Also, minority-serving hospitals may face challenges attracting and retaining clinical and administrative expertise because of their payer mix. Another explanation is that minority-serving hospitals are unfairly labeled as low quality because inadequate risk adjustment fails to account for unobservable risk factors associated with their vulnerable patient populations (Lucas et al. 2006; Jha, Orav, and Epstein 2011).

Numerous studies have sought to identify characteristics of hospitals that are associated with low-quality care. Researchers have found that minority patients are more likely to receive care in safety net and Medicaid-dependent hospitals (Kind et al. 2010; Ly et al. 2010), hospitals that are located in poor communities (Lucas et al. 2006; Sarrazin, Campbell, and Rosenthal 2009; Culler et al. 2010; Ly et al. 2010), teaching hospitals (Gaskin et al. 2008; Jha et al. 2010b; Kind et al. 2010; Haider et al. 2013), public hospitals (Gaskin et al. 2008, 2011; Ly et al. 2010), hospitals with fewer nurses per patient-day (Ly et al. 2010), and hospitals with greater lengths of stay (Joynt, Orav, and Jha 2011). These characteristics associated with minority patient use are also associated with quality.

These systematic differences in hospital quality associated with the racial and ethnic composition of the patient population create a challenge for policy makers interested in improving hospital quality. The Affordable Care Act created the Centers for Medicare and Medicaid Services (CMS) Innovation Center to develop, test, and promulgate new payment reforms (PPACA 2010b) that would incentivize providers to improve quality (PPACA 2010a). One of the criteria for evaluating new payment reforms is whether it reduces disparities. The association between racial and ethnic composition of patients and hospital quality raises concerns that policies that financially penalize poor performance will have the unintended consequence of increasing disparities in quality (Karve et al. 2008; Ly et al. 2010; Joynt, Orav, and Jha 2011). Some

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researchers warn that pay-for-performance policies would have the perverse effect of reducing resources in hospitals that serve higher proportions of minority patients because these hospitals may be unable to meet quality standards due to systemic factors beyond their control (Jha, Orav, and Epstein 2010a; Ly et al. 2010). Hence, reimbursement policies designed to improve quality may compromise minority-serving hospitals' ability to provide high-quality care to their patients.

While studies have found hospitals' percentage of minority patients is inversely related, this finding negatively impacts the image of minority-serving hospitals (Epstein, Gray, and Schlesinger 2010; Kind et al. 2010; Mayr et al. 2010) and ignores high-performing minority-serving hospitals. In this study, we compare quality between minority-serving and nonminority-serving hospitals to determine whether the best minority-serving hospitals are comparable to the best nonminority-serving hospitals. We used quality indicators from the Medicare Hospital Compare database. This database contains quality indicators for a broad range of services such as surgical, pneumonia, heart attack, heart failure, emergency department, preventive care, children's asthma, stroke care, blood clot prevention and treatment, and pregnancy and delivery care (CMS 2012b). In this article, we focus on surgical and pneumonia process of care measures. We selected these two processes of care because they are objective measures that are not subject to patient perception or interpretation. Also they are less subject to inadequate risk adjustment due to patients' underlying unobserved health conditions.

DATA AND METHODS

Data

In this study, we focused on acute care general hospitals from 11 states: AZ, CA, FL, IA, MA, MD, NC, NJ, NY, WA, and WI. We selected these states because we could use their state inpatient discharge data to measure the racial and ethnic composition of their hospitals' patients. We used 2012 data from Medicare Hospital Compare to measure hospital quality (CMS 2012b). Specifically, we used 18 indicators of timely and effective care measures: 12 surgical care indicators and 6 quality process indicators for pneumonia (Table 1). To measure the racial and ethnic composition of hospitals' patients, we obtained 2008 state inpatient discharge (SID) data from Healthcare Cost and Utilization Project (HCUP) for the 11 states (SID 2008).

Table 1: Comparing Surgical and Pneumonia Process of Care Measures in Majority-White Hospitals with Minority-Serving and Racially Integrated Hospitals, with at least Thirty Observations for Each Indicator

Type of Hospital by Race/Ethnic Composition of Patients										p values from t-tests	
Majority-White										Minority-Serving	
Racially Integrated										Mean (SD)	
Obs.										Mean (SD)	
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Table 1. Continued

Quality Indicators	Type of Hospital by Race/Ethnic Composition of Patients						p values from t-tests	
	Majority-White			Racially Integrated			White versus Racially Integrated	Majority White versus Minority-Serving
	Minority-Serving			Mean (SD)				
	Obs.	Mean (SD)	Obs.	Mean (SD)	Obs.	Mean (SD)		
7	664	99.64 (0.95)	212	99.28 (2.39)	137	99.22 (1.76)	0.0014	0.0001
Percent of surgery patients needing hair removed from the surgical area before surgery who had hair removed using a safer method								
8	602	92.38 (6.48)	200	91.32 (6.78)	112	89.54 (9.77)	0.0467	0.0001
Percent of surgery patient whose urinary catheters were removed on the first or second day after surgery								
9	581	95.16 (3.94)	194	94.58 (4.64)	101	92.72 (6.13)	0.0901	0.0000
Percent of surgery patients who were taking heart drugs collected beta blockers before coming to the hospital								
10	537	94.38 (5.45)	166	94.10 (4.72)	99	91.04 (7.35)	0.5433	0.0000
Percent of outpatients having surgery who got an antibiotic at the right time, within 1 hour before surgery								
11	538	95.10 (4.33)	166	94.36 (4.91)	97	93.22 (5.64)	0.0620	0.0002
Percent of outpatients having surgery who got right kind of antibiotic(s)								
12	669	99.68 (1.03)	212	99.48 (2.14)	135	99.25 (2.06)	0.0637	0.0003
Percent of patients having surgery who were actively warmed in the operating room or whose body temperature was near normal by the end of surgery								

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Table 1. *Continued*

Quality Indicators	Type of Hospital by Race/Ethnic Composition of Patients						p values from t-tests	
	Majority-White		Racially Integrated		Minority-Serving		White versus Racially Integrated	Majority White versus Minority-Serving
	Obs.	Mean (SD)	Obs.	Mean (SD)	Obs.	Mean (SD)		
Pneumonia process of care measures								
1	700	93.63 (7.58)	213	92.29 (9.19)	138	89.16 (14.98)	0.0325	0.0000
2	692	95.99 (3.27)	212	94.79 (4.89)	138	93.00 (6.32)	0.0000	0.0000
3	662	96.76 (2.87)	214	95.85 (3.67)	138	94.37 (5.41)	0.0002	0.0000
4	478	98.14 (3.33)	162	98.09 (3.57)	88	97.52 (6.04)	0.8723	0.1689
5	652	94.45 (4.64)	210	94.46 (4.16)	134	94.01 (3.86)	0.9740	0.3058
6	603	93.07 (6.75)	206	90.56 (9.65)	127	87.94 (12.47)	0.0000	0.0000

*Majority white (if minority patient discharges: 0–34%); integrated (if minority patients discharges: 35–64%); minority (if minority patient discharges ≥65%).

[†]Probability checked majority-white hospitals with integrated and minority-serving hospitals separately.

[‡]Different observation related to some missing Obs.

[§]Bonferroni correction ($\alpha = 0.05$; 0.0014) employed to determine the statistical differences in means between majority-white, racially integrated, and minority-serving hospitals.

^{||}Observation for each indicator is different because only hospital with at least 30 observations for each indicator included.

Source: Authors' analysis from the Medicare Compare (2010–2013) and State Inpatient Discharge (HCUP) (2008).

We used categorical and continuous measures of minority-serving status. The race and ethnicity data from the SID data were used to compute the percentage of minority patients in each hospital. In addition, we created a categorical variable, designating whether a hospital is minority-serving, racially integrated, or majority-white. We defined *minority-serving hospitals* as those whose patient census was 65 percent or more minority, *racially integrated hospitals* as those whose patient census was between 35 and 65 percent minority, and *majority-white hospitals* as those whose patient census was less than 35 percent minority. These cutoffs, while somewhat arbitrary, have been used in a prior study to describe race-ethnic composition of zip codes (Gaskin et al. 2009, 2012). These cutoffs are a recognition of possible differences between racially segregated and integrated environments. America has a troubled history of racial-ethnic segregation in housing and public accommodations where predominantly white spaces are rich in resources, predominantly minority spaces have limited resources, and racially integrated spaces are fragile and subject to reduction in resources due to possible white flight. Sociologists have documented associations between racial-ethnic composition and resource allocation (Massey, Condran, and Denton 1987; Williams and Collins 2001; Wilson 2012). The use of categorical variables is useful because it allows us to interpret the magnitudes of the differences between hospitals in terms that commonly describe the racial and ethnic composition of spaces. However, to demonstrate that our findings are robust to these definitions, we estimated the models using continuous variables to see if the associations we observe in continuous models are similar to the categorical models.

We used data from the 2011 American Hospital Association (AHA) Survey of Hospitals to measure hospital characteristics (AHA 2011). Our analysis controlled for bed size, ownership status, teaching status, percentage of discharges for Medicare and Medicaid patients, urban-rural location, tertiary and high-tech services index, community service index, and full-time equivalent (FTE) total personnel per adjusted admission. We used the interns and residents to bed (IRB) ratio to determine teaching status. Hospitals with an IRB ratio greater than zero but less than 0.25 were designated as minor-teaching, those with an IRB ratio greater than 0.25 were designated as major-teaching, and nonteaching hospitals had an IRB ratio of zero. To control for patient cost severity, we use the case mix index reported by CMS (2012a).

The tertiary high-tech services index was the count of specialty services the hospital provided from a list of 29: computed tomography (CT) scanner, electron beam computed tomography, full-field digital mammography, magnetic resonance imaging, intraoperative magnetic resonance imaging,

multislice spiral computed tomography <64 slice, positron emission tomography (PET), positron emission tomography/CT (PET/CT), single photon emission computerized tomography, ultrasound, image-guided radiation therapy, intensity-modulated radiation therapy, proton beam therapy, shaped beam radiation, system and stereotactic radio-surgery, robotic surgery, transplant services (bone marrow, heart, kidney, liver, lung, tissue and other transplant), burn care, trauma center, extracorporeal shock-wave lithotripter, therapeutic radiology, adult cardiac surgery, and neonatal intensive care. We also controlled the number of community services provided by hospitals by creating a community index from a list of 11 services: community outreach, health fairs, community health education, health screenings, immunization program, indigent care clinic, linguistic/translation services, meals on wheels, mobile health services, teen outreach services, and rural health clinic.

In addition to hospital-level factors, we controlled for market/area-level factors. We measured hospital competition using a county-level Herfindahl Index and included county median household income (Census 2010) and an urban–rural county designation. State fixed effects were used to control differences between government policies, practice variations, reimbursement methodologies, and data collection methods that vary across states. There are some missing data for some of our control variables. To maintain the sample size, we imputed values for these covariates using the mean and included in our regression models a dummy variable to indicate which observation had imputed data (Firebaugh 2008).

Statistical Analysis

We conducted bivariate and multivariate analyses. We used the *t*-test for comparing each measure between minority-serving with majority-white hospitals and racially integrated and majority-white hospitals (Table 1). We employed a Bonferroni correction ($\alpha = 0.05$; 0.0014) to determine the statistical differences in means between majority-white, racially integrated, and minority-serving hospitals (Weisstein 2014).

We estimated unconditional quantile regression models to determine whether the quality of surgical and pneumonia care were lower in minority-serving and racially integrated hospitals compared to majority-white hospitals. This model developed by Firpo, Fortin, and Lemieux uses recentered influence function to estimate impact of changes in explanatory variables on quantiles of unconditional distribution for the outcome variables (Firpo, Fortin, and Lemieux 2009b). We included state fixed effects; therefore, to adjust for

any clustering by states, we reported bootstrapped standard errors using the `rifreg` command developed by Firpo, Fortin, and Lemieux (2009a). To control heteroscedasticity, we created adjusted admission by dividing total admission to total FTE and weighted regression mode by the square root of adjusted admissions. As a sensitivity analysis, we estimated the models using the percentage of minority patients as the key independent variables instead of the categorical variables to test whether our findings were sensitive to our definitions of racially integrated and minority-serving hospitals. All of the models were estimated using STATA 11. We reported results from standard weighted least squares and unconditional quantile regression models.

RESULTS

Descriptive Analysis

Our sample included 1,198 acute care general hospitals in the 11 states that had valid surgery and pneumonia process of care quality indicators. The sample varied across quality indicators because some hospitals did not report all the indicators. The percentage of hospitals reporting for surgery and pneumonia process of care quality indicators ranged from 80 to 95 percent. There are 825 majority-white hospitals, 224 racially integrated hospitals, and 149 minority-serving hospitals in the sample. We restricted our analysis to hospitals that had at least 30 observations for each indicator. Depending on the indicator, the number of observations varied from 204 to 700 majority-white hospitals, 108 to 214 racially integrated hospitals, and 39 to 138 minority-serving hospitals. We report the average score for each of the quality measures by racial-ethnic composition of the hospital in Table 1. We found differences in performance between majority-white, racially integrated, and minority-serving hospitals. Compared to majority-white hospitals, racially integrated hospitals had statistically lower scores for 2 of the 12 surgical indicators and three of six pneumonia indicators used in regression. Compared to majority-white hospitals, minority-serving hospitals had statistically lower scores for 11 of the 12 indicators and four of six pneumonia indicators. We used $p < .0014$ as the threshold for significance because we are making 36 comparisons.

The observed differences in quality for minority-serving hospitals could be due to other hospital characteristics (Table 2). Compared to majority-white hospitals, minority-serving hospitals were larger, more likely to have public or for-profit ownership, and more likely to be a major or minor-teaching hospital. Compared to majority-white hospitals, minority-serving hospitals had a

Table 2: Descriptive Statistics for Independent and Control Variables in Majority-White, Racially Integrated, and Minority-Serving Hospitals

Control Variables	Majority White				Racially Integrated				Minority-Serving				p values from t-tests	
	Obs.	Mean/Perc.	Std. Dev.	Obs.	Mean/Perc.	Std. Dev.	Obs.	Mean/Perc.	Std. Dev.	Obs.	Mean/Perc.	Std. Dev.	Majority White versus Racially Integrated	Majority White versus Minority-Serving
Hospital characteristics														
Hospital size														
Total hospital beds	825	180.85	-173.04	224	345.3	-296.09	149	280.77	-239.02				0.000	0.000
Adjusted admission	825	16,531	-15,179	224	28,271	-22,731	149	21,746	-17,481				0.000	0.000
FTE per adjusted admission	825	17.75	-8.86	224	15.86	-5.97	149	17.03	-11.15				0.003	0.38
Ownership type (Ref: NFP)														
Nonfor-profit (=1, Yes)	825	0.7	-0.46	224	0.7	-0.46	149	0.5	-0.5				0.648	0.000
For-profit (=1, Yes)	825	0.13	-0.34	224	0.12	-0.33	149	0.25	-0.43				0.988	0.000
Public (=1, Yes)	825	0.17	-0.38	224	0.18	-0.39	149	0.25	-0.43				0.671	0.024
Teaching categories (Ref: nonteaching)														
Nonteaching (Ref)	825	0.67	-0.47	224	0.38	-0.48	149	0.31	-0.47				0.000	0.000
Minor-teaching (≤ 0.25)	825	0.29	-0.45	224	0.47	-0.5	149	0.52	-0.5				0.000	0.000
Major-teaching (> 0.25)	825	0.04	-0.2	224	0.15	-0.36	149	0.17	-0.37				0.000	0.000
Patient characteristics														
Medicaid	825	0.12	-0.09	224	0.15	-0.1	148	0.24	-0.15				0.000	0.000
Medicare	825	0.42	-0.13	224	0.28	-0.13	149	0.24	-0.13				0.000	0.000

Continued

Table 2. *Continued*

Control Variables	Majority White				Racially Integrated				Minority-Serving		p values from t-tests			
	Obs.	Mean/Perc.	Std. Dev.	Obs.	Mean/ Perc.	Std. Dev.	Obs.	Mean/ Perc.	Std. Dev.		Majority White versus Racially Integrated	Majority White versus Minority- Serving		
Case mix index	825	1.48	-0.21	224	1.59	-0.26	149	1.47	-0.22	0.000	0.000	0.583		
Service mix														
Hi-tech services	825	8.27	-4.4	224	10.64	-5.44	149	7.99	-4.05	0.000	0.000	0.463		
Index														
Hospital	825	5.29	-1.87	224	5.76	-2.08	149	5.58	-1.96	0.001	0.001	0.091		
Community index														
Market characteristics														
Urban (=1, Yes)	825	0.59	-0.49	224	0.86	-0.35	149	0.81	-0.39	0.000	0.000	0.000		
Herfindahl index	825	0.51	-0.34	224	0.28	-0.3	149	0.2	-0.25	0.000	0.000	0.000		
High competitive;	825	0.2	-0.4	224	0.59	-0.49	149	0.69	-0.46	0.000	0.000	0.000		
HI ≤ 0.185 (=1, Yes)														
Moderate competitive;	825	0.38	-0.49	224	0.23	-0.42	149	0.21	-0.41	0.000	0.000	0.000		
$0.185 < \text{HI} \leq 0.516$														
(=1, Yes)														
Low competitive;	825	0.42	-0.49	224	0.18	-0.38	149	0.09	-0.29	0.000	0.000	0.000		
HI > 0.516 (=1, Yes)														
Median household	825	5.64	-1.51	224	6.26	-1.59	149	6.11	-1.53	0.004	0.004	0.001		
income (\$10,000)														

*We only included hospitals with valid data for surgical/pneumonia process of care measures.

†Herfindahl index calculated in county level for each hospital.

‡There are 168 (14%) missing values for Hi-Tech services and Hospital Community indexes and 213 (17.7%) missing values for case mix index; we replaced them by mean and included dummy in the models.

Source: Authors' analysis from the Medicare Compare (2010–2013), HCUP (2008), American Hospital Association [AHA] (2011), and Census (2010).

higher percentage of Medicaid patients and a lower percentage of Medicare patients. Minority-serving hospitals were more likely to be located in urban areas, with more hospital competition and higher median household incomes. Also, there were systematic differences between majority-white and racially integrated hospitals. Specifically, racially integrated hospitals were larger and more likely to be teaching hospitals. They served more Medicaid patients, fewer Medicare patients, and had a higher case mix index. Compared to majority-white hospitals, they provided more high-tech services and community services. Similar to minority-serving hospitals, racially integrated hospitals were more likely to be located in urban areas, with more hospital competition and higher median household incomes.

Multivariate Analysis

Table 3 reported the results of the unconditional quantile coefficient (UQF) for the all surgical and pneumonia process of care indicators. We found differences in performance between minority-serving, racially integrated, and majority-white hospitals after controlling for other hospital characteristics and market-level factors. These differences varied across quantiles. Minority-serving hospitals in the bottom 10th quantile performed lower than comparable majority-white hospitals on 5 of 12 surgical care process indicators and three of six pneumonia process indicators while minority-serving hospitals in the 90th quantile performed as well as majority-white hospitals on all of the indicators, that is, the differences are close to zero and statistically insignificant. The pattern of the UQF suggests that there are significant differences between the worst minority-serving hospitals and the worst majority-white hospitals, but the best minority-serving hospitals performed as well as the best majority-white hospitals. The differences in quality between minority-serving and majority-white hospitals developed and increased as one moves from the best performing hospitals to the worst performing hospitals.

Similarly, the UQF offer a nuanced story for racially integrated hospitals compared to majority-white hospitals. We do see a pattern where racially integrated hospitals in the bottom 10th quantile performed lower than comparable majority-white hospitals for 2 of the 12 surgical process indicators and 2 of 6 pneumonia process indicators. However for all indicators, racially integrated hospitals at the 90th quantile performed as well as comparable majority-white hospitals.

Table 3: Unconditional Quantile Results for Surgical and Pneumonia Process of Care Measure, Comparing Racially Integrated and Minority-Serving Hospitals with Majority White Hospitals

Row	Quality Indicators (Dependent Variable)	Racially Integrated Hospitals					Minority-Serving Hospitals					Obs.
		OLS	Q10	Q50	Q90		OLS	Q10	Q50	Q90		
1	Surgical process of care measures Percent of surgery patients given an antibiotic at the right time (within 1 hour before surgery) to help prevent infection	-0.270 (0.323)	-3.216* (1.284)	0.007 (0.253)	0.068 (0.162)		-0.396 (0.411)	-1.292 (1.686)	-0.517 (0.336)	0.413 (0.213)		988
2	Percent of surgery patients whose preventive antibiotics were stopped at the right time (within 24 hours after surgery)	-1.532*** (0.371)	-3.690** (1.428)	-0.653* (0.301)	-0.446 (0.290)		-2.400*** (0.475)	-7.639** (2.323)	-1.232*** (0.434)	-0.549 (0.413)		984
3	Percent of surgery patients who were given the right kind of antibiotic to help prevent infection	-0.567* (0.244)	-1.316 (0.880)	-0.075 (0.185)	-0.165 (0.145)		-1.264*** (0.310)	-2.958* (1.249)	-0.254 (0.252)	-0.105 (0.154)		988
4	Percent of surgery patients who got treatment at right time (within 24 hours before or after surgery) to help prevent blood clot	-0.746 (0.482)	-2.648 (1.896)	-0.033 (0.532)	0.445 (0.367)		-1.318* (0.617)	-3.981 (2.568)	-0.162 (0.700)	0.217 (0.460)		989
5	Percent of surgery patients whose doctors ordered treatments to prevent blood clots after certain types of surgeries	-0.795 (0.473)	-3.763 (2.397)	-0.150 (0.404)	0.176 (0.291)		-1.466* (0.605)	-5.536 (3.324)	-0.220 (0.544)	-0.028 (0.377)		990
6	Percent of all heart surgery patients whose blood sugar is kept under good control in the days right after surgery	-0.653 (0.515)	-1.399 (1.210)	-0.667 (0.782)	-0.642 (0.624)		-0.512 (0.745)	-0.861 (1.938)	-0.058 (1.059)	-0.825 (0.806)		351

Continued

Table 3. *Continued*

Row	Quality Indicators (Dependent Variable)	Racially Integrated Hospitals				Minority-Serving Hospitals				Obs.
		OLS	Q10	Q50	Q90	OLS	Q10	Q50	Q90	
7	Percent of surgery patients needing hair removed from the surgical area before surgery who had hair removed using a safer method	-0.832*** (0.185)	-0.518 (0.293)	-0.022 (0.014)	-0.022 (0.014)	-0.251 (0.233)	-0.450 (0.245)	-0.027 (0.019)	-0.027 (0.018)	1,013
8	Percent of surgery patients whose urinary catheters were removed on the first or second day after surgery	-1.492* (0.722)	-3.848 (2.258)	-1.050 (0.782)	0.273 (0.523)	-3.368*** (0.952)	-7.849* (3.920)	-1.159 (1.017)	0.456 (0.597)	914
9	Percent of surgery patients who were taking heart drugs collected beta blockers before coming to the hospital	-0.242 (0.471)	-0.914 (1.236)	-0.146 (0.540)	0.068 (0.376)	-1.283* (0.640)	-6.142* (2.736)	-0.893 (0.779)	0.172 (0.445)	876
10	Percent of outpatients having surgery who got an antibiotic at the right time, within 1 hour before surgery	-0.321 (0.676)	0.022 (1.639)	-0.332 (0.562)	0.222 (0.418)	-2.598** (0.894)	-6.920** (2.430)	-2.421*** (0.649)	0.124 (0.559)	802
11	Percent of outpatients having surgery who got right kind of antibiotic(s)	-0.738 (0.502)	-1.500 (1.443)	-0.935 (0.514)	-0.295 (0.291)	-1.164 (0.672)	-1.149 (2.565)	-1.487* (0.687)	0.016 (0.390)	801
12	Percent of patients having surgery who were actively warmed in the operating room or whose body temperature was near normal by the end of surgery	-0.395* (0.156)	-0.009 (0.084)	-0.025 (0.015)	-0.025 (0.023)	-0.303 (0.198)	-0.135 (0.117)	-0.036* (0.018)	-0.036 (0.031)	1,016

Continued

Table 3. *Continued*

Row	Quality Indicators (Dependent Variable)	Racially Integrated Hospitals				Minority-Serving Hospitals				Obs.
		OLS	Q10	Q50	Q90	OLS	Q10	Q50	Q90	
1	Pneumonia process of care measures Percent of pneumonia patients assessed and given pneumococcal vaccination	-1.906* (0.963)	-1.811 (3.533)	-0.988 (0.593)	0.226 (0.405)	-3.077* (1.201)	-3.071 (4.829)	-0.879 (0.907)	0.162 (0.584)	1,051
2	Percent of pneumonia patients given initial antibiotic(s) within 6 hours after arrival	-0.407 (0.384)	-0.100 (1.030)	-0.551 (0.368)	0.214 (0.328)	-0.984* (0.479)	-3.367* (1.637)	-0.871 (0.483)	-0.277 (0.325)	1,042
3	Percent of pneumonia patients whose initial ER blood culture was performed prior to administration of first dose of antibiotics	-1.015** (0.332)	-3.190** (1.172)	-0.431 (0.288)	0.047 (0.188)	-1.565*** (0.418)	-4.482** (1.536)	-1.137** (0.355)	-0.244 (0.243)	1,014
4	Percent of pneumonia patients given smoking cessation advice/counseling	-0.043 (0.425)	-0.480 (1.389)	-0.065 (0.122)	-0.065 (0.118)	-0.226 (0.550)	0.304 (1.578)	-0.121 (0.129)	-0.121 (0.131)	728
5	Percent of pneumonia patients given the most appropriate initial antibiotic(s)	-0.688 (0.508)	-1.917 (1.397)	-0.422 (0.462)	0.302 (0.326)	-0.288 (0.633)	-0.282 (1.675)	-1.139* (0.548)	-0.450 (0.444)	996
6	Percent of pneumonia patients assessed and given influenza vaccination	-2.486** (0.839)	-7.213* (2.866)	-0.612 (0.750)	0.441 (0.481)	-3.055** (1.073)	-8.627* (4.022)	-1.784 (0.968)	0.234 (0.643)	936

*For each indicator, observations for all quantiles are equal.

†In the regression model, not-for-profit hospitals considered as a reference group.

‡In the regression model, the high-competitive hospitals considered as a reference group.

§Parentheses for quantiles reported bootstrap SE for *recentered influence function* regression and SE for OLS; all models weighted by $1/\sqrt{bd-tot}$.

¶Observation for each indicator is different because only hospital with at least 30 observations for each indicator was included.

*** $p < .001$; ** $p < .01$; * $p < .05$.

Source: Authors' analysis from the Medicare Compare (2010–2013), HCUP (2008), American Hospital Association [AHA] (2011), and Census (2010).

Sensitivity Analysis

In Table 4, we reported the coefficients from the Recentered Influence Function using percentage of minority discharge as the key independent variables. The patterns of the coefficients are consistent with our findings from Table 3. In the 10th quantile, the estimated associations of the percentage of minority discharges were negative and significant for 7 of the 12 surgical indicators and 2 of the 6 pneumonia indicators. In contrast in the 90th quantile, they have 2 of the 12 surgical indicators and none of the pneumonia indicators had statistically significant negative associations with the percentage of minority discharges. As one moves from the 10th to the 90th quantile, the coefficients increase from negative values to values close to zero. This yields a different interpretation than the traditional ordinary least squares (OLS) estimates, which would suggest that there is a simple negative association for 8 of the 12 surgical and 4 of 6 pneumonia indicators. Considering differences in quantile, it seems the disparities in quality among hospitals by minority-serving status are larger for lower quantiles and almost nonexistent for the upper quantiles. This is a much different conclusion than one drawn from the OLS estimates. Also, because minority-serving and racially integrated hospitals are more likely to be large, urban, or teaching hospitals compared to majority white hospitals, we conducted stratified analyses by these hospital characteristics to determine if our findings are robust. We found that within size, location, and teaching categories that significant differences in quality existed primarily among the worst performing hospitals. These results are available by request from the authors.

DISCUSSION

Prior studies have argued that hospitals serving higher percentages of minority patients performed lower than other hospitals on quality indicators (Epstein, Gray, and Schlesinger 2010; Hasnain-Wynia et al. 2010; Kind et al. 2010; Joynt and Jha 2011; Joynt, Orav, and Jha 2011). A recent study reported that black patients tend to live closer to high-quality hospitals, but they are more likely to use lower quality hospitals for surgery (Dimick et al. 2013). These findings could create a misperception that minority-serving hospitals are uniformly lower quality providers. Or even worse, it promotes a more dangerous axiom that hospital quality is inevitably lowered as the proportion of minority patients increases. Also, these findings offer little insight as to why some hospi-

Table 4: Unconditional Quantile Results for Surgical and Pneumonia Process of Care Measure in Hospitals

Row	Quality Indicators (Dependent Variables)	Racial/Ethnic Groups Composition as a Continuous Variable						Obs.
		OLS	Q10	Q25	Q50	Q75	Q90	
1	Surgical process of care measures Percent of surgery patients given an antibiotic at the right time (within 1 hour before surgery) to help prevent infection	-0.007 (0.006)	-0.030 (0.025)	-0.018 (0.009)	-0.007 (0.005)	0.001 (0.003)	0.003 (0.003)	988
2	Percent of surgery patients whose preventive antibiotics were stopped at the right time (within 24 hours after surgery)	-0.039*** (0.007)	-0.110*** (0.031)	-0.042*** (0.012)	-0.020** (0.006)	-0.010 (0.005)	-0.013* (0.006)	984
3	Percent of surgery patients who were given the right kind of antibiotic to help prevent infection	-0.020*** (0.004)	-0.048* (0.019)	-0.024** (0.008)	-0.004 (0.004)	-0.005* (0.002)	-0.004 (0.002)	988
4	Percent of surgery patients who got treatment at right time (within 24 hours before or after surgery) to help prevent blood clot	-0.022** (0.009)	-0.060 (0.036)	-0.039* (0.017)	-0.002 (0.010)	0.001 (0.006)	0.002 (0.006)	989
5	Percent of surgery patients whose doctors ordered treatments to prevent blood clots after certain types of surgeries	-0.026** (0.008)	-0.103* (0.049)	-0.038* (0.017)	-0.007 (0.008)	0.003 (0.006)	0.001 (0.005)	990

Continued

Table 4. *Continued*

Row	Quality Indicators (Dependent Variables)	Racial/Ethnic Groups Composition as a Continuous Variable							Obs.
		OLS	Q10	Q25	Q50	Q75	Q90		
6	Percent of all heart surgery patients whose blood sugar is kept under good control in the days right after surgery	-0.012 (0.011)	-0.006 (0.026)	-0.014 (0.020)	-0.013 (0.016)	-0.030* (0.012)	-0.023 (0.013)	351	
7	Percent of surgery patients needing hair removed from the surgical area before surgery who had hair removed using a safer method	-0.008* (0.003)	-0.009* (0.005)	-0.003 (0.001)	-0.001 (0.000)	-0.001* (0.000)	-0.001* (0.000)	1,013	
8	Percent of surgery patient whose urinary catheters were removed on the first or second day after surgery	-0.054*** (0.013)	-0.125* (0.057)	-0.066* (0.028)	-0.025 (0.015)	-0.007 (0.010)	-0.002 (0.009)	914	
9	Percent of surgery patients who were taking heart drugs collected beta blockers before coming to the hospital	-0.026** (0.009)	-0.096** (0.036)	-0.039** (0.013)	-0.019 (0.010)	-0.000 (0.007)	-0.001 (0.007)	876	

Continued

Table 4. *Continued*

Row	Quality Indicators (Dependent Variables)	Racial/Ethnic Groups Composition as a Continuous Variable						Obs.
		OLS	Q10	Q25	Q50	Q75	Q90	
10	Percent of outpatients having surgery who got an antibiotic at the right time, within 1 hour before surgery	-0.039** (0.012)	-0.100* (0.041)	-0.051* (0.020)	-0.032*** (0.009)	-0.008 (0.009)	-0.002 (0.008)	802
11	Percent of outpatients having surgery who got right kind of antibiotic(s)	-0.022* (0.009)	-0.025 (0.037)	-0.041** (0.015)	-0.026** (0.009)	-0.013* (0.006)	-0.001 (0.006)	801
12	Percent of patients having surgery who were actively warmed in the operating room or whose body temperature was near normal by the end of surgery	-0.005 (0.003)	-0.002 (0.002)	-0.003* (0.001)	-0.001 (0.000)	-0.001 (0.000)	-0.001 (0.000)	1,016
1	Pneumonia Percent of pneumonia patients assessed and given pneumococcal vaccination	-0.053** (0.017)	-0.036 (0.068)	-0.073* (0.033)	-0.026* (0.013)	-0.012 (0.010)	-0.002 (0.008)	1,051
2	Percent of pneumonia patients given initial antibiotic(s) within 6 hours after arrival	-0.017* (0.007)	-0.047* (0.022)	-0.029* (0.012)	-0.013 (0.007)	-0.006 (0.005)	-0.000 (0.005)	1,042

Continued

Table 4. *Continued*

Row	Quality Indicators (Dependent Variables)	Racial/Ethnic Groups Composition as a Continuous Variable							Obs.
		OLS	Q10	Q25	Q50	Q75	Q90		
3	Percent of pneumonia patients whose initial ER blood culture was performed prior to administration of first dose of antibiotics.	-0.025*** (0.006)	-0.066** (0.023)	-0.030** (0.010)	-0.022*** (0.006)	-0.011* (0.005)	-0.003 (0.003)	1,014	
4	Percent of pneumonia patients given smoking cessation advice/counseling	-0.000 (0.008)	0.008 (0.023)	0.002 (0.014)	-0.003 (0.002)	-0.003 (0.002)	-0.003 (0.002)	728	
5	Percent of pneumonia patients given the most appropriate initial antibiotic(s)	-0.007 (0.009)	-0.014 (0.026)	0.001 (0.013)	-0.013 (0.008)	-0.006 (0.006)	-0.005 (0.006)	996	
6	Percent of pneumonia patients assessed and given influenza vaccination	-0.045** (0.015)	-0.106 (0.057)	-0.084** (0.029)	-0.027* (0.013)	-0.027* (0.013)	-0.002 (0.009)	936	

*For each indicator, observations for all quantiles are equal.

†In the regression model, not-for-profit hospitals considered as a reference group.

‡In the regression model, the high-competitive hospitals considered as a reference group.

§Parentheses for quantiles reported bootstrap SE for *recentered influence function* regression and SE for OLS; all models weighted by $1/\sqrt{bd-tot}$.

¶Observation for each indicator is different because only hospital with at least 30 observations for each indicator was included.

*** $p < .001$; ** $p < .01$; * $p < .05$.

Source: Authors' analysis from the Medicare Compare (2010–2013), HCUP (2008), American Hospital Association [AHA] (2011), and Census (2010).

tals are performing poorly for their minority patients. Our findings indicated that the best minority-serving and racially integrated hospitals provide care on par with the best majority-white hospitals for surgery and pneumonia care. Differences in quality were evident among the worst minority-serving and racially integrated hospitals when compared to the worst majority-white hospitals. In effect, the lowest quality minority-serving hospitals bring down the mean quality rating for the entire group of minority-serving hospitals and create an inaccurate perception of all minority-serving hospitals.

The Patient Protection and Affordable Care Act (ACA) requires payment reform in the Medicare, Medicaid, and Children's Health Insurance Program programs to improve quality (PPACA 2010a). Specifically, the ACA created the CMS Innovation Center to develop, test, and promulgate new payment reforms that would incentivize providers to improve quality. One of the Innovation Center's criteria for evaluating a payment reform program is its impact on disparities. Payment reforms that disproportionately penalize minority-serving hospitals may be viewed as "unfair" and could weaken already fragile health care delivery systems serving minority patients. A few studies have looked at the impact of pay-for-performance on minority-serving hospitals (Ryan 2010; Blustein et al. 2011); these studies do not show that these reimbursement methodologies increase disparities. However, recent implementation of financial penalties for high rates of hospital readmissions disproportionately fell on hospitals serving minority patients (Lagoe, Nanno, and Luziani 2012; CMS 2013).

The National Quality Forum (NQF) expressed concern that the public reporting quality indicators and their use for evaluating hospital performance and reimbursement could have unintended negative consequences for hospitals serving disadvantaged populations (NQF 2014). They acknowledge that quality indicators are correlated with sociodemographic composition of the patient population, that is, race, ethnicity, language, and socioeconomic status. NQF recommended including sociodemographic factors in risk adjustment methodologies unless there are conceptual reasons or empirical evidence indicating that this adjustment is unnecessary or inappropriate. Also, they recommended stratification and the creation of peer groups of hospitals serving similar patients to address the possibility of unfairly penalizing hospital for unobserved patient related risk factors correlated with sociodemographic factors.

The overall policy goal is to improve quality of care in all hospitals and eliminate disparities. CMS and other policy makers should design reimbursement schemes that provide appropriate incentive structures for improving

quality in all hospitals. Simply rewarding top-performing hospitals with financial bonuses may do little to accomplish this overall goal, while penalizing low-performing hospitals could directly negatively impact care for low-income and minority patients. Alternative incentive schemes could be focused on improvement in individual hospitals with annual goals (say a 10 percent relative improvement in performance as a stretch goal). This would incentivize low performers to make substantial improvements, encourage them to develop a culture of quality improvement if stretch goals are updated annually, and in the long term lead to high performance.

Researchers have suggested that the lack of resources is the primary reason for low-performing hospitals that serve predominantly minority populations (Karve et al. 2008; Ryan 2010; Weissman et al. 2012). Public policy should go beyond providing financial incentives. If the poor performance of these hospitals is due to a lack of resources, then public policy should address possible deficits in clinical, managerial, and physical plant resources. Policy makers could allow low-performing hospitals to use grants, tax subsidies, and loan repayment programs to attract managerial and clinical expertise targeted to address specific quality problems. The Maryland Health Enterprise Zone Initiative is an example of such a policy. A few Maryland hospitals have used this program to provide needed medical services to poor underserved neighborhoods (Reece, Brown, and Sharfstein 2013). Similarly, tax-exempt capital financing could be made available to low-performing hospitals to improve facilities and address infrastructure needs related to specific quality problems.

Our analysis is somewhat limited in that our data do not include states from the Deep South that have large black populations, that is, Alabama, Arkansas, Georgia, Louisiana, and Mississippi. Moreover, our models are cross-sectional and cannot infer any causal inferences. This is why we strictly interpreted our estimates as associations rather than making causal inferences. More important, we do not believe that racial and ethnic composition of hospital patients intrinsically influences quality of care. Rather the racial and ethnic composition of hospital patients is correlated with resources, practices, and policies that influence quality in the Donabedian sense (Donabedian 2002). Also, there are no minority-serving and racially integrated hospitals in Iowa. However, we estimated the models without hospitals from Iowa and compared the results. This sensitivity analysis found no significant changes in our results. Our racial composition measure is from 2008 HCUP data. These data typically have a 2-year lag, which makes it difficult to include contemporaneous data in our analysis. However, we do not believe this leads to a misclassification of hospitals because the racial composition of a hospital's patient

census does not change dramatically over short periods of time. A change in the demographics of the patient census would probably require hospitals to change their geographic market substantially. Also because we converted these data into a categorical measure, this problem affects only those hospitals with racial-ethnic compositions near the 35 and 65 percent cutoff points. Finally, quality differences among high-performing hospitals are difficult to determine because of ceiling effects associated with these quality measures. Top-performing minority-serving, racially integrated, and majority-white hospitals may differ along other important aspects that are not captured by these measures.

Policy Implications

We found that for surgical and pneumonia process of care measures, the best minority-serving and racially integrated hospitals performed as well as the best majority-white hospitals. However, low-performing, minority-serving, and racially integrated hospitals performed worst than low-performing majority-white hospitals for surgical and pneumonia quality indicators. Other studies are needed to evaluate disparities in other quality indicators. Efforts to improve surgical and pneumonia care for patients in minority-serving and racially integrated hospitals should target the lowest performers. Policy makers should consider alternative incentive programs to encourage low-performing hospitals to meet quality standards. Future studies should focus on the quality differences within minority-serving and racially integrated hospitals. There may be some valuable lessons to be learned from high-performing, minority-serving, and racially integrated hospitals that could be replicated in their low-performing counterparts.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.