RACIAL DIFFERENCES IN HOSPITAL MORTALITY FOR MEDICAL AND SURGICAL ADMISSIONS: VARIATIONS BY PATIENT AND HOSPITAL CHARACTERISTICS

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Objective: To determine if there are disparities between White and Black inpatient mortality rates for specific medical and surgical conditions and whether disparities vary by patient and hospital subgroups.

Design, Setting, Participants: All-payer discharge records in the 2009 Healthcare Cost and Utilization Project, State Inpatient Databases (SID) for 36 states that comprised about 80% of the Black and White populations in the United States were used to create a random, stratified sample of about 1,900 community hospitals (a 40% sample of US hospitals). All discharges in the hospitals were included and weighted for national estimates.

Main Outcome Measures: Inpatient Quality Indicators, developed by the Agency for Healthcare Research and Quality, were used to measure risk-adjusted hospital mortality for six medical conditions and four surgeries. National estimates compared non-Hispanic Whites to Blacks by patient and hospital characteristics.

Results: Blacks had lower mortality for all medical conditions compared to Whites. However, they had higher mortality rates for two surgical procedures (coronary artery bypass graft and craniotomy) and lower mortality for one surgery (abdominal aortic anuerysm repair). These patterns held for most, though not all, patient and hospital subgroups for medical conditions, but disparities typically varied by subgroup for surgeries.

Conclusions: Policymakers and researchers may use these findings in targeting interventions, designing quality reporting programs and designing studies on why the disparities exist and how to reduce them. (*Ethn Dis.* 2015;25[1]:90–97)

Key Words: Race, Hospital Care, Hospital Mortality

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INTRODUCTION

Numerous studies and reports have revealed racial disparities in health care in the United States.[1,2] Early studies on disparities in hospital care focused on use of surgical procedures and found that Blacks were less likely to receive these procedures even after controlling for socioeconomic and clinical status.[3–5] In more recent years, research on disparities in hospital outcomes have been published, with the unexpected finding that Blacks often have lower hospital mortality than Whites for certain medical conditions.[6–9] In contrast, studies on surgical patients have often found that hospital mortality is higher for Blacks than for Whites.[10–12] These studies have been conducted on different populations, leading to some inconsistencies in results and questions about the generalizability of the findings. Some of these studies have focused on males in the Veteran's Administration (VA).[7,8] Studies of patients in community hospitals have been restricted to selected states,[9] communities,[6] those covered by Medicare,[10,11] or large convenience samples.[12]

Our study is the first to our knowledge to provide all-payer national estimates on hospital mortality for common medical and surgical conditions for Blacks compared to Whites treated in US community hospitals. Our article addresses two questions: 1) are there national disparities between Blacks and Whites in the inpatient mortality rates for specific medical and surgical conditions, and 2) are the patterns of racial differences the same across patient and hospital subgroups?

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METHODS

Data Sources

Our study used the 2009 analytic file developed to make national estimates on racial and ethnic disparities in hospital care for the National Healthcare Disparities Report,[2] hereafter termed disparities analysis file.[13] The 2009 Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID), developed by the Agency for Healthcare Research and Quality (AHRQ), were the primary data sources for the disparities analysis file. The SID contain discharge summaries for all stays in all hospitals reporting to the statewide data organizations that voluntarily contribute data to HCUP.[14] The SID were linked to the American Hospital Association (AHA) Annual Survey of Hospitals to identify the universe of US community hospitals (non-Federal short-term general and other specialty hospitals, excluding rehabilitation hospitals) and to obtain

hospital characteristics. A 40% random, stratified sample of US community hospitals was selected, using the AHA Annual Survey to define the universe of US community hospitals and SID for the sampling frame. (The use of a 40% sample of hospitals was based on a statistical power analysis for estimates for the small populations, eg, children of specific race/ethnic groups, examined in the National Heathcare Disparities Report, for which the disparities analysis file was created). The sampling frame was the SID from 36 states that collected race and ethnicity data in their discharge summaries (Ark, Ariz, Calif, Colo, Conn, Fla, Ga, Hawaii, Iowa, Ill, Kan, Ky, Mass, Md, Me, Mich, Mo, NH, NJ, NM, Nev, NY, Okla, Ore, Pa, RI, SC, SD, Tenn, Tex, Utah, Va, Vt, Wash, Wis, and Wyo). These states account for about 80% of Whites and 77% of Blacks residing in the United States. The sampling strata were defined based on five hospital characteristics: geographic region, hospital control (ie, public, private not-for-profit, and proprietary), urban-rural location, teaching status, and bed size category. All discharge records for the sampled hospitals were included and discharge weights were created for national estimates. This resulted in the disparities analysis file containing 15.7 million discharge abstracts (39.4 million when weighted for national estimates) from 1,967 hospitals.[13]

Measurement

The AHRQ Inpatient Quality Indicators (IQI) software (Version 4.1) was used for this analysis.[15] The IQI mortality indicators, also used in previous studies on disparities,[16,17] include inpatient procedures and medical conditions for which mortality varies across hospitals and evidence indicates that high mortality may be associated with poorer quality of care. Our study uses six IQI in-hospital mortality measures for common medical conditions: patients with a principal diagnosis for acute myocardial infarction (AMI), congestive heart failure (CHF), gastrointestinal hemorrhage (GIH), hip fracture, pneumonia, and stroke. The study includes the four highest volume IQI surgical measures for mortality: abdominal aortic aneurysm (AAA) repair, coronary artery bypass graft (CABG), craniotomy, and percutaneous transluminal coronary angioplasty (PTCA). The software excludes obstetrical admissions and includes discharges for those aged ≥18 years, with the exception of the CABG and PTCA patients (≥40 years) and hip fracture (≥65 years).

The IQI risk adjustment variables include age, sex, age-sex interaction, All-Patient Refined-DRG[18] (APR-DRG) (with risk of mortality subclasss) applicable to each medical and surgical condition.[19] Regression-based standardization was used for risk adjustment. Because present on admission (POA) data is not collected by most SID states in 2009, the analysis did not include the use of POA. SAS software was used for all analyses, and in particular, SAS Proc Survey Means was the procedure used to obtain the mortality rates and standard errors taking into account the clustering of patients within hospitals and the hospital stratification aspects of the sampling design for the disparities analysis file.[20] The in-hospital mortality rates were weighted for national estimates and are presented unadjusted (observed) and risk-adjusted as rates per 1000 discharges. Tests for statistical significance of differences in hospital mortality were made using t tests.[13]

Non-Hispanic Blacks were compared to non-Hispanic Whites. For ease of discussion, we simplify the labels to Black and White. For comparisons by patient and hospital characteristics, Black adjusted mortality rates relative to White adjusted rates were calculated by dividing the Black by the White rate. A relative rate >1.0 means Blacks have a higher rate than Whites, <1.0 means Blacks have a lower rate.

RESULTS

Study Population

Descriptive statistics (national estimates) for the study population (Table 1) show that among the medical conditions, pneumonia had the largest number of discharges (113,000 for Blacks and 751,000 for Whites) while hip fracture had the fewest discharges (about 9,000 for Blacks and 233,000 for Whites). Among the surgical conditions, PTCA was the largest (52,000 for Blacks and 506,000 for Whites) and AAA repair had the fewest number of discharges (about 2,000 for Blacks and 40,000 for Whites). The proportion of Blacks varied considerably across conditions, from 4% of hip fracture discharges to 30% of CHF discharges. There was variability in the proportion of Blacks across surgical procedures, though not as great. Blacks made up 5% of the AAA repair and 16% of the craniotomy discharges. For comparison, Blacks made up 15% of the combined Black and non-Hispanic White US adult population (aged ≥18 years) and 10% of the elderly (≥65 years) in 2009.[21]

Hospitalized Blacks were less likely to be elderly than were Whites. The difference in age was most pronounced for medical conditions, with CHF having the largest disparity (46% of Blacks were elderly compared to 82% of Whites). Blacks had a higher % of females than did Whites for several conditions and surgeries, notably AMI, AAA repair, CABG and PTCA. For most medical conditions, Blacks had a similar % of patients that were at high risk of mortality. Blacks had a lower percentage who were at high risk of mortality for CHF, but for hip fracture and all surgeries Blacks were more likely to be at high risk of mortality.

Hospital Mortality Rates by Race

Blacks had lower risk-adjusted mortality rates for all six medical conditions (Table 2). The difference was highest for

Table 1. Characteristics of adult study population by race and condition, national estimates, 2009[a]

	Black	White
Medical condition		
Acute myocardial infarction		
Number of discharges, *n*	53,604	421,211
Age ≥65, %	45.8	60.1
Female, %	48.6	39.3
Major or extreme risk of mortality, %	46.7	45.9
Congestive heart failure		
Number of discharges, *n*	217,005	720,626
Age ≥65, %	46.0	82.0
Female, %	51.2	51.0
Major or extreme risk of mortality, %	39.4	47.1
Gastrointestinal hemorrhage		
Number of discharges, *n*	75,413	369,589
Age ≥65, %	53.4	69.9
Female, %	52.4	50.6
Major or extreme risk of mortality, %	30.1	29.0
Hip fracture, ≥65 years		
Number of discharges, *n*	9,103	232,770
Age ≥65, %	100.0	100.0
Female, %	69.3	73.2
Major or extreme risk of mortality, %	35.8	27.6
Pneumonia		
Number of discharges, *n*	112,992	750,820
Age ≥65, %	36.1	65.9
Female, %	55.4	53.4
Major or extreme risk of mortality, %	31.8	33.6
Stroke		
Number of discharges, *n*	88,576	372,593
Age ≥65, %	47.1	72.9
Female, %	53.9	53.1
Major or extreme risk of mortality, %	32.6	30.6
Surgical condition		
Abdominal aortic anuerysm repair		
Number of discharges, *n*	1,984	38,551
Age ≥65, %	74.6	84.2
Female, %	32.0	20.6
Major or extreme risk of mortality, %	36.4	25.6
Coronary artery bypass graft, aged ≥40 years		
Number of discharges, *n*	15,534	194,440
Age ≥65, %	44.2	59.3
Female, %	42.6	27.1
Major or extreme risk of mortality, %	50.0	41.6
Craniotomy		
Number of discharges, *n*	16,519	104,741
Age ≥65, %	22.0	36.7
Female, %	60.8	53.8
Major or extreme risk of mortality, %	36.3	25.5
Percutaneous transluminal coronary angioplasty, aged ≥40 years		
Number of discharges, *n*	51,592	505,645
Age 65, %	40.1	53.1
Female, %	45.7	32.9
Major or extreme risk of mortality, %	22.3	17.9

[a] The statistics in the table are national estimates for hospitalization across all US community, non-rehabilitation hospitals (50 states and District of Columbia) using weighted records from a random, stratified sample of hospitals from 36 States.

CHF, where the Black rate was about 38% less than the White rate (16.6 vs 26.6 deaths per 1000 discharges) and lowest for pneumonia where the Black rate was only 5% less than the White rate (29.6 vs 31.1 deaths per 1000 discharges). In contrast, Blacks had higher risk-adjusted mortality rates for two of the four surgeries; CABG and craniotomy. Black patients' adjusted mortality was 13% higher for CABG (26.2 vs 23.1 deaths per 1000 discharges) and 10% higher for craniotomy (47.0 compared to 42.9 deaths per 1000 discharges). Blacks had about a 20% lower adjusted mortality rate for AAA repair however (39.3 vs 48.4 deaths per 1000 discharges).

Hospital Mortality Rates by Race and Patient and Hospital Characteristics

For CHF and stroke, Blacks had lower risk-adjusted mortality than Whites within all patient and hospital subgroups (Table 3). In addition, across all medical conditions, Blacks had lower mortality than Whites in the following subgroups: elderly, those on Medicare, patients at moderate or major risk of mortality, and low-income-community residents. For AMI, GIH, and hip fracture, patient and hospital subgroups either had a lower rate for Blacks than Whites or there was no statistical difference (in no case did Blacks have a higher rate than Whites). However, for pneumonia, Blacks had higher mortality rates than Whites in two patient subgroups: the 18 to 44 year age group (relative rate of 1.32) and the extreme risk of mortality group (relative rate of 1.10). For the other pneumonia subgroups, Blacks had either a lower rate of mortality or there were no statistically significant differences.

For surgical conditions, there were no consistent results within condition or for patient and hospital subgroups across conditions (Table 4). While Blacks overall had a lower adjusted mortality rate for AAA repair (relative rate of .81), those treated in micropolitan hospitals had a

Table 2. Observed and risk-adjusted mortality rate (per 1,000 discharges) by race and medical or surgical condition, national estimates 2009

	Observed Rate (SE)		Risk-Adjusted[d] (SE)	
	Black	White	Black	White
Medical Condition				
Acute myocardial infarction	56.63 (1.96)	64.22[a] (.93)	47.60 (.90)	54.54[a] (.32)
Congestive heart failure	16.42 (.50)	38.52[a] (.52)	16.57 (.38)	26.60[a] (.17)
Gastrointestinal hemorrhage	20.99 (.89)	24.41[a] (.46)	16.95 (.47)	19.03[a] (.21)
Hip fracture	23.58 (2.50)	29.38[c] (.59)	16.75 (1.36)	24.67[a] (.29)
Pneumonia	33.07 (1.02)	42.52[a] (.56)	29.57 (.51)	31.06[b] (.18)
Stroke	73.77 (2.39)	98.68[a] (1.56)	65.76 (.78)	84.73[a] (.38)
Surgical Condition				
Abdominal aortic anuerysm repair	43.77 (7.26)	44.16 (1.80)	39.30 (4.05)	48.41[c] (1.00)
Coronary artery bypass graft	34.62 (2.81)	27.60[c] (.79)	26.19 (1.12)	23.15[b] (.33)
Craniotomy	83.99 (4.88)	54.27[a] (1.81)	47.01 (1.19)	42.87[b] (.57)
Percutaneous transluminal coronary angioplasty	16.18 (1.07)	16.22 (.49)	12.34 (.42)	12.57 (.13)

[a] $P<.001$.
[b] $P<.01$.
[c] $P<.05$.
[d] Risk adjusted by age, sex, age-sex interactions, major diagnostic category and risk of mortality (using AHRQ Quality Indicators software, v 4.1).

higher mortality (relative rate of 2.59) and for the other subgroups Blacks had lower rates of mortality or there were no statistical differences. Although Blacks overall had a higher mortality rate for CABG (relative rate 1.13), they had a lower mortality rate among females (relative rate .79). For the other patient and hospital subgroups, Blacks who underwent CABG either had lower rates or the results were not statistically different. Similarly, Blacks had a higher adjusted mortality rate following craniotomy overall (relative rate 1.10), but their mortality was lower in one subgroup– residents of the highest income communities (relative rate .73). Although there were no racial disparities overall for PTCA, Blacks had a higher rate among high income area residents, in the Northeast and private for-profit hospitals. Blacks had lower PTCA mortality rates than Whites among the elderly, when looking separately at males and females, and those treated at Midwest or private not-for-profit hospitals.

DISCUSSION

Our study goes beyond existing literature on Black-White disparities in hospital mortality, which has generally focused on elderly Medicare beneficiaries,[10,11] male users of VA hospitals[7,8], or specific geographic areas[6,9] by providing national, all-payer estimates. Consistent with previous work using these more limited study populations,[6–9] our study finds that Blacks experience lower mortality rates than Whites when hospitalized for medical conditions that are common reasons for hospitalization. However, disparities following surgical procedures varied by type of procedure; in some cases Blacks had higher mortality (CABG and craniotomy), in others lower mortality (AAA repair) or no disparity existed (PTCA).

Consistent with previous work using these more limited study populations,[6–9] our study finds that Blacks experience lower mortality rates than Whites when hospitalized for medical conditions that are common reasons for hospitalization.

We examined Black-White differences within subgroups, in contrast to previous studies that created models to adjust for subgroup differences (covariates) and did not examine disparities within subgroups.[6–12] Our subgroup analyses showed that there are variations in disparities based on patient and hospital characteristics. These variations may be of relevance to policy, practice and future research. For example, hospitals located in the Midwest tended to have larger Black-White mortality differences for the medical conditions than those located in the South. So, disparities reduction efforts may want to focus on the Midwest and researchers may want to examine reasons behind the regional differences. The subgroup findings also demonstrate that disparity results vary by patient age and sex. For example, among the elderly (aged ≥65 years), Blacks had lower mortality rates than Whites for all six medical conditions, while among individuals aged 18 to 44, Blacks had lower mortality for CHF and stroke only and higher mortality for pneumonia. Research will benefit from acknowledging that findings from studies focused

Table 3. Black risk-adjusted hospital mortality rate relative to White for medical conditions by patient and hospital characteristics, 2009 national estimates[d]

	AMI	CHF	GI hemorrhage	Hip Fracture	Pneumonia	Stroke
Total	.87[a]	.62[a]	.89[a]	.68[a]	.95[b]	.78[a]
Patient characteristic						
Age, years						
18–44	1.02	.81[c]	1.36	NA	1.32[a]	.83[a]
45–64	.97	.57[a]	.97	NA	.91[b]	.89[a]
≥65	.76[a]	.50[a]	.75[a]	.68[a]	.80[a]	.66[a]
Sex						
Male	.69[a]	.39[a]	.74[a]	.69[a]	.67[a]	.73[a]
Female	.71[a]	.43[a]	.82[a]	.58[a]	.66[a]	.69[a]
Risk of mortality						
Minor	.92	DSU	DSU	DSU	.62[b]	.47[a]
Moderate	.64[a]	.32[a]	.74[b]	DSU	.80[a]	.35[a]
Major	.67[a]	.51[a]	.79[a]	.51[a]	.83[a]	.57[a]
Extreme	.96[c]	.81[a]	.96	.91	1.10[a]	.95[a]
Median income of patient's ZIP Code						
First quartile (lowest)	.81[a]	.56[a]	.83[a]	.76[b]	.87[a]	.74[a]
Second quartile	.84[a]	.61[a]	.87[c]	DSU	.96	.79[a]
Third quartile	.85[a]	.67[a]	.82[c]	.72[c]	.94	.73[a]
Fourth quartile (highest)	.99	.73[a]	.94	.85	.94	.74[a]
Expected primary payer						
Private insurance	.84[a]	.56[a]	.94	DSU	.94	.74[a]
Medicare	.85[a]	.62[a]	.86[a]	.68[a]	.91[a]	.74[a]
Medicaid	.98	.63[a]	1.02	DSU	.95	.84[a]
Uninsured	.90	.42[a]	.57[a]	DSU	.82[c]	.81[a]
Urban-rural residence						
Metropolitan	.89[a]	.64[a]	.91[b]	.66[a]	.98	.80[a]
Micropolitan	1.04	.66[a]	.71[b]	1.33	1.07	.86[a]
Non-metropolitan, non-micropolitan	.81[b]	.71[a]	1.07	DSU	1.06	.64[a]
Hospital characteristic						
Region						
Northeast	.92	.68[a]	.96	.51[a]	1.01	.80[a]
Midwest	.78[a]	.55[a]	.89	.62[b]	.87[a]	.69[a]
South	.92[b]	.67[a]	.92[c]	.75[b]	.98	.82[a]
West	.85[b]	.53[a]	.75[b]	.78	.93	.69[a]
Ownership						
Private, not-for-profit	.86[a]	.60[a]	.85[a]	.73[a]	.93[a]	.78[a]
Private, for-profit	.97	.65[a]	1.02	.57[b]	1.06	.72[a]
Public	.82[a]	.64[a]	.94	.50[a]	.91[c]	.78[a]
Teaching status						
Teaching	.82[a]	.66[a]	.89[c]	.70[a]	.95	.80[a]
Non-teaching	.93[b]	.62[a]	.91[c]	.67[a]	.97	.77[a]
Urban-rural location						
Metropolitan	.90[a]	.65[a]	.92[b]	.65[a]	.99	.81[a]
Micropolitan	.92	.66[a]	.72[b]	1.10	1.11[c]	.68[a]
Non-metropolitan, non-micropolitan	.52[a]	.38[a]	.84	DSU	.75[a]	.57[a]
Number of beds						
<100	.74[a]	.65[a]	1.12	DSU	.97	.66[a]
100–299	.95	.66[a]	.89[c]	.75[b]	1.04	.68[a]
300–499	.93[c]	.65[a]	1.05	.67[b]	1.01	.87[a]
≥500	.82[a]	.65[a]	.75[a]	.66[a]	.94	.81[a]

DSU, Data do not meet the criteria for statistical reliability of relative standard error <30%; NA, not applicable; AMI, acute myocardial infarction; CHF, congestive heart failure; GI, gastrointestinal intestinal.

[a] $P<.001$ indicates the significance level of the Black compared to White difference in risk-adjusted mortality.

[b] $P<.01$.

[c] $P<.05$.

[d] Risk-adjusted by age, sex, major diagnostic category, risk of mortality (using AHRQ Quality Indicators software v. 4.1). The reporting by age does not include age adjustment and reporting by sex does not include sex adjustment.

Table 4. Black risk-adjusted hospital mortality rate relative to White for selected surgical conditions by patient and hospital characteristics, 2009 national estimates[d]

	AAA Repair	CABG	Craniotomy	PTCA
Total	.81[c]	1.13[b]	1.10[b]	.98
Patient Characteristic				
Age, years				
18–44	DSU	2.41[a]	1.06	.72
45–64	.93	1.41[a]	1.21[a]	.92
≥65	.71[b]	.93	.96	.90[c]
Sex				
Male	.86	1.07	1.06	.87[b]
Female	.45[a]	.79[a]	.95	.71[a]
Risk of mortality				
Minor	DSU	DSU	2.78[b]	1.07
Moderate	DSU	2.30[a]	.73	.80
Major	DSU	1.33[c]	1.02	1.05
Extreme	1.19	.98	1.10[b]	.98
Median income of patient's ZIP Code				
First quartile (lowest)	.80	1.20[b]	1.15[b]	.94
Second quartile	.90	1.07	1.22[a]	.98
Third quartile	DSU	.80	1.08	.90
Fourth quartile (highest)	DSU	1.05	.73[a]	1.22[c]
Expected primary payer				
Private insurance	.79	1.13	1.12	.91
Medicare	.70[b]	1.11	1.03	1.00
Medicaid	DSU	1.64[b]	1.09	.93
Uninsured	DSU	.99	1.19[b]	.99
Urban-rural residence				
Metropolitan	.87	1.11[c]	1.07[c]	1.01
Micropolitan	DSU	.94	1.27	.86
Non-metropolitan, non-micropolitan	DSU	2.00[a]	1.28	DSU
Hospital characteristic				
Region				
Northeast	1.19	1.19	1.05	1.22[c]
Midwest	.68[c]	.99	.89	.87[c]
South	.73[c]	1.10	1.25[a]	.96
West	DSU	1.43[c]	1.16	1.14
Ownership				
Private, not-for-profit	.78[c]	1.06	1.08[c]	.92[c]
Private, for-profit	DSU	1.38[b]	1.15	1.33[a]
Public	1.27	1.27	1.15	.98
Teaching status				
Teaching	.83	1.04	1.03	.92
Non-teaching	.78	1.29[a]	1.21[a]	1.06
Urban-rural location				
Metropolitan	.77[c]	1.19[a]	1.09[b]	1.01
Micropolitan	2.59[b]	DSU	1.10	.80
Non-metropolitan, non-micropolitan	DSU	DSU	1.11	.73
Number of beds				
<100	DSU	DSU	DSU	DSU
100–299	1.02	1.28[c]	1.29[b]	.97
300–499	.84	1.17	1.23[a]	1.07
≥500	.75	1.06	1.02	.94

DSU, Data do not meet the criteria for statistical reliability of relative standard error <30%; AAA- abdominal aortic anuerysm; CABG, coronary artery bypass graft; PTCA, percutaneous transluminal coronary angioplasty.

[a] $P<.001$ indicates the significance level of the Black compared to White difference in risk-adjusted mortality.

[b] $P<.01$.

[c] $P<.05$.

[d] Risk-adjusted by age, sex, major diagnostic category, risk of mortality (using AHRQ Quality Indicators software v. 4.1). The reporting by age does not include age adjustment and reporting by sex does not include sex adjustment.

on the elderly and males, typical study populations in prior research,[7,8,10,11] cannot always be generalized to other age groups and females.

While our study did not address the question of why Blacks and Whites experience different mortality rates in the hospital, it may offer some insight for future research. We examined mortality for both surgical procedures and medical conditions in the same set of hospitals and show that Blacks have higher mortality rates than Whites for some surgeries but lower mortality for the medical conditions examined. Possible explanations are that: 1) Blacks go to different hospitals for surgical as compared to medical conditions (poorer quality for surgeries and higher for medical), or 2) Blacks are more likely to go to hospitals that provide poorer surgical care but better medical care, or 3) Blacks have different quality of care than Whites within the same hospital (lower for surgical and higher for medical). A number of studies provide evidence that racial differences in the types of hospitals used for surgeries may account for much of the observed Black-White differences in surgical mortality and surgical complications.[11,12,22,23] However, one study found that Blacks often have longer procedure times, which is associated with greater risk for postoperative complications, than Whites undergoing surgery within the same hospital.[24] On the other hand, for common medical conditions (AMI, CHF, and pneumonia) researchers have demonstrated that Blacks are more likely to be admitted to hospitals that deliver poorer quality of care using process of care measures,[25,26] but when using outcomes (mortality rate) as the measure of hospital quality, racial disparities in the quality of hospital varies across medical conditions.[16,17] Hence, although the evidence related to surgical outcomes generally points to differences in the hospitals used by Blacks and Whites, the evidence for the quality of hospitals used by Blacks and Whites is not as straightforward. Researchers may be inspired to examine the contradictory evidence on disparities in hospital care found when using process compared to outcomes measures of quality for medical conditions.

Our study may have several implications for policy makers. Because risk-adjusted hospital mortality varies by race, hospitals that care for disproportionate numbers of Blacks may be predicted to have higher mortality rates for certain surgeries and lower mortality for certain medical conditions. Stratified results by race may be particularly important as hospital information is increasingly reported to the public or used to adjust payments from insurers.[27,28] In addition, policy makers may want to fine tune quality improvement interventions by considering variations in mortality observed across subgroups.[29]

Limitations of our study should be noted. It is based on hospital discharge abstract (administrative) data, which contain ICD-9-CM diagnoses and procedure codes whose accuracy may be affected by several factors, including the quality of the information in the medical record, training and experience of hospital coders, and financial incentives to maximize reimbursement.[30] In addition, these codes may not adequately account for differences in severity of illness or comorbidities between Blacks and Whites due to the lack of detailed clinical information.[31] However, we derive some comfort from analyses stratified by risk of mortality. These analyses showed that Black-White mortality differences were typically observed across risk of mortality subclasses. Also, the disparities analysis file only permitted examination of inpatient deaths; deaths following admission are not examined. Another limitation relates to our subgroup analyses, which were univariate. Some of the subgroups may be correlated, such that patients in one subgroup may tend to be in another (eg, patients in rural areas may also tend to be hospitalized in non-teaching, small bed size hospitals for some conditions).[32] Bivariate or multivariate analyses focusing on clusters of subgroups, and/or the independent contribution of specific subgroups, should be examined in future research.

In summary, we demonstrated that Blacks had lower mortality rates than Whites when hospitalized for variety of medical conditions but higher mortality when hospitalized for some surgeries. The disparities patterns generally held for most patient and hospital subgroups for medical conditions, but disparities typically varied by subgroup for the surgeries. Understanding these patterns and variations may help guide efforts to reduce hospital mortality and disparities.

ACKNOWLEDGMENTS

We thank the statewide data organizations participating in the HCUP whose data were used in this study (listed at www.hcup-us.ahrq.gov/partners.jsp). This study was supported by the AHRQ. The authors are responsible for the contents of the article. No statement in this article should be construed as an official position of AHRQ or the United States Department of Health and Human Services. The authors would like to acknowledge the contribution of Marguerite Barrett, MS (M.L. Barrett, Inc.) for managing file preparation and statistical programming support.

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Manuscript draft: Andrews, Moy
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